

2rd World Congress on **Climate Change**

Sep 26 - 28, 2019 at Berlin, Germany

<https://wccc-2019.com>

Email: climatechange@innovinc.org

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Scientific Program

Thursday
Sept 26, 2019

Moderator: Kartikey Gupta, Vatsalya, India

08:00 - 09:00 Registrations

09:00 - 09:20 Opening Ceremony & Welcome Speech

TIME	TOPIC	SPEAKERS
Keynote Forum		
09:20-09:50	How expensive is an energy transition? A lesson from the German Energiewende	Thomas Unnerstall, Germany
09:50-10:20	Addressing Global challenges: BioEconomy can contribute significantly to climate change mitigation	Lene Lange, LLa-BioEconomy Research & Advisory, Denmark
10:20-10:50	Case studies to build rangeland resilience to climate change	J. Shannon Neibergs, Washington State University, USA
Coffee & Refreshment Break 10:50-11:05 @ Foyer		
Plenary Talk		
11:05-11:30	Aerosols' impacts and feedback on meso scale meteorology during severe haze episodes in East China	Hong Wang, Chinese Academy of Meteorological Sciences, China
Sessions		
Climate Change & Climatology		
Adaptation & Mitigation of Climate Change		
Climate Change & Natural Environment		
Biofuels & Bioenergy Applications		
Session Chairs		
Makoto Usami, Kyoto University, Japan		
Rongshuo Cai, Third Institute of Oceanography, Ministry of Natural Resources of China, China		
11:30-11:50	Detecting Environmental and Climatic Changes in Western Mediterranean during the Late Quaternary Using Small Mammal Assemblages	Juan Manuel López-García, IPHES, Spain
11:50-12:10	Agroecology - A climate resilient approach for food and nutrition security: Lessons learned from Action Against Hunger project in Bangladesh	Bader Mahaman Dioula, Action Against Hunger, Paris, France
12:10-12:30	Water challenges in the face of climate change in Mexico City	Sampan Tongnunui, Mahidol University, Thailand

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|--------------------|--|---|
| 12:30-12:50 | Why CMIP5 models cannot simulate the change trend of Pacific Walker Circulation over the last three decades? | Y. Guan,
<i>South China Sea Institute of Oceanology, CAS, China</i> |
| 12:50-13:10 | Indigenous Knowledge and Climate Change Adaptive Management - A case study on Orchid Island, Taiwan | Huei-Min Tsai,
<i>National Taiwan Normal University, Taiwan</i> |

Group Photo

Lunch & Networking 13:10-14:00 @ Restaurant

Session Chairs

Lene Lange, *LLa-BioEconomy Research & Advisory, Denmark*

Hong Wang, *Chinese Academy of Meteorological Sciences, China*

- | | | |
|--------------------|---|---|
| 14:00-14:20 | Agricultural cropping system change under climate warming in the Loess Plateau of China | Yansui Liu,
<i>Chinese Academy of Sciences, China</i> |
| 14:20-14:40 | Effects of Porous Materials and Tetrahydrofuran on the Enhancement of Biogas Storage with Hydrate Formation | Pramoch Rangsunvigit,
<i>Chulalongkorn University, Thailand</i> |
| 14:40-15:00 | Climate Change Through the Eyes of the Young: Innovation is a Key Strategy | Ray Ann Havasy,
<i>Center for Science Teaching and Learning, USA</i> |
| 15:00-15:20 | Could Cohesion Policy push EU climate efforts? | Michal Nekvasil,
<i>People in Need, Czech Republic</i> |
| 15:20-15:40 | Responses and compound risks of the coastal China areas to Global Change | Rongshuo Cai,
<i>Third Institute of Oceanography, Ministry of Natural Resources of China, China</i> |

Coffee & Refreshment Break 15:40-15:50 @ Foyer

- | | | |
|--------------------|---|--|
| 15:50-16:10 | Historical Tree Height Growth associated with Climate Change at The Species Geographic Range in Western North America | Yassine Messaoud,
<i>Lakehead University, Canada</i> |
| 16:10-16:30 | Variability of the Caspian Sea at decadal to millennial scales: the theory | Alexander Kislov,
<i>Lomonosov Moscow State University, Russia</i> |
| 16:30-16:50 | Projections of climate change on microclimatic conditions of an urban area: CFD simulations and adaptation measures | Nestoras Antoniou,
<i>University of Cyprus, Cyprus</i> |

Extended Q & A

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Scientific Program

Friday
Sept 27, 2019

Moderator: **Julia Tschersich**, *Carl von Ossietzky University Oldenburg, Germany*

Keynote Forum

- | | | |
|--------------------|--|--|
| 09:30-10:00 | Historical Responsibility for Climate Change: The Problem of Excusable Knowledge | Makoto Usami ,
<i>Kyoto University, Japan</i> |
| 10:00-10:30 | Insect damage influences expression of heat and drought stress resistance genes in maize | Patrick Dowd ,
<i>USDA, Agricultural Research Service, USA</i> |
| 10:30-11:00 | IPCC relationship with IPBES | Alan Feest ,
<i>University of Bristol/Ecosulis, United Kingdom</i> |

Coffee & Refreshment Break 11:00-11:20 @ Foyer

Sessions

Rules & Policies of Climate Change
Climate Change Impacts on Human Health
Hydrometeorology & Hydrology
Impacts and adaptations in agriculture and water management

Session Chairs

J. Shannon Neibergs, *Washington State University, USA*

Juan Manuel López-García, *IPHES, Spain*

- | | | |
|--------------------|---|--|
| 11:20-11:40 | The Cold Effect of Ambient Temperature on Ischemic and Hemorrhagic Stroke Hospital Admissions: A Large Database Study in Beijing, China between Years 2013 and 2014—Utilizing a Distributed Lag Non-linear Analysis | Xiuhua Guo ,
<i>Capital Medical University, China</i> |
| 11:40-12:00 | Flower phenology and Pollen limitation as main drivers of fruiting dynamics in temperate oak species | Marie-Claude Bel-Venner ,
<i>University of Lyon, France</i> |
| 12:00-12:20 | Development as adaptation: Framing and measuring urban resilience in Beijing | Yan ZHENG ,
<i>Chinese Academy of Social Sciences, China</i> |
| 12:20-12:40 | Groundwater Scenario of Hydrological and Hydrogeological Critical Terrains of India | Pankaj Kumar Roy ,
<i>Jadavpur University, India</i> |
| 12:40-13:00 | Satellite-based prediction of daily SO ₂ exposure across China using a high-quality random forest-spatiotemporal Kriging (RF-STK) model for health risk assessment | Rui Li ,
<i>Fudan University, China</i> |

Lunch & Networking 13:00-13:50 @ Restaurant

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Poster Presentations (13:50 -15:10)

Poster Judges

Alan Feest, *University of Bristol/Ecosulis, United Kingdom*

Patrick Dowd, *USDA, Agricultural Research Service, USA*

WCCC-1	Thermal Tolerance of Non-indigenous Fish from Tropical River Habitat in Thailand	Patitta Kritjirakorn , <i>Mahidol University, Thailand</i>
WCCC-2	Temperature Tolerance of Thai Freshwater Fishes Exposed to Dynamic Change in the Temperate rivers: Global Warming Implication	Thanasit Punkumsing , <i>Mahidol University, Thailand</i>
WCCC-3	Methodology for climate characterization of protected areas in Southern Brazil	Cássio Arthur Wollmann , <i>Federal University of Santa Maria, Brazil</i>
WCCC-4	Management strategies of cold air for establishing urban ventilation corridor plans: A case study of the Cheongju, Jeonju, Jinju in South Korea	Jeong-Min son , <i>Kyungpook National University, Korea</i>
WCCC-5	Wind driven airlift pump for artificial upwelling or forced downwelling powered by air at atmospheric pressure	Bruno Cossu , <i>Private Lawyer, Italy</i>
WCCC-6	Normalized difference vegetation index (NDVI) an indicator of climate change. Particular case of grapevine in Extremadura (Spain)	Fulgencio Honorio Guisado , <i>University of Extremadura, Spain</i>
WCCC-7	The current status and implications of laws and institutions concerning spatial planning to improve urban thermal environment in South Korea	Kwon Kim , <i>Kyungpook National University, Korea</i>
WCCC-8	Impacts of Climate Change on Flood Disaster Risk in the Mekong River Basin	Sophal Try , <i>Kyoto University, Japan</i>
WCCC-9	Aerodynamic Roughness Length Application for the Sustainable Urban Land Use Management Policy Development	Seung Man An , <i>Korea Research Institute for Human Settlement, South Korea</i>
WCCC-10	Aridity change in southwest of Iberian Peninsula	Abelardo García Martín , <i>University of Extremadura, Spain</i>
WCCC-11	Influence of climate change on active days trends for grapevine in the Guadiana river basin	Luis L Paniagua Simón , <i>University of Extremadura, Spain</i>
WCCC-12	The effect of climate change on aridity in Extremadura, southwestern Spain	Francisco Jesús Moral García , <i>University of Extremadura, Spain</i>

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|----------------|---|--|
| WCCC-13 | Winter chilling trends for cherry trees in the north of Extremadura | Francisco Javier Rebollo Castillo,
<i>University of Extremadura, Spain</i> |
| WCCC-14 | Agricultural cropping system change under climate warming in the Loess Plateau of China | Zhengjia Liu,
<i>Chinese Academy of Sciences, China</i> |
| WCCC-15 | Management strategies of cold air for establishing urban ventilation corridor plans: A case study of the Cheongju, Jeonju, Jinju in South Korea | Jeong-Hee Eum,
<i>Kyungpook National University, Korea</i> |
| WCCC-16 | Modeling of Atmospheric Pollution in Urban and Rural Sites Using a Probabilistic and Objective Approach | Fernando López-Rodríguez,
<i>University of Extremadura, Spain</i> |
| WCCC-17 | The current status and implications of laws and institutions concerning spatial planning to improve urban thermal environment in South Korea | Jun-Beom Baek,
<i>Kyungpook National University, Korea</i> |
| WCCC-18 | Modeling of Atmospheric Pollution in Urban and Rural Sites Using a Probabilistic and Objective Approach | Pablo Valiente Gonzalez,
<i>University of Extremadura, Spain</i> |

Session Chairs

Huei-Min Tsai, *National Taiwan Normal University, Taiwan*

- | | | |
|--------------------|---|---|
| 15:10-15:30 | How Are The Relationships Between Preterm Birth And Ambient Air Pollution Vary Over Space and How Will they be Affected by Climate Change: A Case Study in Georgia, USA | Jun Tu,
<i>Kennesaw State University, USA</i> |
| 15:30-15:50 | Assessment of hydro meteorological condition of flood in monsoon dominated Ganga-Brahmaputra-Meghna (GBM) floodplain system | Malabika Biswas Roy,
<i>Women's College, Calcutta under University of Calcutta, India</i> |
| 15:50-16:10 | Genetic Variation of Circadian Clock Genes in a Cavernicolous Anopheles dirus in western Thailand | Uraiwan Arunyawat,
<i>Kasetsart University, Thailand</i> |
| 16:10-16:30 | Overcoming the process-structure divide in conceptualizations of Social-Ecological Transformations | Julia Tschersich,
<i>Carl von Ossietzky University Oldenburg, Germany</i> |
| 16:30-16:50 | Application Potential of CO ₂ Enhanced Water Recovery Technology in Four Major Energy and Industry Sectors in China | Ning Wei,
<i>Chinese Academy of Sciences, China</i> |

Extended Q & A

Coffee & Refreshment Break 16:50-17:10 @ Foyer

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Saturday
Sept 28, 2019

Sessions

Climate change - Agriculture & Other Industries
Atmospheric Sciences & Meteorology
Land, Water & Fisheries

Sessions Chair

Alan Feest, *University of Bristol/Ecosulis, United Kingdom*

Pankaj Kumar Roy, *Jadavpur University, India*

10:00-10:20

On the climate change from the geosciences point of view

Modesto Eusebio Portilla Gamboa,
National University of Colombia, Colombia

10:20-10:40

Evaluating the performance of two surface layer schemes for the momentum and heat exchange processes during severe haze pollution in Jing-Jin-Ji in eastern China

Yue Peng,
Chinese Academy of Meteorological Sciences, China

10:40-11:00

Analysis of Extreme Urban Heat Island: Correlation with Climate Change

Kartikey Gupta,
Vatsalya, India

Coffee & Refreshment Break 11:00-11:20 @ Foyer

11:20-11:40

Effects of NPK and Plant Tea Manure (*Tithonia diversifolia*) on Growth Rate of Amaranth (*Amaranthus cruentus* L.) in Soilless Growing Media

Roseline Chemutai,
Bukalasa Agricultural College, Uganda

11:40-12:00

Due to severe drought, erosion caused by high rate of irrigation water in the harran plain, southeastern turkey

Yakup DARAMA,
Atilim University, Turkey

12:00-12:20

The influence of Maritime transport on the air quality around Spanish coasts and Sea Ports

Juan Moreno-Gutiérrez,
University of Cádiz, Spain

12:20-12:40

Assessment of Rainfall Variability as Evidence of Climate Change and Its Impact on Maize Production in Southeast Nigeria

Fidelis Chinazor Okorie,
Imo State University, Nigeria

12:40-13:00

Modeling CO₂ storage in geological formations – overview and challenges

Avinoam Rabinovich,
Tel Aviv University, Israel

Thanks giving & Closing Ceremony

Lunch & Networking @ Restaurant

Abstracts



How expensive is an energy transition? A lesson from the German Energiewende

Dr. Thomas Unnerstall
Germany

Biography

Dr. Thomas Unnerstall has been a board member of German utility companies for 15 years and is now a self-employed consultant, author and speaker. He studied physics and philosophy in Germany, in the USA and in France and got his PhD in physics in 1990. He started his career at the Ministry of the Environment of Baden-Württemberg, soon becoming the personal assistant to the Environment Secretary. In 1995, he joined the energy industry, focusing on generation, trading, sales and energy efficiency. In the last years Dr. Unnerstall has worked mainly on the political and macroeconomic aspects of the German energy transition and has written several books and a number of articles on these issues.

The Paris climate agreement of December 2015 is generally considered a breakthrough on the way to a sustainable future for mankind. In particular, the agreement calls for fundamental transitions in the energy systems worldwide, since more than 80% of CO₂ emissions stem from the use of fossil fuels in the energy supply. Considering such energy transitions, there is no doubt that the question of cost is one of the most crucial issues in the course of such a long-term project. After all, the expected financial burden on the national economy and its stakeholders is the most convincing argument for putting in energy transition off or for slowing it down.

There is also no doubt that the German Energiewende, at first sight, does not serve as an encouraging example in this respect: The cost bill - in the sense of the direct, perceptible financial effects - has already run up to almost € 500 billion, and the German private households as well as many businesses pay significantly more for electricity than in most other OECD-countries. As a consequence, in Germany as well as in the international media, the initially positive image of the Energiewende has suffered.

A closer look at the costs of the German energy transition, however, reveals that around 75% of them are due to two particularities of the Energiewende that do not hold true for other energy transitions: the politically enforced nuclear phase-out and the fact that Germany massively expanded renewable energies at a time when they were still very expensive.

Therefore, the real lesson of the German example is the opposite of what it may seem: The transition to renewable energies in the electricity sector in a highly industrialized country can be quite affordable.



Addressing Global challenges: BioEconomy can contribute significantly to climate change mitigation

Lene Lange

BioEconomy, Research & Advisory, Denmark

Biography

Career. Professor (f), PhD et Dr. Scient Director and Founder of LLa-BioEconomy, Research & Advisory. Has reached research director level positions in both industry and academia; acquired extensive experience from all parts of the knowledge-value-chain: research, technology, innovation, patenting, environmental impact assessment, product development, knowledge management, business models, and commercialization. Professional career includes experience from leading R&D positions in both private sector business and public research institutes. In industry (Novo, Novo Nordisk, and Novozymes) finishing in top research career position (Director of Research, in Molecular Biotechnology) within Novozymes R&D. From 01.02.07 back in academia, first as Head of Department of Biology, University of Copenhagen, and from 01.09.08 as Dean of Research and Professor in Biotechnology at Aalborg University, Denmark; later Campus director, AAU, and Director of Research. Professor, Research Leader, DTU 2015-2018.

An overview will be presented of the areas where Bioeconomy (knowledge, technologies, products and solutions) can contribute to mitigating climate change.

By substituting fossil-based products with renewable, biobased products such as biobased-chemicals, bio-materials and bio-fuel

Compensating for climate change induced lower agricultural yields; due e.g. to lower yields and failed harvest due to irregular rain fall and too high temperatures; achieved by using all of the products produced; upgrading crops residues and industrial side streams and organic waste to higher value products especially urgent in Africa

Improved resource efficiency: lower CO₂ & increased Food & Feed!
Now >50% of all the bio-resources are wasted, on the field, in the storage, in industrial processing, and in the consumer part of the value chains. If less is wasted, the CO₂-emission per ton produced can be reduced significantly

Increased public health by Biorefinery conversion of residues and sidestreams for production of food and feed ingredients with gut health promoting effect. Further, making animal feed from industrial side streams can cut down the acreage used; leaving more room for biodiversity; and cut down the need for prophylactic antibiotics, hereby reducing risk of antibiotic resistance!

Turbo Mitigation of Climate change, by make upgraded use of the misplaced greenhouse gases:

It is recommended to start exploiting also biological types of negative emission technologies (NET): e.g. by CCU, Carbon Capture and Use technologies! The new technologies for use of greenhouse gasses such as CO₂ and Methane for fuels, chemicals and animal feed will be described!



Case studies to build rangeland resilience to climate change

J. Shannon Neibergs

Professor, School of Economic Sciences, Washington State University, USA

Biography

Dr. J. Shannon Neibergs is a Professor in the School of Economic Sciences at Washington State University and serves as the Director of the Western Center for Risk Management Education. Shannon is a principal investigator of a number of studies investigating the applied economics of livestock production system efficiencies and environmental interactions.

Climate change studies consistently conclude that the Pacific Northwest (PNW) of the continental United States will increase in temperature, with the greatest change occurring as hotter summer temperatures; precipitation becomes more uncertain with projections for wetter winters and drier summers; a decline in snowpack and an increase in wildfire risk.^{1,2,3} Rangelands are particularly vulnerable to climate change because of their large land extent, sensitive ecology, inaccessibility to mechanical equipment and relative low economic value. Rangeland ecosystems in the Northwest exhibit complex feedbacks between drought, grazing, invasive annual grasses, and wildfire that could amplify climate change impacts⁴, and generates a complex management situation affecting both private and public land managers. For example, with fire risk increasing across many areas of the PNW, there has been some interest in intensive grazing to reduce potential fuels and reduce risk. Highly prescriptive grazing management of plant communities with cheatgrass (*Bromus tectorum*) can effectively suppress seed production of invasive annual grasses, reducing fine fuel biomass, and disrupting continuity of fuel to reduce the extent and severity of wildfire.

This study develops three case studies to evaluate and demonstrate rangeland management decisions that enhances climate change resiliency. These case studies highlight different types of resilience: ecological resilience, based on the health and condition of the rangeland vegetation and soils; operational resilience, based on the ability to make management changes in response to year-to-year variations; and economic resilience. There is no one recipe for increased resilience that works across the inland Pacific Northwest. These three case studies provide examples of cattle operations with very different characteristics and different challenges, as well as different strategies that have led to increased resilience to future climate change.

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Aerosols' impacts and feedback on mesoscale meteorology during severe haze episodes in East China

Hong Wang^{1,2}, Xiaoye Zhang^{1,3}, Yao Peng^{1,2}, Hongli Liu¹, Meng Zhang⁴ and Huizheng Che¹

¹State Key Laboratory of Severe Weather (LASW), Chinese Academy of Meteorological Sciences (CAMS), CMA, Beijing 100081, China

²Collaborative Innovation Center on Forecast and Evaluation of Meteorological Disasters, Nanjing University of Information Science & Technology, Nanjing 210044, China

³Center for Excellence in Regional Atmospheric Environment, Institute of Urban Environment, Chinese Academy of Sciences (CAS), Xiamen 361021, China

⁴Beijing Meteorological Bureau, Beijing 100089, China

Biography

Prof. Hong Wang's research encompasses model study on mesoscale atmosphere, chemistry and radiation. Hong is an expert in the field of aerosol-cloud-radiation interactions and their feedbacks on mesoscale circulation and pollution episodes.

Central-east China is the most haze polluted region in China. The interactions of meteorology features (mainly PBL meteorology) and PM_{2.5} during severe haze episodes were simulated and discussed using an online two-way atmospheric chemical GRAPES_CUACE in this region. PBL wind speeds by model and NCEP reanalysis both showed a reversing trend of PM_{2.5} variation, illustrating the importance of the "PBL window shadow" on haze formation. Turbulence diffusion and PBL height showed had opposite phases to surface PM_{2.5}, indicating that lower PBL height and weaker PBL turbulence diffusion are essential to haze formation. Two model experiments, namely a control (CTL) experiment without aerosol-radiation feedback (ARF) and a RAD experiment with online aerosol-radiation interactions, were designed to study the radiative feedback on meteorology and haze formation due to aerosols during haze episodes. The results showed that the mean solar radiation flux that reaches the ground decreases about 15% and even 20 to 25% in the region with the highest AOD. The fact that aerosol cools the PBL atmosphere but warms the atmosphere above it leads to a more stable atmospheric stratification, which causes a decrease in about 52% of turbulence diffusion and 33% of the PBL height, which finally result in about a 14% increase in surface PM_{2.5}. However, the persistence time of haze pollution is not effected by the aerosol.

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Further study on the contribution of the explosive growth (EG) of $PM_{2.5}$ due to aerosols-radiation feedback (ARF) and further decrease in turbulence diffusion (DTD) showed that turbulence diffusion coefficient (TDC) calculated by is about $60-70m^2/s$ on clear day and $30-35m^2/s$ on haze day. This difference of TDC was not enough to discriminate the unstable atmosphere on clear day and extreme stable atmosphere during EG stage of $PM_{2.5}$, and the inversion calculated was also weaker than the actual atmosphere by sounding observation on haze day. This led to 40-51% underestimation of the $PM_{2.5}$ EG by model; ARF reduced about 43-57% of TDC during EG stage of $PM_{2.5}$, which strengthened the local inversion obviously on haze day and the simulated local inversion was much closer to the sounding observation than the result without ARF, which resulted in 20-25% reduction of model errors of $PM_{2.5}$ and it was as low as -11 to -16%. However, the inversion by ARF was still weaker than the actual observation and ARF could not solve all the problems of $PM_{2.5}$ underestimation. Further 80% DTD of chemical tracers resulted in a near-zero turbulence diffusion named as "turbulent intermittent " atmosphere resulting in a further 14-20% reduction of $PM_{2.5}$ underestimation and the negative $PM_{2.5}$ errors of was reduced to -11 to 2% during EG stage. The combined effects of ARF and DTD solved over 79% underestimation of $PM_{2.5}$ EG in the case study. The results showed that the online calculation of aerosol-radiation feedback and a further improving arithmetic of PBL scheme focusing on extreme stable atmosphere stratification are indispensable for reasonable description of local "turbulent intermittent" and more accurate prediction of $PM_{2.5}$ EG and extreme levels during the severe haze in Central-east China.

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Detecting environmental and climatic changes in Western Mediterranean during the Late Quaternary using small mammal assemblages

Juan Manuel López-García

IPHES, Institut Català de Paleoecologia Humana i Evolució Social, Campus Sescelades URV, Edifici W3, 43007 Tarragona, Spain.

Àrea de Prehistòria, Universitat Rovira i Virgili (URV), Avinguda de Catalunya 35, 43002 Tarragona, Spain

Biography

Dr. Juan Manuel López-García is a Ramón y Cajal researcher and Head of the Paleontology Unit at the Institut Català de Paleoecologia Humana i Evolució Social (IPHES, Tarragona, Spain). He obtained his PhD degree in Prehistory in 2008 at the Universitat Rovira i Virgili (Tarragona, Spain), rewarded with Excellent Cum Laude and extraordinary departmental award. His main research line is focused on the small mammal studies in order to reconstruct the environment and climate where our ancestors lived during the Quaternary in Western Europe, including Iberian Peninsula, South of France, Italy, Belgium and North Africa. Leading several funded projects and into various international collaborations is the main author or co-author of more than 90 original papers in SCI and peer-reviewed journals. As well as, is member of the committee of experts in project evaluation of the Spanish Evaluation Agency (AEI) and the Italian Ministry of Education and Universities (MIUR).

The knowledge of palaeoenvironment and palaeoclimate during the late Pleistocene and the beginning of the Holocene is one of the main studied topics of the last decades by multitude of disciplines, including the research on small mammals. It is widely demonstrated that micromammals (bats, insectivores and rodents), thanks to the fact that they are mostly susceptible to changes in temperature, precipitation and environment, are good indicators of the changes in landscape and climatic fluctuations produced in the past. The interest for the development of these studies during this period lies in two main issues closely related: 1) detect the rapid fluctuations produced during the late Quaternary; 2) observed how the environmental and climatic changes affected the hominin populations. Taking into account this context, various methods (such as Habitat Weighting, Mutual Ecogeographic Range or Bioclimatic Model) are applied to small-mammal assemblages to try to reconstruct the environment and climate in western Mediterranean region, mainly focused on a score of late Pleistocene and early Holocene archaeo-paleontological sites, coming from the Italian and the Iberian peninsulas. The results obtained applying these methods to the small-mammal assemblages allow us to detect various climatic fluctuation, such as various cold Heinrich Events, the Bølling-Allerød interstadial or the late Pleistocene-Holocene transition. Moreover, the environmental and climatic data obtained using the small-mammal assemblages allow us to observe how our ancestors lived, showing for example that independently of climatic fluctuations Neanderthals and Anatomic Modern Humans (AMH) inhabited, in general, in landscapes surrounded by forest formations.

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Agroecology - A climate resilient approach for food and nutrition security: Lessons learned from Action Against Hunger project in Bangladesh

Bader Mahaman Dioula¹, Victor Kiaya¹, Cyril Lekiefs¹, Tapan Kumar Chakraborty², Abdullah Al Mamun², Rejaul Islam³, Moshir Rohman³ and Pascal Revault¹

¹Action Against Hunger, France

²Action Against Hunger, Bangladesh

³Khulna University, Bangladesh

Biography

Bader Mahaman Dioula is a Ph.D. agronomist with more than 10 years international and multidisciplinary experience. He currently holds the position of Senior Advisor in Sustainable Agriculture at Action against Hunger France, www.actioncontrelafaim.org. Action against Hunger is a non-governmental, non-profit international humanitarian organization committed to ending world hunger while working with communities to provide sustainable and long-term solutions to hunger and malnutrition. Bader is the one of the lead authors of the Action against Hunger strategy for agricultural interventions, a strategy that focuses on sustainable agriculture and agroecology. Bader's career pathway includes the International Federation of Agricultural Producers (former IFAP), the French National Institute for Agricultural Research (INRA), the Agricultural University of Athens (Greece), and the Niger Ministry of Agriculture.

Already vulnerable populations in developing countries are the first affected by the impacts of climate change, particularly in rural areas where household food security depends on their own agricultural production. Extreme weather events due to climate change such as droughts, torrential rains, floods directly affect farmers' productive resources and threaten agricultural systems. This is the case for smallholder farmers in Satkhira and Jessore districts in the South-West coast of Bangladesh, where waterlogging becomes a chronic problem. Landless and marginal farmers are the main victims of waterlogging as they lost their traditional livelihoods based on crop and animal production. To sustainably ensure food and nutrition security for the most vulnerable populations in Satkhira and Jessore and reduce climate-related risks, there is a need for climate resilient agricultural approaches such as agroecology. As a smart approach to climate change, agroecology can improve food and nutrition security, and increase farmers' ability to adapt to climate change and mitigate its effects. The objective of this paper is to present key findings and lessons learned from the project titled "Enhance resilience of the most vulnerable communities to cope with waterlogging in Satkhira and Jessore districts in Bangladesh", implemented in 2016-2018 by Action Against Hunger and its partners. The project aimed at building up the resilience of the impacted smallholder farmers and farming systems through a range of agroecological practices, including crop and animal production, improved water and soil management, diversified production systems. The project targeted a total of 2,404

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farmers' households. Applied research on land and water based adaptive farming practices were tested to find suitable adaptive technology and farming practices for the waterlogging areas.

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Thermal Capacity of Endemic Fishes from Small Rivers and Climate effects to freshwater fishes

Sampan Tongnunui¹, F.W.H. Beamish² and Amnuay Wattanakornsiri³

¹*Department of Conservation Biology, Mahidol University, Kanchanaburi Campus, Lum Sum, Sai Yok, Kanchanaburi, 71150, Thailand*

²*Environmental Science Program, Faculty of Science, Burapha University, Bangsaen, Chonburi, 20131, Thailand*

³*Environmental Science Program, Faculty of Science and Technology, Surindra Rajabhat University, Meuang, Surin, 32000, Thailand*

Biography

Dr. Sampan Tongnunui is a lecturer and researcher in Mahidol University, Kanchanaburi Campus, Thailand, where his research focuses on the implication of ecological freshwater fish, taxonomy, bioassessment of water quality using fish and the effect of global warming to freshwater fish diversity in the tropical rivers in Thailand. He has been collaboratively working with Prof. Dr. F.W.H. Beamish, emeritus professor, Guelph University and adjunct professor, Faculty of Sciences, Burapha University, Prof. Dr. Lawrence M. Page, curator of fish, Florida Museum of Natural History, Florida University and Asst. Prof. Dr. Amnuay Wattanakornsiri, Faculty of Science and Technology, Surindra Rajabhat University, and works in the climate change and diversity of fish in Thailand. He hope that his research will be useful for helping the world in protecting the global warming and biodiversity loss.

Critical thermal maxima (CT_{max}) were related positively with the acclimation temperature among 20.0 °C and the maximum values, varying in the four endemic species: *Devario regina*, *Mystacoleucus chiloaterus*, *Barbodes rhombeus* and *Rasbora rasbora*, in the ranges of 30.0 °C and 35.0°C. Highest and lowest CT_{max} were 39.0±1.2°C at 35.0°C acclimation for *B. rhombeus* and 34.6±0.6°C at 20°C for *D. regina*, respectively. Thermal capacity was positively correlated with those from 20.0 to 35.0 °C acclimation temperature that *D. regina* at 20.0 to 30.0°C acclimation temperature had the lowest thermal capacity. Besides, *M. chiloaterus* at 20.0 to 32.5°C acclimation temperature had higher thermal capacity, as well as *R. rasbora* and *B. rhombeus* had the highest thermal capacity at 35.0 °C acclimation temperature. Interestingly, the tropical Thai fish had lower thermal capacity than temperate fish. Hence, global temperature increases predicted from the endemic fish in Thai rivers during the latter portion of the current century are likely to exceed the thermal capacity of many indigenous fish with important loss in species diversity of fishes.

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Why CMIP5 models cannot simulate the change trend of Pacific Walker Circulation over the last three decades?

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Biography

Dr. Yuping Guan is a Senior Scientist in the State Key Laboratory of Tropical Oceanography at the South China Sea Institute of Oceanology, Chinese Academy of Sciences, where he research focuses on the ocean circulation and climate change, mechanic energy driven theory of oceanic thermohaline circulation, ocean eddies, and typhoon. He recently is interesting in visualization of atmospheric and oceanic motions. He is also a Professor in the College of Earth and Planetary Sciences at University of Chinese Academy of Sciences in Beijing, China, there he educates the course of Physical Oceanography. He earned a Bachelor and Master of Science degree in Theoretical Physics at the Lanzhou University, China. He also earned a doctorate in Atmospheric Sciences at Lanzhou University. Then in Physical Oceanography at the China Ocean University in Qingdao, China, for postdoctoral researcher on Marine Ecosystem Dynamics.

The Pacific Walker Circulation (PWC) is the most pivotal atmospheric systems over the equatorial Pacific Ocean, and the long-term change of PWC under global warming still remains open to debate. The observation records show that PWC has significantly strengthened in the past three decades. However, the output results from numerical models are controversial. Here we analyze the simulations of PWC in 18 CMIP5 models, which widely used to predict the future climate change, and discuss the bias and its causes. Most CMIP5 models can simulate the climatological states of PWC, but only a few models present the significant trend of strengthened PWC, particularly the ensemble-mean result is failure, and some models even yield the weakened PWC. To take a closely examine, we find that the simulated spatial patterns of sea surface temperature (SST) in the Pacific Ocean are insufficiently compare to or even opposite to observations. In other words, there are two type of outputs by CMIP5 (coupled) models, one is a PWC enhanced and corresponding to La Niña-like SST pattern, which similar to the observed SST anomaly; the other is a PWC weakened and corresponding to El Niño-like pattern. On the other hand, even though for the latter, the atmospheric-only model could get the enhancement of PWC by using the real observed SST to simulate the atmospheric circulation. Therefore, in order to get reasonably prediction in the future climate change by CMIP5 models, we firstly need to improve the capability of the coupled model to simulate SST correctly, at least corresponding to the past PWC under the global warming, changes in tropical Pacific.

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Indigenous Knowledge and Climate Change Adaptive Management - A case study on Orchid Island, Taiwan

Huei-Min Tsai

Graduate Institute of Environmental Education, National Taiwan Normal University, Taiwan

Biography

Dr. Huei-Min Tsai is currently Associate Professor at Graduate Institute of Environmental Education and serves as the Director of Indigenous Research and Development Center at National Taiwan Normal University, Taipei, Taiwan. She also acts as Vice Chair for the International Geographical Union (IGU) Commission on Islands, Honorable Member of International Small Islands Studies Association (ISISA), and Member of National Committee for Future Earth-Taipei. Her research interests include environmental changes and sustainability of Small Island, historical political ecology, 'Native Science' and Indigenous knowledge systems of tribal communities, climate literacy and island resilience. Dr. Tsai holds B.Sc. in Biology from National Taiwan Normal University, M.Sc. in Natural Resources Management from the Ohio State University, Post-graduate Certificate in Museum Studies from New York University, and Ph.D. in Geography from National Taiwan University.

As increasing impacts in climate change, there are emerging studies in linking Indigenous knowledge as measures for climate change adaptive management at local level. Researchers explored how indigenous knowledge can become part of a shared learning effort to address climate change impacts and adaptation as well as indigenous knowledge's links with sustainability and resilience (Floke 2006, Berkes et al 2006). At global climate change forums, indigenous peoples have often been recognized that their cultures and traditions are inherently resilient (IIPFCC, 2009, 2018, Nakashima et al, 2012). This paper aims to highlight the role of indigenous knowledge in disaster reduction and resilience building on the basis of an empirical case studies of a small Pacific island, Orchid Island (or, 'Pongso-no-Tao', literally means 'Island of People', with area of 47 sq. km., population ca. 4700) in Taiwan. Lying on the tropical typhoon route, the island frequently attacked by typhoon in summer and strong Northeastern Monsoon in winter. The knowledge for risk management has been embedded in the islanders' indigenous knowledge system, including the concepts of house design, community living spaces selection, irrigation terraces system, wave and weather observations, social networks, taboos, stories, and so on. A case of Typhoon Tanpin which badly hit the island in August 2012, demonstrates that most of the built environment damaged was constructed by outsiders while the traditional villages did not sustain major damage due to adaptive strategies retained in traditional knowledge. This study indicates that the inherent dynamism of Indigenous knowledge system lies at the heart of ability for adaptation and disaster reduction at community level.

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Agricultural cropping system change under climate warming in the Loess Plateau of China

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Biography

Dr. Yansui Liu, Professor, the fellow of The World Academy of Sciences (TWAS), Director General of Key Laboratory of Regional Sustainable Development Modeling, Chinese Academy of Sciences (CAS), and Ph.D. supervisor in the Institute of Geographic Sciences and Natural Resources Research (IGSNRR), CAS. Professor Liu is a specialist of land use and human-economic geography, and his major areas of research are agricultural and rural geography, urban-rural development issues, urbanization and rural revitalization, land consolidation engineering, land-water allocation, land use policy, rural human-land system and poverty reduction. He combines the theories, methods and practical applications and leads the team going deep into grassroots villages for surveys in typical areas, and formed the scientific perception on Chinese rural development problems. These contributions have mostly been used to guide regional development planning, policy formulations and national decision supports.

Loess Plateau (LP) is the largest loess area on the earth, which is located in the temperate continental monsoon climate zone, and used to be one of the most serious ecological degradation in the world, historically suffered from severe soil and water erosion. In past half century, the magnitude of soil erosion, however, decreases from 1.6 billion tons to 0.3 billion tons. This phenomenon is largely related with a series of ecological engineering measurements. Particularly, the 'Grain for Green' program evidently accelerates regional land greening. Yet, at the same time LP faced a new challenge of regional food shortage due to converting a mass of slope cultivated land to ecological land. To increase cultivated land and meet the regional requirement of grain, land consolidation in gully regions have been practiced since 2012. To take fully advantage of newly increased cultivated land and maximize regional crop yield, our research group set up a field station in typical gully region of the LP. By carrying out geographic engineering experiments and farmland demonstration, we have found out the fact of climate warming and its regional characteristics, and successfully realized the new cropping mode of maize and forage rape rotation in the context of temperature increase by organically combining climate resources with water, soil and agricultural resources in this region. Further, we used long-term (1961-2015) grid climatic data to explain the potential opportunities of developing a new cropping system with two crops per year at the regional scale. We find that the area of warm temperate zone across LP increased from 21.0% in 1960s to 50.3% in 2015 due to climate warming, and there are large potential to develop the new cropping system with two crops per year in the future. Our findings will be helpful for better supporting most LP, especially in regions with good soil conditions and sufficient water resources, had a large potential to develop new cropping systems with two crops per year, which will be helpful for optimizing regional land use and providing academic decisions on agricultural management in other same type areas.

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Effects of Porous Materials and Tetrahydrofuran on the Enhancement of Biogas Storage with Hydrate Formation

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Biography

Pramoch Rangsunvigit is a professor in chemical engineering at The Petroleum and Petrochemical College. He is also the director of the Center of Excellence on Petrochemical and Materials Technology (PETROMAT). His research interest involves separation processes and gas storage including hydrogen and methane with a number of technologies. He has published more than 70 scientific papers.

Effects of different porous materials and tetrahydrofuran on the biogas (methane) hydrate formation were investigated. It is well known that gas hydrate technology has emerged as a strong contestant for gas storage. However, the technology has its own limitation including slow hydrate formation, which could hinder the gas-storing rate. Porous materials and tetrahydrofuran are among many potential promoters to enhance hydrate formation. The porous materials used included activated carbon (AC) and hollow silica (HS). Experiments were carried out at 4 C and up to 8 MPa of methane in a quiescent crystallizer with different amounts of AC, HS, and THF.

The results show that the promoters, AC, HS, and THF accelerated the methane hydrate formation. Synergistic effects can also be observed with the combination of promoters. Note that, at the same experimental conditions without any promoter, no hydrate formation can be observed for at least 48 hours. In addition, more than 95% of methane can be recovered from the hydrates. For the investigated experimental conditions, storing biogas via hydrate formation is promising.

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Climate Change through the Eyes of the Young: Innovation is a Key Strategy

Ray Ann Havasy, Ph.D

Executive Director –Center for Science Teaching and Learning, USA

Biography

Dr. Ray Ann Havasy has been a scientist, educator, and not-for-profit business executive for over 20 years. She received her Bachelor's Degrees in zoology and education from Connecticut College and Davis and Elkins College, and her Masters and Doctorate Degrees in biology and education from Columbia University. She was a science teacher, a district wide science coordinator, and a middle school principal. She is a founder and Executive Director of The Center for Science Teaching and Learning (CSTL), a global non-profit organization dedicated to engaging people in STEM learning. CSTL has done projects for NBC News, US Department of Energy, National Science Foundation, and others. CSTL also administers the Clean Tech Competition, the only global clean technology, STEM based innovation competition for secondary students. CSTL was just awarded a grant from New York State to develop the first network of community based STEM centers. This summer CSTL will be opening Dinosaurs! and Peoples United Bank Animal Adventure, two new attractions for New York. Dr. Havasy is a tireless advocate for

Millennials have been touted as the generation that will do something about global warming. Recent social and political campaigns have hinged their tactics on the widespread idea that young people are more likely to act on climate change than older Americans (Kuppa 2017). Every year, The Center for Science Teaching and Learning administers The Clean Tech Competition, a global innovation competition for secondary students. These students, from over 40 countries, are asked to innovate a way to curb climate change or mitigate for the effects of climate change. In examining the innovations created by these bright and eager young people, a conclusion can easily be reached that they think we are probably beyond solving climate change. They sense the urgency that we find ways to "live with" climate change. However, by no means do they feel as though we are "doomed," instead focusing on ways in which technology can serve as a tool for humanity.

Several projects will be spotlighted during this presentation, and data has been collected over a period of three years. Based on the innovations created it can be concluded that these students do not see climate change as an ongoing factor leading to the end of humans, rather as a challenge in which innovation holds the key to success.

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students and she has been interviewed by NY Times, USA Today, and other media. She has traveled throughout the world, speaking about the importance of STEM and has been part of a national initiative to bring Project Based Learning into classrooms. She served as the STEM Education Specialist for the Singapore Board of Science and Technology and she is currently a STEM specialist for the government of the Grand Caymans.

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Could Cohesion Policy push EU climate efforts?

Dr. Michal Nekvasil

People in Need, Czech Republic

Biography

Dr. Michal Nekvasil is a free-lance expert working on climate-change related issues for various organizations – People in Need (a Czech NGO), UNDP, World Bank, Czech Development Agency, etc. He has spent 13 years working for the European Commission as an EU official – expert at the Directorate General for the Environment in Brussels, Deputy Head of Cooperation at the EU Delegation to Georgia, and Head of Cooperation at the EU Delegation to Nicaragua and Central America. Besides that, he has passed the ‘Environmental Studies’ programme at the Faculty of Humanitarian Studies of the Charles University (Prague, the Czech Republic) and he received his PhD degree in 2016. He published the results of his research, besides others, in the impacted Climate Policy journal. Furthermore, he became a Certified Expert in Climate & Renewable Energy Finance after having passed a semester course at the Frankfurt School of Finance & Management.

This presentation is based on the assumption that financing of climate change mitigation and adaptation projects in the developing countries has been profoundly changing – in terms of both donors and mechanisms. While a few years ago these projects were funded mostly by traditional donors, nowadays they are financed also by one of the climate funds (e.g. Green Climate Fund) or by newly emerging actors, including private ones. While a few years ago grants were the prevailing financing mechanism, nowadays other mechanisms are prevailing. “Climate funds” are based on the fact that developed countries caused most of the climate change while developing countries suffer from it. Therefore various financing mechanisms have been created - within the UN Framework Convention on Climate Change, traditional donors have created their own climate-related specific programmes, many new funding mechanisms (including private ones) emerged, etc. The presentation will discuss “climate funds” in general and various financing options and mechanisms in particular. It will also provide practical advices on how to access these funds.

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Responses and compound risks of the coastal China areas to Global Change

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Biography

Dr. Rongshuo Cai is a Professor and Deputy Director of Research Center for Marine Resources, Environment Management, and Sustainable Development, Third Institute of Oceanography, Ministry of Natural Resources, P.R. China. Due to his specific research experiences in marginal sea responses and adaptation to Climate Change, including marine environment and dynamics, air-sea interaction of marginal seas, and climate forcing and marine ecosystem responses in the western Pacific Ocean, he was selected as a Coordinating Lead Author of the Ocean of the Working Group II contribution to the Intergovernmental Panel on Climate Change Fifth Assessment Report (IPCC-AR5), a Lead Author of the IPCC Special Report on the Ocean and the Cryosphere in a changing climate during AR6 cycle, a member of Editorial Committee of Chinese Journal of Atmospheric Sciences and Journal of Advances in Climate Change Research. He also holds a Ph.D. degree from the Graduate University of Chinese Academy of Sciences.

The response and risks of global change in the coastal China areas are highly complex and uncertain, and there is an urgent need for further research. This paper conducts a review of recent literatures concerning the responses, mechanism and risks of the coastal zone and seas in China to global change. Results show that since the 1960s, the coastal China areas has experienced a significant warming trend, and the increase range and rate of surface temperature are higher than the global mean. The phenological changes of biotic and abiotic are significant. The warm period (spring and autumn) is obviously longer, and is most prominent in the East China Sea (Bohai Sea, Yellow Sea and East China Sea). The changes in geographical distribution of marine species, biological seasonal succession, bio-community structure and function are prominent. Marine ecological disasters such as red tides and green tides are frequent, e.g., red tides have an interdecadal increase, and coral bleaching in tropical sea is exacerbated. The analysis also shows that since the 1980s, more and more high temperature and heat waves have appeared in the coastal China seas. The coastal sea level has continued to rise and reached new heights. The record-breaking extreme high sea temperature events, super typhoon-storm surges and extreme sea levels have occurred frequently, which makes the climate exposure of coastal social-ecological systems increase. Meanwhile, human activities, such as eutrophication, large-scale reclamation, destructive and overfishing in coastal waters have aggravated the climate vulnerability of socio-ecological system. The floods in coastal areas are serious and the habitat and biodiversity of coastal wetlands are reduced. In the different RCPs climate scenarios, eastern China, especially the East China Sea, is likely to be one of the

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regions with the highest global warming and sea level rise. It is suggested that the disaster risk of the coastal China areas tends to be more complex and change in the future. To this end, this paper points out that a number of scientific issues and key technologies of comprehensive risk assessment to global change need urgently to study in the coastal China areas.

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Historical Tree Height Growth associated with Climate Change in Western North America

Yassine Messaoud, Gordon Nigh, Faouzi Messaoud and Han Chen
Lakehead University, Canada

Biography

Yassine Messaoud has completed his PhD at the age of 36 years from University of Quebec in Abitibi-Temiscamingue, QC, Canada and postdoctoral studies from Lakehead University. He has published 7 papers in reputed journals and has been serving as reviewer of reputed journals. He also participated in many conferences, workshops, and did posters in Canada.

The effect of climate change on tree growth in boreal and temperate forests has received increased interest in the context of global warming. However, most studies were conducted in small areas and with a limited number of tree species. Here, we examined the height growth responses of 14 tree species to climate change over the whole species range of western North America. 27425 stands from forest inventory databases in Canada and USA with varying establishment dates (1089-1967) were selected. Dominant and co-dominant trees from each stand were sampled to determine total tree height at 50 years from stand establishment measured at breast height and related to the average mean annual (AN_T) and summer temperatures (June-August; JJA_T), Palmer Drought Severity Index (PDSI), establishment date (ED), slope, aspect, soil fertility as determined by the rate of carbon organic matter decomposition (carbon on nitrogen), geographic locations (latitude, longitude, and elevation), species range (coastal, interior, and both ranges), growth habits (shade tolerance) and leaf form (needle leaves, deciduous needle leaves, and broadleaves). Climate change had mostly a positive effect on tree height growth. The model explained 55.5% of the height growth variance. Since 1880, warming was more beneficial for coastal species, although interior species showed the greatest sensitivity to JJA_T. Height growth increased more on moderate and steep slopes, on medium soil fertility, and for the medium and high-shade tolerant species. Greater height growth increase was globally observed at the leading range and upward. However, a few species showed the opposite trend and declined, probably related to the peculiarity and particularity of western North America topography and climate conditions. The novelty of this study highlights the role of the species ecological amplitude and traits, and geographic locations as the main factors determining the growth response and its magnitude to the recent global climate change.

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Variability of the Caspian Sea at Decadal To Millennial Scales: The Theory

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The secular variability of climate dynamics is inferred from different proxies. The Caspian Sea level (CSL) variations and sea area dynamics are manifested in transgressive and regressive events of various amplitude which lasted for years, decades, hundreds, thousands, and tens of thousands years. Based on well-established views, they were climate-induced variations. Often there are no clear links with the calendar of climatic anomalies. Therefore, the question about the origin of secular CSL fluctuations remains open.

Based on ideas about the laws of temporal dynamics relating to massive inertial objects, the observed changes of the CSL under the semi-steady climate state of the Holocene can be represented as resulting from the accumulation of small anomalies in the water regime. To test this hypothesis, the model of the water balance of the CS was used. Time scale for the sea fluctuations was estimated as ~20 years. This model is interpreted as stochastic, and from this perspective, it is a Langevin equation that incorporates the action of precipitation and evaporation as random white noise, so that the whole CS can be thought of as an analogue of Brownian motion. Under these conditions, the CS is represented by a system undergoing random walk.

Rare "super-large" anomalies in CSL were much more individual. For example, the low stand of the CS (dozens of meters below the present CSL) during the Last Glacial Maximum was determined by a significant reduction in precipitation over the Volga River catchment and by a corresponding reduction in the volume of river runoff. The origin of Khvalynian transgressions (dozens of meters above the present CSL) that occurred in the CS during the second part of MIS 3 (~35-25 ka BP) and the Late Glacial epoch (~17-12 ka BP) is not clear, because no source of required water has been identified.

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Projections of climate change on microclimatic conditions of an urban area: CFD simulations and adaptation measures

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Biography

Nestoras Antoniou is a PhD candidate in a joint doctoral program between the Department of Civil and Environmental Engineering of the University of Cyprus in the Environmental Fluid Mechanics Laboratory under the supervision of Associate Professor Marina Neophytou, and the Technical University of Eindhoven in the Department of the Build Environment of under the supervision of Professor Bert Blocken. He holds a diploma in Architectural Engineering from the Architectural Engineering School of the University of Patras and an MSc degree in Building Energy and Environmental Performance Modelling from the Wales School of Architecture of the University of Cardiff. He is also a full member of the Cyprus Technical Chamber (ETEK) with experience in building construction. During his doctoral studies he has attended various international conferences and PhD schools in the field of Urban Physics and Wind engineering, contributing with oral presentations and conference papers; the most recent results of his doctoral work have been published in peer reviewed Journals (Antoniou et al. 2017, 2019). He has also served as Teaching Assistant and Expert Scientist for the courses of Fluid Mechanics and Experimental Fluid Mechanics in the Civil and Environmental Engineering Department of the University of Cyprus.

Future climatic conditions are associated with higher temperatures and decrease of precipitation (Hayes, Dubrovsky, and Zara 2014; Sheffield and Wood 2008). This is expected to result in more severe drought periods, especially in the Mediterranean region, due to the complex climatic conditions and unstable precipitation periods (Hertig and Trambly 2017). In addition, due to climatic changes, phenomena like the Urban Heat Island (UHI) effect and heat waves are becoming more severe, with dramatic consequences for the urban population (Toparlar et al. 2017; Montazeri et al. 2017). Currently, around 54% of the world's population lives in urban areas (UNFPA, 2007) which is expected to increase and reach up to 66% by 2050 (United Nations, 2014). Considering these trends, the analysis of future microclimatic conditions in urban areas is getting more significant. While computational power is radically increasing, the use of numerical simulation approaches is getting more popular. The use of Computational Fluid Dynamics (CFD) is considered advantageous since it can provide information of both temperature and velocity fields, and can be used in higher resolution scales. In this perspective, this study analyzes future microclimatic conditions in a real compact urban area, with the use of CFD simulations. The validation of the CFD model is performed with on-site measurements of the same area (N. Antoniou et al. 2018). The real compact inhomogeneous urban area under study is located in Nicosia, Cyprus. Computational Fluid Dynamics (CFD) simulations are performed based on the 3D unsteady Reynolds-Averaged Navier-Stokes equations to assess the air temperature and wind speed distributions. Based on the results, conclusions are going to be made regarding future thermal comfort conditions in the case study area.

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Historical Responsibility for Climate Change: The Problem of Excusable Knowledge

Makoto Usami

Graduate School of Global Environmental Studies, Kyoto University, Japan

Biography

Makoto Usami, LL.D., is Professor of Philosophy and Public Policy at Kyoto University. Before joining the faculty, he has been Professor of Law and Philosophy at the Tokyo Institute of Technology (2008- 2013), Professor of Jurisprudence at Chukyo University (2002-2004), and a visiting scholar at Harvard University (1997-1999). He was elected Vice President of Public Policy Studies Association, Japan (2010-2012) and currently serves as the President of the International Association of the Philosophy of Law and Social Philosophy, Japan. Among his areas of interest are legal philosophy and political Philosophy, and he has engaged in the analytical study of distributive justice, while working on applied issues as well, such as climate justice, global justice, intergenerational justice, and transitional justice. He is the author of three books and more than sixty journal articles and book chapters written in English or Japanese and an editor of six anthologies including Climate Justice (2019).

The idea of historical responsibility for the past emissions has been increasingly claimed by delegates from less developed countries as well as climate change activists based in developed countries. The claim is that current citizens in every economically advanced society hold moral responsibility for the greenhouse gases which have been emitted since industrial revolution occurred in the society. More specifically, it is argued that these citizens bear the obligation to take an extra reduction in present emissions and/or the duty to pay for a substantial portion of the cost of adaptation policies to be enacted and implemented in the global South.

The demand of historical responsibility has also been advanced and supported by many authors on climate justice, which refers to a set of moral issues surrounding climate change and climate policy. However, this demand encounters a criticism based on excusable ignorance, according to which the past emitters were unable to know what consequence their actions would have, and thus they should not be held responsible for these actions. Despite several attempts have been made to circumvent the excusable ignorance objection, it remains a formidable challenge to proponents of historical responsibility.

To fill this gap in the literature, the current keynote speech explores how the problem of excusable ignorance can be resolved. After mentioning the scientific facts that the historical responsibility argument relies on, the speaker clarifies what the argument exactly claims. Next, he briefly reviews the state of the art in the philosophical study on the excusable ignorance problem. Then, a solution to this problem is proposed and defended, with reference to some recent works on historical responsibility. The speech concludes by noting that this solution also provides a reasonable principle that works in the distribution of burdens among citizens within each developed country.

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Insect damage influences expression of heat and drought stress resistance genes in maize

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Biography

Dr. Dowd is a Research Entomologist in the Crop Bioprotection Research Unit of the USDA, Agricultural Research Service, National Center for Agricultural Utilization Research, located in Peoria, Illinois, USA. His research currently focuses on maize resistance to insect and mycotoxin-producing fungi and interactions with abiotic and biotic factors. Over his 33 year career with USDA, Dr. Dowd has identified many different management strategies for insects that promote mycotoxin occurrence in maize. Most recently he had cloned several resistance genes from maize that produce products that promote resistance to both mycotoxin-producing fungi and associated insects and demonstrated their efficacy in transformed maize callus studies, and now their interaction with insect pathogens. He has a B.S. in Agronomy from Virginia Tech, an M.S. in Entomology from Virginia Tech where he worked on biological control agents of thistles, and a Ph.D. from Louisiana State University where he worked on pyrethroid insecticide resistance mechanisms in insects.

Excessive heat and drought limit the sustainable production of maize and other crops. Ear molds that produce toxins harmful to humans and animals often occur at high levels in heat and drought stress years as well. Developing heat and drought resistant varieties is one strategy that can be used to cope with heat and drought stress brought on by climate change, but relevant genes and factors that influence their expression are little known, as a variety of different biotic and abiotic factors may be involved. Environmental conditions in the midwestern maize growing areas in central Illinois, USA allowed for gene expression comparisons in fields of popcorn, which has a small root system and is susceptible to heat and drought stress, despite applied irrigation. Milk stage ears were collected from two locations in 2010 (normal growing conditions), 2011 and 2012 (both heat and drought stress years); and subjected to gene expression microarray analysis. A different complex of heat stress resistance genes had higher levels of expression in stress years depending on whether the ears were damaged by insects or not. The reduction in expression levels of several water stress resistance genes was more severe in insect damaged ears compared to undamaged ears in stress years. Transgenic overexpression of certain regulatory genes has been reported to enhance yields of some crops. Thus, identification of the regulatory genes positively or negatively affecting the expression of different heat and drought stress resistance genes as influenced by insect damage or other factors should allow for breeding or transgenic introduction of appropriate regulatory genes to promote desirable levels of heat and drought stress resistance factors during heat or drought stress, thereby helping to maintain yield and quality.

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IPCC relationship with IPBES

Alan Feest

University of Bristol/Ecosulis, United Kingdom

Biography

Dr Feest entered University (BSc Exeter) as a mature student having worked as a Technician for 14 years the final seven years as Head Technician for a large Poultry Firm. His PhD (Bristol) was on the ecology of slime moulds (Myxogastroids) and his papers have become the standard references on the subject of soil Myxozoa. Following a period as a Secondary School teacher Dr Feest returned to Academia as a Staff Tutor in Environment and Health Studies then moving to the Department of Civil Engineering where his MSc in Water and Environmental Management was highly successful and greatly appreciated (he also ran a BSc in Occupational Health Nursing and an MSc in Occupational Health and Safety). Dr Feest's background studies in mycology (slime moulds are generally honorary fungi despite being protists!) led him to tackle the problem of how to measure biodiversity (fungi representing a worst case!) and this and the application of his techniques in environmental consultancy is his current research theme. Dr Feest is a Director of a Large Environmental Consultancy (50 staff) and a long-serving member of IPCC. Since the creation of IPBES Dr Feest has been an active Lead Author. Dr Feest has published over 70- papers and currently reviews over 100 papers per year for a variety of Journals.

IPCC purports to measure physical changes but this is problematic since instruments are not global in coverage (at least historically). But we know (!) there is a problem! There remains doubt (very small) that CC is real since unequivocal evidence of change in temperature (by such small degrees) is difficult to substantiate. There remains continuing public confusion between weather and climate! Some countries remain sceptical of the whole process (largely due to misguided nationalism). IPCC reports never mention biodiversity.

IPBES purports to measure biodiversity change despite there being no globally accepted definition of biodiversity (CBD definition does not work; what is variability?) or how change might be measured let alone the even more problematic understanding of Ecosystem Services (but we know (!) there is a problem!). The loss of species is unequivocal. There is little public doubt that loss of species is real and it is easy to demonstrate the impact of such things as nitrogen deposition on biodiversity. BUT the application of Ecosystem Services is highly problematic (and now referred to in IPBES as nature's contribution to people) since it "gives more power to the rich". Very few estimates of the value of Ecosystem Service have been measured (Boerema 2018) properly so there are very few fully valid data for ES. There are no dissenting nations although some do not seem to see the point!

Structure of both follows UN pattern: overall direction at plenaries with directed work parties/committees addressing particular problems. The jargon is just as impenetrable for both.

The 60 page IISD report of the 2018 Katowice COP 24 fails to mention biodiversity, loss of biodiversity or IPBES once (not even in the Glossary) so there would seem to be no relationship in that direction.

IPBES frequently mentions IPCC and climate change as one of the recognized drivers of loss of species is climate change. There would seem to be a one way relationship which may relate to IPCC deliberately not trespassing into the territory of another convention before it was set up (diplomatic interpretation) and remaining circumspect.

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The Cold Effect of Ambient Temperature on Ischemic and Hemorrhagic Stroke Hospital Admissions: A Large Database Study in Beijing, China between Years 2013 and 2014—Utilizing a Distributed Lag Non-linear Analysis

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Biography

Professor Xiuhua Guo is the Head of Department of Epidemiology and Health Statistics at School of Public Health, Capital Medical University. She is the President of the Health Medical Big Data Society of China Industrial Statistics Teaching Research Association, the Vice Chairman of the China Field Statistics Biostatistics Society, the Vice Chairman of the China Society of On-Site Statistics and the Institute of Educational Statistics and Management, and the Standing Committee Member of the Statistical Theory and Method Committee of the China Health Information Society. Professor Xiuhua Guo has been a

Background: The effects of ambient temperature on stroke death in China have been well addressed. However, few studies are focused on the attributable burden for the incident of different types of stroke due to ambient temperature, especially in Beijing, China. We purpose to assess the influence of ambient temperature on hospital stroke admissions in Beijing, China.

Methods: Data on daily temperature, air pollution, and relative humidity measurements and stroke admissions in Beijing were obtained between 2013 and 2014. Distributed lag non-linear model was employed to determine the association between daily ambient temperature and stroke admissions. Relative risk (RR) with 95% confidence interval (CI) and Attribution fraction (AF) with 95% CI were calculated based on stroke subtype, gender and age group.

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visiting scholar in Department of Mathematics and Statistics at La Trobe University. She is the editor in chief for nine textbooks, one of which is awarded as Excellency. She owns four national patents, and seven third-prizes for Progress in Science and Technology at provincial level and was awarded as the leader of Academic Innovation Team. Based on her research in the areas of big data and statistics, Professor Xiuhua Guo has published over 300 scientific papers in peer-reviewed journals. In addition, she is serving as a reviewer and editor for some scholarly journal.

Results: A total number of 147,624 stroke admitted cases (including hemorrhagic and ischemic types of stroke) were documented. A non-linear acute effect of cold temperature on ischemic and hemorrhagic stroke hospital admissions was evaluated. Compared with the 25th percentile of temperature (1.2 °C), the cumulative RR of extreme cold temperature (first percentile of temperature, -9.6 °C) was 1.51 (95% CI: 1.08-2.10) over lag 0-14 days for ischemic type and 1.28 (95% CI: 1.03-1.59) for hemorrhagic stroke over lag 0-3 days. Overall, 1.57% (95% CI: 0.06%-2.88%) of ischemic stroke and 1.90% (95% CI: 0.40%-3.41%) of hemorrhagic stroke was attributed to the extreme cold temperature over lag 0-7 days and lag 0-3 days, respectively.

Conclusions: The cold temperature's impact on stroke admissions was found to be more obvious in male gender and the youth compared to female gender and the elderly. Exposure to extreme cold temperature is associated with increasing both ischemic and hemorrhagic stroke admissions in Beijing, China.

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Flower phenology and pollen limitation as main drivers of fruiting dynamics in temperate oak species

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Biography

Dr. Bel-Venner is a research assistant working in the field of Evolutionary and Community Ecology. She is interested at understanding the evolutionary forces governing weevil communities specialized on oak acorns that constitute a pulsed resource for these species competing with each other and coexisting on the same resource. Together with Samuel Venner who is header of the Oak Masting project, she is now working at identifying the proximate causes of masting in temperate oak species, by developing a long-term survey of the flowering and fruiting effort of trees belonging to a field network in cooperation with the RENECOFOR program held by ONF. Their research program aims to uncover the determinants of masting, to develop models predicting the future of masting under climate change scenarios, and to provide tools for forest managers.

In many perennial wind-pollinated plants, the dynamics of seed production is commonly known to greatly fluctuate from year to year and be synchronized among individuals within populations. The proximate causes of such seeding dynamics -called masting- are still poorly understood in oak species that are widespread in the northern hemisphere, and whose fruiting dynamics markedly impacts forest regeneration and biodiversity. Combining long-term surveys of oak airborne pollen amount and acorn production over large-scale field networks in temperate areas, and a mechanistic modelling approach, we found that flower phenology and pollen dynamics are key drivers of oak masting. Mechanisms at play involved both internal resource allocation to pollen production synchronized among trees and spring weather conditions affecting the amount of airborne pollen available for reproduction. Moreover, we show that temperate oak species exhibit early flower phenology resulting in pollen being often released during unfavorable weather conditions and in frequent reproductive failure. Simulated fruiting dynamics exhibit much reduced stochastic variation if pollen release was delayed as a result of natural selection. We propose that early flower phenology might be adaptive by making mast-seeding years rare and unpredictable, which would greatly help controlling the dynamics of seed consumers and tree reproductive success. The sensitivity of flower phenology and airborne pollen to weather conditions might make oak masting and forest regeneration highly sensitive to climate change.

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Development as adaptation: Framing and measuring urban resilience in Beijing

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Biography

ZHENG Yan is a research fellow of Institute for Urban & Environmental Studies (IUE) of Chinese Academy of Social Sciences (CASS). She was a visiting scholar of the Harvard-China Energy and Environmental Project in Harvard University during 2014 to 2015. Dr. Zheng Yan is a lead author for IPCCt on Climate Change 2021: Impacts, Adaptation and Vulnerability, and a chief lead author for China National Assessment Report on Risk Management and Adaptation of Climate Extremes and Disasters. Dr. Zheng Yan has research interest on climate change policy, focusing on climate risk governance, resilient cities, and so on.

As part of their efforts to cope with climate change, many municipal governments have considered the improvement of urban resilience as an important strategy. In this study, we take the megacity of Beijing as an example and conduct a mixed methods research using both qualitative and quantitative methods to explore linkage between resilience and development. First, based on expert consultation, we develop an analytical framework and propose reference indicators for measuring urban resilience. Second, we conduct an exploratory factor analysis to justify this analytical framework and rank the urban resilience index for 16 districts in Beijing. Results indicate that urban resilience at the district level is distinguished by the characteristics of the district's functional zones. This implies that the development focus of each district influences the factors of urban resilience. This article provides evidence that development and adaptation can be complementary. We showcase in Beijing that urban generic resilience is highly dependent on development and urbanization, whereas specific resilience to climatic extremes can be attributed to natural endowment and environmental investment. In conclusion, using this study's findings as a guideline, megacities are urged to adopt development-oriented adaptation as a strategy of proactive risk planning in the context of rapid urbanization and global climate change in China.

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Groundwater Scenario of Hydrological and Hydrogeological Critical Terrains of India

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Biography

Prof. (Dr.) Pankaj Kumar Roy He is now acting as the Dean of Faculty of Interdisciplinary Studies, Law and Management, Jadavpur University, West Bengal, India and Professor and Joint Director, School of Water Resources Engineering, Jadavpur University, West Bengal, India and also appointed as Director, School of Environmental Studies, Jadavpur University. He is an expert in Hydraulics, Hydrology, Water Quality Modelling and Impact of Climate Change on Water Resources. He has over 15 years teaching experience and provides valuable guidance to research scholars of which more than 12 has been awarded. Prof. Roy has attended to several national and international conferences and has more than 170 publications at international and national level. At present he is acting as a Sectional Recorder of Engineering Science (ISCA) 2018-2020.

Groundwater vulnerability is one of the most important consequences of extensive land utilization and degradation. Changes in the land use and land cover dynamicity and rapid population growth is putting unavoidable stress over the water resources of the nation. Aquifers are in vulnerable condition due to excessive ground water extraction and over exploitation as the ground water drafts are exceeding than recharge. Indian aquifer system is facing an acute crisis due to unscientific extraction of deep underground water for agricultural, industrial and domestic sector by the 130 crore growing population. Problems related to groundwater are countless in India where few states like Punjab, Delhi and Haryana the water table reached to about 35-40 m below ground level. Areas suitable for rain water harvesting technique can be identified by calculating the water budget of a river basin and identification of the recharge potential areas can be made through remote sensing and GIS. Huge numbers of well are drilled into the alluvial flood plain of Ganges for public water supply in Bangladesh and West Bengal in India as well. A wide variety of technologies have been used for the treatment of arsenic in water, including conventional co-precipitation with ferric chloride, lime softening, filtration using exchange resins and adsorbents such as activated alumina or ferric hydroxide, and membrane filtration processes. The increase of the Arsenic concentration in groundwater aquifer zone can be the result of iron oxy-hydroxides. This paper reflects groundwater vulnerability and management in three different terrain conditions. Applications of different in-situ and ex-situ modeling techniques for identification of recharge potential zones, saline contaminated zone and arsenic treatment has been used to manage the valuable hidden resource in a sustainable way.

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Satellite-based prediction of daily SO₂ exposure across China using a high-quality random forest-spatiotemporal Kriging (RF-STK) model for health risk assessment

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Biography

WWW is a Ph. D student in Department of Environmental Science & Engineering, Institute of Atmospheric Sciences, Fudan University, where his research focuses on the field observation and air quality modelling using machine learning technique and spatial statistics. Before joining Fudan University, he earned a Master of Science degree in environmental geochemistry in Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, where his research focused on the biogeochemical processes of trace metal and phosphorus.

China has been suffered from the severe sulfur dioxide (SO₂) pollution in the past decades. The spatiotemporal estimation and health effect assessment of SO₂ using two-stage machine learning models have not been performed yet. In this study, a high-quality model named random forest coupled with spatiotemporal Kriging (RF-STK) model was developed to estimate the daily SO₂ concentration across the entire China from May 2014 to May 2015 based on the satellite data and geographic covariates. Compared with other statistical methods, the RF-STK model showed the better explanatory performance, with the 10-fold cross-validation $R^2 = 0.62$ (root-mean-square error (RMSE) = 10.36 $\mu\text{g}/\text{m}^3$) for daily estimations. The annually mean population-weighted SO₂ concentration was estimated to be $30.49 \pm 10.83 \mu\text{g}/\text{m}^3$ (mean $\pm$ standard deviation). The SO₂ levels displayed the remarkably seasonal variation with the peak in winter ($47.27 \pm 22.64 \mu\text{g}/\text{m}^3$), followed by ones in autumn ($28.41 \pm 10.41 \mu\text{g}/\text{m}^3$) and spring ($25.92 \pm 7.95 \mu\text{g}/\text{m}^3$), and in summer ($21.33 \pm 6.51 \mu\text{g}/\text{m}^3$). At the national scale, only 20.31% of the population lived in the safe regions (population-weighted SO₂ concentration < 20 $\mu\text{g}/\text{m}^3$). The higher population-weighted SO₂ concentrations were mainly concentrated on some provinces of North China Plain (NCP) (e.g., Shanxi, Hebei, Shandong), followed by the provinces of Northeast China, and the lowest one in Hainan ($8.31 \pm 1.38 \mu\text{g}/\text{m}^3$). The mean all-cause mortalities due to excessive SO₂ exposure were estimated to be 131,957 cases, accounting for 0.009% of the whole Chinese population. Among all of the diseases, the mortalities per year were in the order of respiratory disease (RD) (11913 cases) > cardiovascular disease (CVD) (11386 cases) > chronic obstructive pulmonary disease (COPD) (8112 cases) > cerebrovascular disease (CEVD) (2188 cases). The statistical modelling of SO₂ at a national scale provided the valuable data for epidemiological research and air pollution prevention.

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How Are The Relationships Between Preterm Birth And Ambient Air Pollution Vary Over Space and How Will they be Affected by Climate Change: A Case Study in Georgia, USA

Jun Tu

Department of Geography and Anthropology, Kennesaw State University, USA

Biography

Dr. Jun Tu is a Professor of Geography and Environmental Studies in the Department of Geography and Anthropology at Kennesaw State University, USA. His current research interests include the integration of GIS, spatial statistics, and modeling with environmental and health studies, and the impacts of urbanization and climate change on natural environment and public health. He is currently working on projects that study the combined impact of urbanization and climate change on water resources in northern Georgia, and explore the spatial associations between environmental and socioeconomic factors and birth defects in the state of Georgia using GIS analysis, spatial statistics, and environmental modeling. He received Ph.D. in Earth and Environmental Sciences from the Graduate Center of The City University of New York, USA, and M.E. and B.S. from the Department of Earth Sciences at Nanjing University, China.

Preterm birth (PTB) is a major cause of infant mortality and morbidity. The relationships between PTB and ambient air pollution have been examined by many previous studies worldwide, but the results vary among different studies, and no general conclusion could be drawn about the relationships. We analyzed 116,112 live and singleton births in year 2000 in Georgia, USA in this study. A spatial statistical method, Geographically Weighted Logistic Regression (GWLR), was employed to model the relationships between PTB and two ambient air pollutants, ozone (O_3) and fine particulate matter ($PM_{2.5}$), with nine individual-level birth and maternal demographic, socioeconomic, behavioral, and lifestyle factors, and three community socioeconomic status (SES) and urbanization variables as covariates. The results show that the relationships between PTB and the two pollutants vary over space. Positively significant, negatively significant, and non-significant relationships between PTB and air pollutants are all discovered in different regions of Georgia, and the varying relationships are strongly related to the varying SES and urbanization level of the communities of the births. PTB is not significantly associated with either O_3 or $PM_{2.5}$ in most of the state, especially in urban communities. The positively significant relationship between PTB and O_3 or $PM_{2.5}$ that indicates either air pollutant might be a significant PTB risk factor is primarily located in rural communities with low SES. $PM_{2.5}$ is a more important PTB risk factor than O_3 in the least-urbanized communities of the state. These findings suggest that in order to more successfully reduce PTB risk, it is necessary to consider the varying relationships between PTB and air pollution across the communities with different levels of urbanization and SES for making and implementation of local public health policies. The potential impact of future climate change on the relationships is also discussed.

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Assessment of hydro meteorological condition of flood in monsoon dominated Ganga-Brahmaputra-Meghna (GBM) floodplain system

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Biography

Dr. Malabika Biswas Roy is an Assistant Professor of Women's College, Calcutta, University of Calcutta, India. As a renowned Post Doctoral Fellow of School of Water Resources Engineering, Jadavpur University, She was working on environmental issue of floodplain wetland. She is an expert in Wetland Studies, Hydrology, Water Quality Modelling and Impact of Climate Change on Wetland System. She has over 16 years teaching and research experience and provides doctoral guidance to students. She has presented paper to many conferences and has 57 national and international journal papers. She has been awarded as young scientist for her research in 2017 and 2018. At present she is the member of several learned Societies and completed several research project as PI, Co-PI, and team member as well.

Meteorological and hydrological attributes and hydraulic issues linked to severe floods, which occur in Ganga-Brahmaputra-Meghna (GBM) floodplain area, are all reviewed. At the moment, the flooding regulation system of the domain isn't capable of handling colossal inflow water (that seemed as surface runoff and channel flow) coming in the broad upper catchment of Ganga river. Because of this, the lower plate of Ganga-Brahmaputra-Meghna floodplain yearly experiences small to the high size of flood and overflow condition since the present canal system, flows, paleochannels, along with the river system itself have dropped their former carrying capability to adapt all of extra water inside its active domain because of more than siltation and drainage congestion. When the rivers aren't able to regulate flooding stream, then intense rain of duration within the basin turns out the position that is standard in West Bengal, such as the years from 2000 to present into the flood. Identifying GBM floodplain region's issues, this paper also attempts to gauge the present capacity of the river around flooding risk of the floodplain, and the, peak discharge and also to estimate the potentiality of flooding climate. The outcome indicates that the variation of river inundation by flood and accumulation of sediments.

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Genetic Variation of Circadian Clock Genes in a Cavernicolous *Anopheles dirus* in western Thailand

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Biography

Uraiwan has completed her PhD from Ludwig Maximilian University, Munich Germany and postdoctoral research from INRA Boxtedeaux, France. She is currently an assistant professor at Department of Genetics, Kasetsart University, Bangkok Thailand. Her research is focused on Population and evolutionary Genetics of malaria and Dengue mosquitoes. She is also interested in the impacts of climate change to mosquito adaptation.

A*nopheles dirus* is typically a forest-dwelling species and an important malaria vector in parts of Thailand. Climate change and human activity have had a recognizable impact on mosquitoes. As the natural habitat has been reduced, we suspect that mosquitoes may have been seek a refuge into more stable environments such as cave habitats. An unusual oviposition site for this *An. dirus* species is reported within a limestone cave completely devoid of light. Adaptation to an underground habitat may be the result of an alteration in the circadian clock genes that entrain daylight rhythms necessary for insect development. This study aimed to investigate the genetic variation in circadian clock genes of *An. dirus* larvae collected inside and nearby outside of caves. Larvae were collected using an artificial container serving as an oviposition site inside a cave in complete darkness and outside of three nearby limestone caves under normal light-dark conditions. Fragments of TIM, PER, CLK, and CYC circadian clock genes were sequenced. The variation in these partial genes showed a low level of polymorphism and no sign of natural selection in neutrality tests. However, high genetic differentiation in CLK was detected between mosquitoes collected inside and outside caves. Clustering analysis for CLK revealed that larvae inside the cave shared only one genetic background from the two genetic clusters present in outside populations. The results suggest a geographical barrier may exist between the two *An. dirus* populations based on oviposition location and habitat.

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Overcoming the process-structure divide in conceptualizations of Social-Ecological Transformations Assessing the transformative character and impact of processes of change

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Biography

Julia Tschersich is a research assistant in the research project RightSeeds, which analyzes the potential of Commons approaches in plant breeding and seed production (Seed Commons) to contribute to a social-ecological transformation. Her dissertation examines the embedding of Seed Commons in the complex Multi-Level Governance system. She analyzes how seed initiatives can act as social movements to create empowering institutions for a social-ecological transformation of plant cultivation. She has recently completed a research stay at the University of California, Santa Cruz, at the Environmental Studies Department. Previously, she obtained a Master degree in 'Sustainability Economics and Management' at the University of Oldenburg and a Bachelor degree in 'International Relations' at the Technical University of Dresden.

A fundamental transformation towards sustainability in face of complex social-ecological challenges needs to initiate deep changes of those incumbent system structures that support unsustainable trajectories, while at the same time encouraging a diversity of alternative practices. A review of transformation approaches towards sustainability, including the fields of Social-Ecological and Development Resilience, Critical Theory, Dynamic Sustainabilities and Sustainability Transitions, shows that these do not (sufficiently) link processes of change at the micro level to deep leverages of change in wider system structures. Addressing this research gap, we develop a conceptual framework for a social-ecological transformation that connects the macro and the micro level and helps to bridge process-oriented and structural approaches to transformation. At the macro level, the objectives of inter- and intragenerational justice need to be pursued by challenging the central paradigms that constitute unsustainable trajectories. Essential paradigms that need to be overcome are identified as 'control of humans over nature', 'materialistic culture and growth' and 'expert knowledge and specialization'. To make the framework concrete and applicable in practice, we propose a preliminary set of evaluation principles for the micro and meso level that reflect these normative objectives and help to measure the transformative character and transformative impact of change processes. The example of the European Organic Breeding Network illustrates the application of the framework.

The framework can help to navigate societal and political processes towards a fundamental social-ecological transformation, while still allowing for a variety of different and even contending approaches and pathways. Therefore, it can provide important insights into the climate change debate. The evaluative principles can help to link existing initiatives and movements and to increase their transformative impact. It also provides guidance for policy makers in designing more empowering policy structures.

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Application Potential of CO₂ Enhanced Water Recovery Technology in Four Major Energy and Industry Sectors in China

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Biography

Dr. Ning Wei is a Professor in the Energy and Waste underground disposal Group at the Institute of Rock and Soil Mechanics, Chinese Academy of Sciences (IRSM, CAS) where his research focuses on the strategy study, technical invention and consultant, and pore-core-site scale flow-transport phenomena of CO₂ capture, geological utilization and storage (CCUS) technology. His fields include: 1) systematical research and evaluation on the industrialization of CCUS technology through capacity evaluation, site selection, source-sink matching, techno-economic evaluation, technology readiness level assessment, risk assessment, and others assessments; 2) develop innovative methods to cut down the overall cost of CCUS projects; 3) Fundamental studies on the CO₂ storage technology through laboratory experiment, numerical simulation, and field work on the CO₂ geological storage technologies; 4) technical supports and consultants on CCUS projects including Shenhua project and feasibility studies for more than 15 other CCUS projects at early stage in China.

China is the largest country of CO₂ emission, most of total anthropogenic CO₂ come from coal power generation, iron & steel, cement, and coal chemistry industry in China. The total CO₂ emission amount is about 6.5 Gt annually in these four sectors (shown in Fig. 1). China also faces the challenge of the CO₂-Water nexus for China and particularly the low-carbon and sustainable development of fossil fueled energy and industry system. CO₂-enhanced deep saline water recovery (CO₂-EWR) technology, as one important option of CO₂ capture geological utilization and storage (CCUS), can provide large-scale CO₂ mitigation and additional water supply in an integrated manner, especially in arid areas. This study presents the first systematic assessment of cost curve of onshore CO₂-EWR potential using CO₂ streams from four important industrial sectors by the evaluation framework of CO₂ emission inventory, site suitability evaluation, and source-sink matching with techno-economic models of full-chain CCUS project. Preliminary cost curve results suggest that CO₂-EWR technology can help mitigate 3.4 billion tons of CO₂ from industrial separation processes at relatively low cost ranging from 14 to 60 USD/t CO₂ in four industrial sectors in China (shown in Fig. 2). The low-cost portion of the cost curve consist of pure CO₂ streams from coal chemical industry and may effectively represent promising early deployment opportunities of industrial scale CCUS project. Furthermore, 5.2 billion tons of underground water are produced for further desalination and industrial utilization. Therefore, CO₂-EWR technology can be essential to low-carbon and sustainable development of the four major sectors and may also provide low-cost opportunities to accelerate the retrofitting CCUS technology to existing heavy carbon sectors in China.

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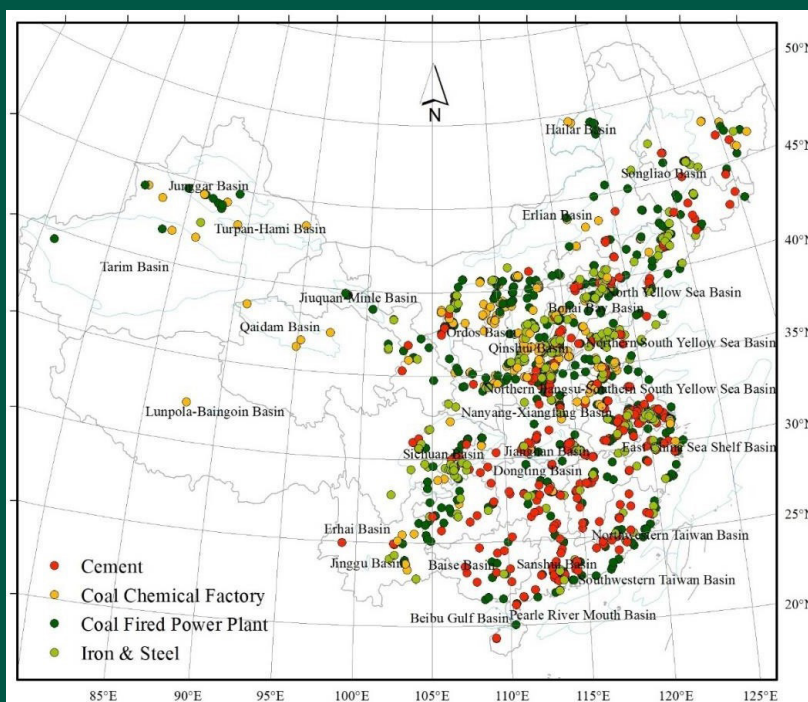


Fig. 1 CO₂ emission in the four major sectors in China

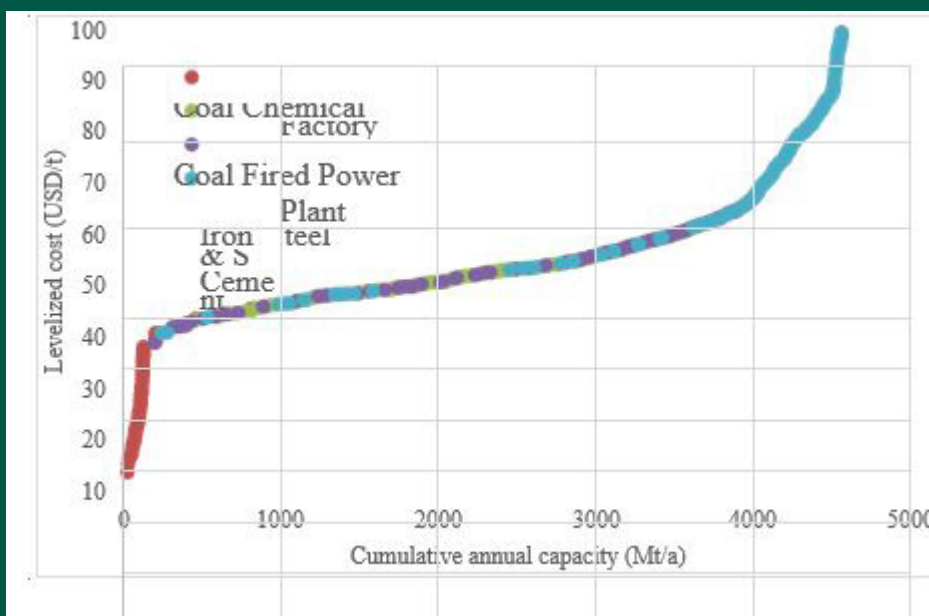


Fig. 2 Levelized cost of possible full-chain CCUS project versus annual cumulative CO₂ capacity in the four major sectors in China

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On the climate change from the geosciences point of view

Modesto Eusebio Portilla Gamboa

Geosciences Department, Sciences Faculty, National University of Colombia

Biography

Dr. Modesto Eusebio Portilla Gamboa is an investigator in the Geo-Environmental Research Group at the National University of Colombia (Bogotá) where his academic activities are related to the geological process impacts into the atmosphere and its role on the climate change, and also analyzing the interaction between ocean, atmosphere and lithosphere as a main factor in the generation of hazards to human, societal, and economic environments. He recently analyzed the environmental risks of hydroelectric and national highway projects as likely generators of catastrophic events and as contributors of ecosystems losses which will be aggravated by the incoming climate change. He is a geologist of Industrial University of Santander (Bucaramanga, Colombia), Specialist in risk assessment and disaster prevention at the Los Andes University (Bogotá, Colombia). He earned a Master of Sciences degree in Geotechnique at the National University of Colombia (Bogotá), and he also earned a doctorate in Terrain Engineering at the Technical University of Catalonia (Barcelona, Spain). He is a peasant coming from Cachirí (Santander, Colombia) since 1964.

The best known graph in history, the hockey stick, shows that global temperature climbs around the 1900 (McGuire, 2012) bringing about a climate change technically speaking; a change in the temperature mean value over the past thousand years. However, the broad trend was towards a cooling of the Earth after temperatures peaked almost 50 million years ago. So, from the geological point of view that is not exactly a climate change due to the natural temperature variability, not only due to changes in its source, the Sun, but also coming from the inner and surface earth dynamics (Cronin, 1999; Freund et al, 2017; Helama et al, 2018; Willeit et al, 2019; Robbins, 2019).

Nowadays it is accepted that volcanism played a crucial role in the early days of planet Earth, basically providing the gases and components of the reconstructed primitive atmosphere and contributing to the environmental processes that govern climate. It is also known that large effusive and explosive volcanic eruptions may have been associated to biotic extinctions by injecting huge amounts of particulate matter and sulfurous components into the atmosphere, thereby triggering long-lasting episodes of global cooling. The role of the more common small-to-moderate eruptions in climate modulation is yet to be elucidated and this factor needs to be incorporated in circulation and climate models to more accurately predict trends in regional temperatures and separate natural from man-made influences in climate change. Colombia is host to at least twenty active volcanoes with numerous explosive and effusive eruptions in the Holocene, the study of the size, nature, and time distribution of these events will contribute to building a data set that could be used in a more refined analysis of regional climate changes.

2nd World Congress on Climate Change



Evaluating the performance of two surface layer schemes for the momentum and heat exchange processes during severe haze pollution in Jing-Jin-Ji in eastern China

Yue Peng, Hong Wang, Yubin Li and Changwei Liu

Chinese Academy of Meteorological Sciences, Beijing 100081, China

Biography

My name is Yue Peng, a doctoral candidate educated at Chinese Academy of Meteorological Sciences, China. The interaction of haze, fog and atmospheric boundary layer is a subject of global concern. Regard to this subject, the focus of my research is to understand the physical and chemical reaction mechanism of pollutants in the boundary layer, and to improve the performance of fog and haze forecast by modifying or creating new physical and chemical scheme of the boundary layer.

The turbulent flux parameterization schemes in the surface layer are crucial for air pollution modeling. The differences between two surface layer schemes (Li and MM5 schemes) were discussed, and the performances of two schemes were mainly evaluated based on the observed momentum and sensible heat fluxes during a heavy haze episode in Jing-Jin-Ji in eastern China. The results showed that the aerodynamic roughness length z_{0h} and the thermal roughness length z_{0h} played major roles in the flux calculation. Comparing with the Li scheme, ignoring the difference between z_{0m} and z_{0h} in the MM5 scheme induced a great error in the calculation of the sensible heat flux (e.g., the error was 54 % at Gucheng station). Besides the roughness length, the algorithm for the surface turbulent flux as well as the roughness sublayer also resulted in certain errors in the MM5 scheme. In addition, magnitudes of z_{0m} and z_{0h} have significant influence on the two schemes. The large z_{0m} and z_{0m}/Z_{0h} in megacities with a rough surface (e.g., Beijing) resulted in much larger differences of momentum and sensible heat fluxes between Li and MM5, compared with the small z_{0m} and z_{0m}/z_{0h} in suburban areas with a smooth surface (e.g., Gucheng). The Li scheme could better characterize the evolution of atmospheric stratification than the MM5 scheme in general, especially for the transition stage from unstable to stable atmospheric stratification, corresponding to the $PM_{2.5}$ accumulation. The biases of momentum and sensible heat fluxes from Li were lower, about 38 % and 43 %, respectively, than those from MM5 during this stage. This study indicates the superiority of the Li scheme in describing regional atmospheric stratification and an improved possibility of severe haze prediction in Jing-Jin-Ji in eastern China by coupling it into atmosphere chemical models.

2nd World Congress on Climate Change



Analysis of Extreme Urban Heat Island: Correlation with Global Warming

Kartikey Gupta

Vatsalya, India

Biography

Kartikey Gupta (www.linkedin.com/in/guptakartikey) is a 26 year old passionate mechanical engineer, working in Solar Energy field since 5 years. He is currently the Chief Technical Officer cum Passion Director for Vatsalya (www.vatsalya.org), an organization working for underprivileged children, women and public health across 5 states in India, of which many institutions are now carbon negative under his initiative, creating over 78 KW of clean energy sources across rural India. He received Solar energy training twice in Germany from Wolfgang Scheffler, Inventor of Scheffler Reflectors, and was also awarded a 'Genius Cap' by Chemistry Nobel Laureate Francis Arnold. A naturalist by heart, he hopes to eradicate the climate change problem along with others realizing the seriousness of the situation.

Global warming and environmental degradation are at their peak today, with the years after 2000A.D. giving way to 15 hottest years in terms of average temperatures. In India, much of the standard temperature measuring equipment are located in 'developed' urban areas, hence showing us an incomplete picture in terms of the climate across many rural areas, which comprises most of the landmass. This data studied since 3 years at Vatsalya's Children's village, in outskirts of Jaipur, Rajasthan, India; in the midst of semi-arid topography, tells us a different story - where consistently huge temperature differences of up to 15.8 degrees Celsius from local Jaipur weather only 30 kilometers away, are stunning yet scary at the same time, encouraging analysis of where the natural climatic pattern is heading due to rapid unrestricted urbanization. Record-breaking data presented in this project enforces the need to discuss causes and recovery techniques. The research project explores how and to what extent we are causing phenomenal disturbances in the natural meteorological pattern by urban growth. Data observations using a standardized ambient weather station at study site and comparing it with closest Airport weather data, evaluating the patterns and differences show striking difference in temperatures, wind patterns and even rainfall quantity, especially during high-pressure zone days. Winter-time lows dip to 8 degrees below freezing with heavy frost and ice, while only 30 kms away minimum figures barely touch single-digit temperatures. Human activity is having an unprecedented effect on climatic patterns in record-breaking trends, which is a warning of what may follow in the next 15-25 years for the next generation living in cities, and a serious exploration into possible solutions is a must.

2nd World Congress on Climate Change



Effects of NPK and Plant Tea Manure (*Tithonia diversifolia*) on Growth Rate of Amaranth (*Amaranthus cruentus* L.) in Soilless Growing Media

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Biography

Ms. Roseline Chemutai is lecturer in Bukalasa Agricultural College in the department of Crop science. She is a teacher by profession, has passion for research and has a degree in Education from Makerere University, Kampala. She completed her Master of Science in Agroecology from Uganda Martyrs University. Her dissertation investigated the possibility of coming up with alternative growth media. The soilless media that were focused were charcoal dust, coffee husks and sawdust. Alternative sources of plant nutrients were also explored in the investigation. She has taught in many Agricultural colleges in Uganda.

Many countries are running short of agricultural land. Even where land appears to be available, soil fertility, water availability as well as nutrient mining still remains a challenge yet at the same time the world's demand for food is rapidly increasing. This study investigated the effects of application of NPK and Plant tea manure on selected soilless growing media on growth rate of *Amaranthus cruentus* L. This was to determine their suitability as an alternative growing media. A split plot design was used and the experiments carried out for two seasons. The soilless growing media investigated were: charcoal dust, saw dust, dry coffee husks, and mixture of charcoal and saw dust (1:1), saw dust and coffee husks (1:1), charcoal dust and coffee husks (4:1) and a compound mixture of charcoal dust, sawdust and coffee husks (2:2:1). The growing media were randomized in the three split blocks with eight pots each. Results indicated that all the growth media could support Amaranth growth. However, a mixture of charcoal dust and dry coffee husk (4:1 respectively) with application of plant tea manure significantly affected the growth rate of *A. cruentus* ($p < 0.05$). Conclusion: Mixture of charcoal dust and dry coffee husk (4:1 respectively) with application of either NPK or plant tea manure could be used as the best alternative growth media for Amaranth production in home Kitchen gardens in rural areas and backyard gardens in urban areas.

2nd World Congress on Climate Change



Due to severe drought, erosion caused by high rate of irrigation water in the harran plain, southeastern turkey

Yakup DARAMA

Atilim University, Turkey

Biography

Dr. Darama is currently an Associate Professor at the Civil Engineering Department of the Atilim University where he is teaching fluid mechanics, hydraulic engineering, hydrology and water resources, and irrigation and drainage courses. His research is focused on hydraulic and hydrologic modelling, sediment transport of rivers, reservoir sedimentation and irrigation. Formerly Dr. Darama was director of Investigation, Planning and Allocation Department of the State Hydraulic Works. In this Department he coordinated Works in Feasibility and Planning studies for Water Resources Development Projects in Turkish basins, coordinated Works in Flood Inundation and Risk Mapping of high flood prone areas of Turkish river basins. He was also focal points of UN-ECE, UNESCO-IHP, and UN-SPIDER programs of the United Nations between 2002 and 2013.

Southeastern part of Turkey, which is known as GAP region, has been subject to severe drought during the last two decades. Due to insufficient and lack of precipitation GRACE-derived drought characterization index developed by Yirdaw et al. (2008) and applied to Tigris-Euphrates basin by Chao et al. (2018) agrees well with the actual drought. Drought during this period resulted by applying high quantity of irrigation water in the GAP area. Thus, a study was made to determine the erosion problem and determine the quantity of suspended sediment transport in the drainage channels of the Harran Plain by conducting periodic suspended sediment sampling and discharge measurements in the field between 1997 and 2017. When irrigation in the Harran Plain started in 1990, production of the agricultural goods quadrupled within a few years. Unfortunately, excessive amounts of irrigation water supplied by farmers to irrigate their crops also led to the erosion of the soil in the fields by surface runoff. The surface runoff caused by excess irrigation water eroded the topsoil. Furthermore, the mixture of clay, silt and fine sand in the topsoil from certain areas accumulated in the tertiary and secondary drainage systems, and reduced the effectiveness of the drainage system. Analysis of the suspended sediment measurements between 1997 and 2017 showed that the yearly averaged sediment transported to Syria by the main drainage canal of the Harran Plain varied between 128 tons/day to 1268 tons/day and the average of the 21-year measurement is about 682 tons/day. Logarithmic plot of suspended sediment rating curve showed that as the discharge of the Cullap Creek increases sediment transport rate also increases linearly. Sediment erosion resulting from rainfall events in the Harran Plain is also computed by using Rusle Universal Erosion Model, and the results showed that rainfall erosion from the Harran Plain is 131.5 ton/day. Comparison of this value with the 21 year value of average sediment erosion by irrigation yields that approximately 20% of sediment erosion from the Harran Plain caused by rainfall events in the area.

2nd World Congress on Climate Change

The influence of Maritime transport on the air quality around Spanish coasts and Sea Ports

Juan Moreno-Gutiérrez and Vanessa Durán-Grados

University College of Marine, Nautical and Radioelectronics Engineering. University of Cádiz. Spain

Biography

Dr. Juan Moreno-Gutiérrez is a Principle investigator in the Energy Efficiency in the Maritime Transport Research Group at the University of Cádiz (RNM 920) where he research focuses on the implications of climate and energy policy on the MARITIME sector, and management strategies in order to reduce emissions from ships. He is coauthor join Dr. Vanessa Durán-Grados of many manuscripts published in High Index journals (the most ranked in first decil and quartil . Both Pr. Moreno and Durán have working in a research project which aims is to define emissions, air quality and epidemiological models in order for calculating the morbidity and mortality produced by the Maritime Transport in the South of Spanish costs cities. They are working in a project to improve the energy Efficiency at Spanish sea ports.

Emissions of exhaust gases and particles from oceangoing ships are a significant and growing contributor to the total emissions from the transportation sector. These emissions are largely composed by both CO₂ and traditional pollutants.

In order to reduce air pollution from ships, the International Maritime Organization has officially designated Emission Control Areas (ECAs) where a global cap of sulphur fuel content is included. However, up to date, only few areas have been designed ECAS despite of the intense traffic of certain maritime routes of some key shipping areas. This is the case of the areas around the Strait of Gibraltar, and the Spanish coasts. In this study, we aim to estimate health impacts attributable to PM_{2.5} and O₃ from ships emissions by precursor species at these areas in order to the areas of the Strait of Gibraltar to be declared as ECAs

2nd World Congress on Climate Change

Assessment of Rainfall Variability as Evidence of Climate Change and Its Impact on Maize Production in Southeast Nigeria

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The impacts of climate change on people's livelihoods in the affected regions can be huge, ranging from flooded houses to endangered food security due to large-scale agricultural losses. Rainfall variability therefore, can negatively affect crop production which in turn can lead to food insecurity of the people. This study assessed the dynamics of rainfall variability in relation to maize production in southeast Nigeria with a view to contributing to the improvement of food security in the region. Rainfall figures were analyzed from 1988 to 2017 which showed yearly fluctuations within the period. Comparison was also made of rainfall variability using rainfall values with the crop yields to analyze their association within 20 years. Questionnaire surveys were used in the field as well archived data on rainfall for 30 years and maize yields for 20 years were also used. Responses from respondents revealed high rainfall variability in the region which affects crop yields (particularly maize) that negatively affects the socioeconomic wellbeing of people. The result is in conformity with time series line graphs analysis that indicates dramatic rainfall variability with shifts in bimodal rainfall pattern and little dry season. Generally, first and second decades (1988-1997 and 1998-2007) shows small increased rainfall trend while the last decade (2008-2017) was marked with very low rainfall regime. This indicates that the 30 years period of study in the region was associated with decrease rainfall trend. The predictive models analyses indicated a significant shift in rainfall occurrence, and that about 18.4% of the variation in maize yield in the region can be explained by the shift in rainfall in the past 20 years. Also, from regression analysis, it's predicted that, a unit increase in rainfall, will increase maize yield by 517 units in 20 years time, thus the crop is highly affected by rainfall variability.

2nd World Congress on Climate Change

Modeling CO₂ storage in geological formations – overview and challenges

Avinoam Rabinovich

School of Mechanical Engineering, Tel Aviv University, Tel Aviv, Israel

Reduction of CO₂ emissions into the atmosphere is possible by capturing it at various sources (e.g., power plants) and injecting it into subsurface geological formations (e.g., saline aquifers) for storage. It is considered likely that 99% or more of the injected CO₂ will remain underground for 1000 years. Furthermore, the global capacity for storage is large and the technology for such projects is fairly well established. It is for these reasons that CO₂ storage is an attractive option in efforts of climate change mitigation. Implementing CO₂ storage technology requires accurate modeling in order to make predictions, monitor projects and answer important fundamental questions such as: how securely and for how long stored CO₂ will be retained? and what are potential leakage pathways and how to deal with them?

This talk will present an overview of modeling CO₂ storage in geological formations and some of the current challenges, e.g., complexity of physical processes, computational intensity and multiscale nature of the problem. Special focus will be given to residual trapping, i.e., CO₂ that remains trapping in pore space by capillary forces and as a result does not migrate towards the caprock. This is considered an important mechanism impacting the spread of CO₂ in the formation and increasing the safety and permanence of storage. Recent results of our research group showing some of the computational challenges as well as methods of dealing with them will be discussed.

2nd World Congress on Climate Change

Thermal Tolerance of Non-indigenous Fish from Tropical River Habitat in Thailand

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Biography

Patitta Kritjirakorn is a student in the Department of Conservation Biology, Undergraduate Program, Mahidol University, Kanchanaburi Campus. She is interested in the effect of the invasive species of fish in aquatic habitats in Thailand. Her working focuses on the implication of the global warming to disturb for native and non-indigenous fishes in tropical aquatic habitats.

Critical thermal maxima (CT_{max}) were measured for one non-indigenous fish, *Oreochromis niloticus*, living in natural river and two non-indigenous from aquarium fishes (hybrid), *Apistogramma* sp. and *Dicrossus* sp., were transferred to acclimate in the natural river habitat for one month. CT_{max} of three non-indigenous fishes acclimated at 25.0°C were 41.5±1.3 °C, being lowest, for *Apistogramma* sp., 42.5±1.2 °C for *Dicrossus* sp., and *O. niloticus*, being highest, for 43.5±1.6 °C, respectively. Interestingly, the CT_{max} of three non-indigenous fishes were higher than those of Thai local fish species that the CT_{max} were most approximately 35.0 °C to 39.0 °C. Ambient temperature predicted by a global climate change model in Southeast Asia will be increased approximately 3.0 °C to 5.0 °C in the coming decades. Forecasted temperature changes are likely to impose the changes in distribution, abundance and mortality of some native Thai fishes, while non-indigenous fishes are likely to have more tolerance for thermal river conditions.

2nd World Congress on Climate Change

Temperature Tolerance of Thai Freshwater Fishes Exposed to Dynamic Change in the Temperate rivers: Global Warming Implication

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Biography

Thanasit Punkumsing is a student in the Department of Conservation Biology, undergraduate program in Mahidol University, Kanchanaburi Campus. He is interested in the effect in the dynamic of water temperature and physiological adaptation of fishes in the tropical rivers. His working focuses on the implication of the adaptation of fish for global warming effect.

Critical thermal maxima (CT_{max}) for fish acclimatized to an ambient river temperature between 23.0 °C and 28.0 °C was the same as the CT_{max} for fish, acclimated to these experimental temperatures. CT_{max} the four species; *Rasbora rasbora*, *Channa gachua*, *Devario regina* and *D. annandalei*, examined were significantly related to the temperature values ($p < 0.05$). CT_{max} were the lowest at 36.0 °C and 36.2 °C for *D. regina* and *D. annandalei*, respectively, acclimated to 23.0 °C and found the highest at 38.6 °C for *M. chlopterus*, *R. rasbora* and *C. gachua*, acclimated to 28.0 °C. The amount of heat shock protein 70 (Hsp70) was found lowest at 23.0 °C acclimation temperature while the amount of Hsp 70 was higher at 28.0 °C for four species. The lowest amount of Hsp70 was found in *D. regina* and *D. annandalei*, and the highest amount of Hsp70 was found for *M. chlopterus*, *R. rasbora* and *C. gachua*, respectively. Interestingly, tropical river fish increasingly produced amount of Hsp 70 when water temperature in the rivers was gradually increasing. Hence, higher concentration of Hsp 70 in fish could be expected to fish physiological process adapted to protect for thermal river condition, where water temperature is altered from global warming phenomena.

2nd World Congress on Climate Change

Methodology for climate characterization of protected areas in Southern Brazil

Cássio Arthur Wollmann

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Biography

Dr. Cássio Arthur Wollmann is an investigator in Geography and Climatology sciences. Graduated in Geography Bachelor's degree from the Federal University of Santa Maria (2004-2007), being guided by Prof^a. Dr^a Maria da Graça to Barros Sartori. Doctor in Physical Geography (2008-2011) and Post-doctor (2017-2018) by the Postgraduate Program in Physical Geography of the University of São Paulo (USP - São Paulo, SP, Brazil), being supervised and supervised by Prof. Dr. Emerson Galvani. The central themes of the thesis and postdoctoral stage developed were Geographic Climatology and Agricultural Climatology. Currently, Assistant Professor (Level IV) of the Department of Geosciences of the Federal University of Santa Maria, Southern Brazil, teaching in the course of Bachelor in Geography and Postgraduate Program in Geography (Master and Doctor Program). Professor responsible for the Laboratory of Environmental and Subtropical Climatology (LaCAS), whose laboratory is in the Directory of Research Groups in Brazil, CNPq, and can be consulted at <http://dgp.cnpq.br/dgp/espel-hogrupu/8330814406402566>.

The methodology used for climatic characterization of protected areas developed concerns in to develop in six stages. First, it is necessary to search for an existing theoretical framework and the accomplishment of a field work, for the knowledge of the area and the different physiographic and microclimatic environments. In a second moment, in laboratory environment, the places for the installation of the equipment are defined. Then (third stage), the installation of the measurement equipment takes place. Instrutherm HT-500 Dataloggers are used to collect data on temperature (°C) and relative humidity (%), the measurement of which is always performed simultaneously at all sample points and at hourly intervals. The instruments remained in place for one year, whose variation of the climatic attributes considered are analyzed monthly, seasonally and annually. In the fourth stage, the first data collection takes place, usually six months after the installation, and the fifth stage of the survey after one year of installation, when the equipment is dismantled. The sixth and last stage is the analysis of the data in the laboratory, being submitted to the statistical, climatic and cartographic analysis. It is not a research with long-term climate records, but a twelve-month experiment that was obviously influenced by weathering and/or climatic events inherent in the upper hierarchies of the atmosphere and influencing the variability in the lower scales. Thus, this research may not represent the climate reality according to the analysis of at least 30 years, as guided by WMO, but because it is a measurement in a little or no altered environment, it can serve as parameter for conclusions and comparisons between the climatic variability of natural environments already altered by human activity, but it needs to be compared with the same geographic factors, landscapes and climatic scale of analysis.

2nd World Congress on Climate Change

Management strategies of cold air for establishing urban ventilation corridor plans: A case study of the Cheongju, Jeonju, Jinju in South Korea

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Biography

Jeong-Min Son completed her Master's degree at Keimyung University in South Korea, and she is now a doctoral student in graduate school at Kyungpook National University. She is interested in spatial planning for mitigating urban heat environment. Prof. Jeong-Hee Eum completed her Dr.-Ing. at Technische Universität Berlin (TU Berlin) in Germany. She worked at National Institute of Meteorological Sciences (NIMR) and Korea Environment Institute (KEI) in South Korea as a researcher. She also worked at Keimyung University as an assistant professor. And, she is now an assistant professor in the department of Landscape Architecture at Kyungpook National University. Her research focuses on evidence-based planning with climate considerations, e.g. urban ventilation corridor planning and climate-friendly urban green areas.

As urban heat environment problems occur due to climate change, eco-friendly cities such as Germany, Japan and Hong Kong have improved the problems through ventilation corridor plan (a.k.a. wind corridor plan). Urban ventilation corridor is an entire system of cold air production areas and fresh air corridors, which contributes to secure the local air exchange (Ministerium fuer Verkehr und Infrastruktur Baden-Wuerttemberg, 2012). In South Korea, forest areas favorable for generating cold air account for about 63 percent of the land area. Furthermore, the Jeongmaek, the axis of the main mountain ranges of Korea, is located close to the cities. Hence, the management of cold air is an effective way to improve the thermal environment of Korean cities.

Therefore, we selected three Korean cities (Cheongju, Jeonju and Jinju) adjacent to the Jeongmaek and analyzed cold air characteristics of each city to suggest management strategies of cold air. We used KALM (Kaltluftabflussmodell), a cold air simulation model developed in Germany and identified both the cold air flow and the height of cold air layer generated during 6 hours at night. As a result, the cold air flow generated in the Jeongmaek became clear and the height of cold air layer increased with time. However, the characteristics of cold air varied depending on the land covers and geographical features of three cities. Hence, we proposed management plans to maintain and expand the cold air flow, based on the urban basic plans, the land use status and the area to be developed. For example, forest areas with active cold air generation were designated as 'cold air conservation areas', and areas requiring management for good cold air flow were as 'cold air management areas'. This study is expected to be useful for establishing systematic urban ventilation plan to improve thermal environment in Korea cities.

2nd World Congress on Climate Change

Wind driven airlift pump for artificial upwelling or forced downwelling powered by air at atmospheric pressure

Bruno Cossu

Private Lawyer, Italy

Biography

"Bruno Cossu is a lawyer who practices law in front of the high Courts of justice (Supreme Court of Cassation, State Council, Constitutional Court, European Court of Human Rights, etc.). For many years, he has been interested, as a private researcher, in hydropneumatic machines powered by natural energy, obtaining several patents. In 2018, he presented at EGU General Assembly (Vienna, 8-13 April 2018) an abstract concerning a "wave powered airlift pump" for artificial upwelling, forced downwelling, production compressed air. He is currently working on other hydropneumatic machines driven by wave energy, above all for electricity production.

This abstract concern a wind driven airlift pump for lifting deep sea waters or the sinking of the surface ones, that uses air at atmospheric pressure as compressed air, thanks to the fact that it operates in an environment subject to a pressure lower than the atmospheric one.

In its essential core, the pump consists of:

- an Andreau wind turbine (that is a wind turbine whose tower, hub and blades are hollow and the latter have openings at the ends) the base of whose tower (T) is immersed, for some meters, in the water, which operates as an air suction pump;
- a long pipe (A), partially immersed in the liquid body, whose lower end reaches the desired depth; the upper one - in the part that comes out of the water (for about 11-16 meters, depending on the fact that the pump is used for upwelling or downwelling) - is internal and coaxial to the tower.

This structure of the pump implies that, when the wind turbine is in operation, the air present in the blades, due to the centrifugal force, is expelled outside; a depression takes place inside the tower; consequently, the water rises both inside the tower and the pipe to the equilibrium height.

In this situation, allowing the outside air to flow, through special pipes, into the pipe A, the pump will act for lifting deep waters; leaving it flow, instead, inside the tower T, it will operate for the sinking of surface waters (since the air-water mixture that is created is able to rise up to a greater height than that of the upper end of the pipe A) leaving it to flow, at the same time (and in the appropriate proportion) inside the pipe and the tower, the pump will operate for the sinking and simultaneous aeration of the sunken waters.

2nd World Congress on Climate Change

Normalized difference vegetation index (NDVI) an indicator of climate change. Particular case of grapevine in Extremadura (Spain)

Fulgencio Honorio Guisado¹, Abelardo García Martín¹, José Rafael Marques da Silva², Adélia Oliveira de Sousa² and Carina de Nóbrega Barcelos²

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Biography

Dr. Honorio Guisado is researcher of the research group in Agroforestry Climatology of University of Extremadura (CAFEX RNM 028), where he has carried out most of his research. He is coauthor of 5 JCR articles published in international journals. Since 2000, his priority research line is the analysis of the influence of climate on crops and the impact of climate change on agriculture.

Extremadura is the most southerly European region of the continent with a Mediterranean climate and great contrasts in the North-South gradient and with important agricultural and livestock character. In this region, the vine is cultivated in traditional system for the production of wine and is a economically very important sector with around 82.000 has. Most of the cultivated area was managed in rainfed conditions, being very affected by changing climatic variables, such as temperature and precipitation, with great influence on grape production and wine quality, causing a high variability between years.

Remote sensing has allowed satellite monitoring of crops. Among the tools available to the satellite, the cultivation indexes are the ones that have shown the greatest interest in recent years. The normalized difference vegetation index (NDVI) is an indicator of the response of crops to climatic conditions, expressing the vigor of them and therefore is an integrator of the effects of climate on crops.

Through the measurements of the NDVI (2000-2018) of two vine varieties in a traditional dry farming area in Extremadura, the evolution of the index and its relationship with climatic variables was analyzed. To determine monotonic trend, the Mann-Kendal test and the Senst slope estimator were used and to obtain correlation between variables the Pearson test was used. The results indicated that the NDVI showed a significant tendency towards increases in the value of the index. This increase was different according to the variety. The value of the index was related to rainfall as well as temperatures. So this index is a good indicator to detect the state of the vineyard in the climate change scenario

2nd World Congress on Climate Change

The current status and implications of laws and institutions concerning spatial planning to improve urban thermal environment in South Korea

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Biography

Kwon Kim completed his Master's degree at Keimyung University in South Korea, and he is now a doctoral student in graduate school at Kyungpook National University. He is interested in spatial planning for improvement on urban thermal environment.

Prof. Jeong-Hee Eum completed her Dr.-Ing. at Technische Universität Berlin (TU Berlin) in Germany. She worked at National Institute of Meteorological Sciences (NIMR) and Korea Environment Institute (KEI) in South Korea as a researcher. She also worked at Keimyung University as an assistant professor. And, she is now an assistant professor in the department of Landscape Architecture at Kyungpook National University. Her research focuses on evidence-based planning with climate considerations, e.g. urban ventilation corridor planning and climate-friendly urban green areas.

Due to climate change and urbanization, urban thermal environment has been getting worse every year. As record-breaking heat wave events caused a lot of damage to the Korean cities in 2018, Korean government defined the heat wave as a natural disaster in the Framework Act on the Management of Disasters and Safety in September 2018. Hence, social countermeasures against heat waves are expected to strengthen. In addition, countermeasures in spatial planning should be accompanied to build climate-friendly cities, and the support of laws and institutions is required.

This study aims to analyze the current status of laws and institutions concerning spatial planning to improve the urban thermal environment in South Korea. For this purpose, we reviewed laws, administrative rules and ordinances of local governments related to improvement of urban thermal environment. Furthermore, analysis and evaluation tools of thermal environment were also analyzed. Finally, climate change adaptation policies of local governments responding to heat wave events were reviewed. As results, we found a lack of unity in terms concerning thermal environment, insufficient bases for introducing factor to improve thermal environment, and the need for improvement of analysis and evaluation tools and methods.

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Impacts of Climate Change on Flood Disaster Risk in the Mekong River Basin

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Chantha Oeurng³ and Günter Meon⁴**

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Biography

Mr. Sophal Try is a current Ph.D student at Kyoto University, Japan where his research focuses on rainfall-runoff and inundation modeling and the climate change impacts on water resources and flood hazard risk assessment in the Mekong River Basin. Mr. Sophal earned Master's Degree in Disaster Prevention Engineering from Kyunpook National University, Republic of Korea and Engineer's Degree in Water Resources Engineering from the Institute of Technology of Cambodia, Kingdom of Cambodia.

Climate change currently affects the ecosystem resilience and aquatic. Climate change can alter the rainfall patterns which have a great impact on river flow in the river. Annual flooding is an important hydrological characteristic of the Mekong River Basin and it drives the high productivity of ecosystem and biodiversity in the Tonle Sap floodplain and the Mekong Delta. This study aims to assess the impacts of climate change on river flow and flood extent in the Mekong River Basin. The changing impacts were simulated by a two dimensional coupled rainfall-runoff and inundation model (RRI model). After the model was calibrated and validated, the model simulated the present climate period (1979-2003) and the future projected climate period (2075-2099) using AGCM60km dataset (official name: MRI-AGCM3.2H). The climate datasets were adjusted by applying bias correction based on observation data. The increasing of rainfall from 8% to 15% by the end of 21st century could affect the large increasing of inundation volume from 83.91 mm (i.e. unit of inundation volume in Lower Mekong Basin is average of total area) in the present climate to 114.60 mm and 144.53 mm in the future corresponding increase of +37% and +72% in scenario RCP4.5 and RCP8.5 respectively. The average annual maximum flood extent in future would increase by 32% and 65% corresponding flooded area increase from 30,528 km² in the present to 40,401 km² and 50,301 km² in the future. Our future work is going to focus on predicting the relationship of flood damage with flood water depth and inundation volume.

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Aerodynamic Roughness Length Application for the Sustainable Urban Land Use Management Policy Development

Seung Man An

Associate Research Fellow, National Territorial Environment & Resources Research Division, Korea Research Institute for Human Settlement, South Korea

Biography

Dr. Seung Man An is an Associate Research Fellow in the National Territorial Environment & Resources Research Division at the Korea Research Institute for Human Settlements (KRIHS) where his research focuses on the urban microclimate management policy development and mountain forest policy development to make a sustainable society with optimal land use. His dissertation examined the land desertification & micro-climate effects by urbanization, with a focus on resource environment management. Before joining KRIHS, he served as an associated research professor, working on a national and continental level biogenic emission inventory program at Kunkuk University. He earned a Master of Science degree in GIS and a doctorate in Landscape Architecture at Sungkyunkwan University. Research and Development for KMA Weather, Climate, and Earth System Services support this study

Though the Seoul Metropolitan Area (SMA) is surrounded by huge mountains - which are densely planted with woodlands -, most of urban citizens felt uneasy about their atmospheric environment. Both regionally transported air pollutants from China and locally emitted pollutants from an adjacent thermal power plants or mobile transport accelerating SMA air quality degradation.

In an urban morphological complexity and aerodynamic roughness view, inland air ventilation is weaker than sea breeze air ventilation and buildings are regarded as a major obstacle or surface wind drag component.

Enlargement of urban-rural air volume exchange or enhancement of urban ventilation in SMA by urban redesign such as building reallocation is inevitable. Hence, most of urban land use planning professionals in South Korea considering the ventilation and urban air quality issues now. One simple method is promoting higher skyscrapers for green open space and the other method is introducing local cold air to urban core. A volume of cold air generated from mountains could flow down along valleys to the urban downtown and consequently enhance weak urban night-time air exchange process and mitigate physical and psychological urban air pollution stress of citizens who live in SMA. However, insufficient climate analysis information - such as cold air source & sink area or ventilation corridor - are prohibiting better decision making for urban spatial planning.

By that reason, in the beginning, we targeted the goal as SMA aerodynamic roughness layer (morphology based indicator) development and study geographical settings of SMA in a view of urban ventilation analysis by using GIS database. Land use, zoning, land surface temperature, air temperature were compared with aerodynamic roughness layer by GIS based overlay method.

In this study, a crossover collaborative work and communications are on the process for developing better application of aerodynamic roughness length parameters.

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For instance, SMA aerodynamic roughness length layer associated methods development like Unified model (UM) based urban canopy model (UCM) development and ventilation corridor, cold air source identification, land use policy (cold air preservation by zoning system) are going on discussion for enhanced applications.

Better understating of the urban climate settings and land use of the SMA will derive more discussions from many disciplines by interpreting SMA urban patters in their ways.

In the end, we could transfer those discussions to SMA climate management based land use indicator and, in the end, to the urban land use plan. Agreements for SMA climate management recommendation with the consideration of opportunity and challenge would compromise an urban land management policy for both reducing climate change effect and sustainable development.

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Aridity change in southwest of Iberian Peninsula (Spain)

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Biography

Dr. Abelardo García Martín is researcher of the research group in Agroforestry Climatology of University of Extremadura (CAFEX RNM 028), where he has carried out most of his research. He has directed 4 doctoral theses, related to agroforestry climatology, and he is coauthor of 12 JCR articles published in international journals. Since 2000, his priority research line is the analysis of the influence of climate on crops and the impact of climate change on agriculture.

In this study, the aridity (using the De Martonne index) of the Southwest of the Iberian Peninsula is analyzed from the daily data of 8 reference stations of Spain and Portugal (1960-2017). The trends of the entire period were analyzed, as well as significant changes in these trends. Complementary analyzes of the time series of rainfall and temperature have been carried out to explain the trends of the aridity of the study area. The trends of the aridity index, annual temperature and precipitation have been analysed applying the techniques of modified Mann-Kendall test and the Sen's estimator, and to identify the gap years in the series Buishand range test was used. A great variation of the annual aridity index of the stations was found, finding semi-arid stations (Badajoz and Sevilla) and semi humid (Lisbon). All stations presented a great intra-annual variation, which is typical of the climate of the area. Regarding the trends of annual aridity, all the stations except Lisbon presented trends of greater aridity, highlighting Jerez de la Frontera and Seville with a relative change of -49% and -46.5%. This increase in aridity was due to both temperature and precipitation, but especially the latter, which showed greater relative changes (-25% compared to 10% of the temperature), having a more decisive influence on the increase in aridity in the zone. There was a significant change in aridity trends in all weather stations and occurred around 1978. In this change in trend, precipitation was more determinant than temperature.

The results indicate the high vulnerability of the area to warming and the reduction of rainfall, as well as the need for containment policies and the reduction of global warming.

Influence of climate change on active days trends for grapevine in the Guadiana river basin (Spain)

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Biography

Dr. Luis L. Paniagua is an Associate Professor at the University of Extremadura (Spain) where one of his research lines focuses on the implications of climate change on climate variables and indices of agricultural interest. He earned a Master of Agricultural Engineering at the University of Extremadura (Spain) and also earned a doctorate in Agricultural Engineering at the same University. He is author of some articles related to the spatial and temporal analysis of climatic variables.

The climatic conditions and trends in the main climatic variables which affect cultivated crops is an essential information to advise farmers about which areas will be the most appropriate for production. Particularly, this is very important in viticulture, taking into account the current global warming. This study has analysed the growing season temperature trends for vineyards in Castilla-La Mancha and Extremadura, which are the two largest vineyard areas of Spain. From some stations operated by the meteorological services of the Spanish government (Meteorological State Agency-AEMET), raw data were incorporated in the initial database. Thus, the daily maximum and minimum temperature were used to compute the annual number of days of vegetative activity for grapevine. The main objective was the analysis of the effect of climate change on the duration of the grapevine vegetative cycle in the Guadianan river basin. The trend analysis for time series was done using the Mann-Kendall and Sen's slope methods to estimate the trend magnitude.

The obtained results have allowed to identify significant increasing trends related to the number of days in which temperatures were active for grapevines. In consequence, it is expected that the beginning of vegetative cycles will be sooner and, additionally, they will finish later, which the agronomic effects for the sustainable viticulture in this area.

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The effect of climate change on aridity in Extremadura, southwestern Spain

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Biography

Dr. Francisco J. Moral is a Professor at the University of Extremadura (Spain) where one of his research lines focuses on the implications of climate change on climate variables and indices of agricultural interest, particularly from a viticultural perspective. He earned a Master of Agricultural Engineering at the University of Córdoba (Spain) and also earned a doctorate in Agricultural Engineering at the same University. He has supervised some doctoral theses and is author of some articles related to the influence of climate change on viticulture and the spatial and temporal analysis of climatic variables.

One of the determining factor on agriculture and other economic activities, besides ecology and human health, is the wetness or drought condition. It is expected an increase in aridity in many areas of the world because of climate change.

Usually, when climatic change is studied in any region, precipitation and temperature are the two main climate variables used as indicators. However, aridity indices express better the significance of climate change in bioclimatic terms. Consequently, with the aim of analysing aridity trends in Extremadura, southwestern Spain, climate data from 81 weather stations, within the 1951-2010 period, were used. The De Martonne aridity index was computed at each station and, later, the Mann-Kendall test and the Sen's estimator were used to analyse the temporal trends and to estimate their magnitudes.

Results show that an increase in aridity was apparent throughout Extremadura, particularly with the highest rate in the more humid locations of the north of the region. Change year detection was achieved using cumulative sum graphs, obtaining that firstly the change point occurred in the annual period in the late 1970s.

The results of this study are very important for evaluating water deficit and water resources with the aim of predicting measures to control the expected increasing aridity in this vulnerable semi-arid region in southwestern Spain, as a consequence of the global warming.

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Winter chilling trends for cherry trees in the north of Extremadura" (Spain)

Francisco J. Rebollo,¹ Luis L. Paniagua², Francisco J. Moral³, and Abelardo García-Martín²

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Biography

Dr. Francisco J. Rebollo is an Associate Professor at the University of Extremadura (Spain) where one of his research lines focuses on the implications of climate change on climate variables and indices of agricultural interest. He earned a Master of Agricultural Engineering at the University of Extremadura (Spain) and also earned a doctorate in Agricultural Engineering at the same University. He is author of some articles related to the spatial and temporal analysis of climatic variables.

A knowledge of climatic conditions and trends on cultivated crops is essential in fructiculture, which is of utmost importance given the current global warming situation. This study has analysed the chilling hour (temperatures below 7, 2°C) trends in Spain's main sweet cherry (*Prunus avium* L.) production area, located in the north of Extremadura. First of all, the daily chilling hours were determined at three meteorological stations located in the study area, belonging to Extremadura Irrigation Network Consultancy. From the daily data gathered, monthly and annual data were obtained. It was then possible to validate Da Mota's method, and reach an improved modified model. This model has been applied to the different geographical locations within the study area contained in MOPREDA database, collecting chilling hour series from 1951 to 2010 in 27 areas, 17 of them being cherry producers. Trend analysis for time series was done using Mann-Kendall and Sen's slope to estimate the magnitude of the trend. Chilling hours range from 1059 to 1289, with a mean coefficient of variation of 16%. The obtained results have allowed us to identify significant decreasing trends in all areas analysed, with an average reduction of 240 chilling hours in the period analysed (about 40 hours per decade). Furthermore, trends were observed becoming greater as elevation increases.

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Separating the contributions of climate change and human activities to land cover change over semi-arid and semi-humid regions of China

Zhengjia Liu and Yansui Liu

Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, 100101, China

Biography

Dr. Zhengjia Liu, Associate Professor of in the Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS). Dr. Liu is interested in land use change and agriculture sustainability development modelling. He recently focuses on using the state-of-the-art methods of satellite observation, machine learning and geo-mathematical modelling to explain the impacts of climate change and human activities on land use and food security.

Separating anthropogenic contributions from observed vegetation change is helpful for improving our understanding of the effects of human activities on regional ecosystems. In this study, using 1982-2015 GIMMS3g normal difference vegetation index (observed NDVI), monthly climatic variables and land use data, we investigated anthropogenic contributions on vegetation change in the farming-pastoral ecotone of northern China (FPEN). Specifically, given that large-area ecological engineering was practiced since 1999 and large-area land use changes were recorded after 2000, we assumed that human activities only had little impact before 1999. Based on this assumption, we developed a climate-based NDVI model (also termed as TPR-based NDVI model) by using 1982-1999 observed NDVI and assembled monthly precipitation, temperature and solar radiation. Subsequently, the TPR-based NDVI model as well as the residual analysis method were used to separate anthropogenic contributions from observed NDVI in the period of 2000-2015. Results showed that most FPEN performed a greening trend for the period of 1982-2015. Yet a browning trend was also found in central and northern FPEN. The browning trend was largely related to changes of observed NDVI after 2000. Spatial statistics for the best related climatic variable with observed NDVI displayed that temperature, precipitation and solar radiation separately accounted for 42.45%, 31.05% and 26.50% of FPEN, implying their similar importance for vegetation growth in space. Importantly, this study found that anthropogenic contributions dominated trends of observed NDVI over FPEN. Human activities significantly increased NDVI in western and southeastern FPEN ($p < 0.05$), but small decreased NDVI was also observed in central and northeastern FPEN. The findings of this study suggest that applications of anthropogenic ecological engineering and associated conservation measures should be suitable for features of eco-climatic zones.

Management strategies of cold air for establishing urban ventilation corridor plans: A case study of the Cheongju, Jeonju, Jinju in South Korea

Jeong-Hee Eum², Jeong-Min Son¹, Kwon Kim¹, Jeong-Hak Oh³

¹*Dept. of Landscape Architecture, Graduate School, Kyungpook National University, South Korea*

²*Dept. of Landscape Architecture, Kyungpook National University, South Korea*

³*Urban Forest Research Center, National Institute of Forest Science, South Korea*

Biography

Prof. Jeong-Hee Eum completed her Dr.-Ing. at Technische Universität Berlin (TU Berlin) in Germany. She worked at National Institute of Meteorological Sciences (NIMR) and Korea Environment Institute (KEI) in South Korea as a researcher. She also worked at Keimyung University as an assistant professor. And, she is now an assistant professor in the department of Landscape Architecture at Kyungpook National University. Her research focuses on evidence-based planning with climate considerations, e.g. urban ventilation corridor planning and climate-friendly urban green areas.

As urban heat environment problems occur due to climate change, eco-friendly cities such as Germany, Japan and Hong Kong have improved the problems through ventilation corridor plan (a.k.a. wind corridor plan). Urban ventilation corridor is an entire system of cold air production areas and fresh air corridors, which contributes to secure the local air exchange (Ministerium fuer Verkehr und Infrastruktur Baden-Wuerttemberg, 2012). In South Korea, forest areas favorable for generating cold air account for about 63 percent of the land area. Furthermore, the Jeongmaek, the axis of the main mountain ranges of Korea, is located close to the cities. Hence, the management of cold air is an effective way to improve the thermal environment of Korean cities.

Therefore, we selected three Korean cities (Cheongju, Jeonju and Jinju) adjacent to the Jeongmaek and analyzed cold air characteristics of each city to suggest management strategies of cold air. We used KALM (Kaltluftabflussmodell), a cold air simulation model developed in Germany and identified both the cold air flow and the height of cold air layer generated during 6 hours at night. As a result, the cold air flow generated in the Jeongmaek became clear and the height of cold air layer increased with time. However, the characteristics of cold air varied depending on the land covers and geographical features of three cities. Hence, we proposed management plans to maintain and expand the cold air flow, based on the urban basic plans, the land use status and the area to be developed. For example, forest areas with active cold air generation were designated as 'cold air conservation areas', and areas requiring management for good cold air flow were as 'cold air management areas'. This study is expected to be useful for establishing systematic urban ventilation plan to improve thermal environment in Korean cities.

Modeling of Atmospheric Pollution in Urban and Rural Sites Using a Probabilistic and Objective Approach

Fernando López¹, Pablo Valiente², Francisco J.Moral¹ and Francisco¹ J.Rebollo

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²*Departamento de Química Analítica, Universidad de Extremadura. Avda. de Elvas, s/n. 06006 Badajoz, Spain*

Biography

Dr. Fernando López Rodríguez is Professor at the University of Extremadura and is a principal investigator of the DTERMA research group (Technological Development in Renewable Energy and the Environment). Among the projects carried out are the determination of the potential of forest biomass in areas of south-western Europe, its characterization in order to implement power generation plants with GIS, the determination of the floodplains before the overflow of a river, the application of the SIG to check the state of infrastructure and roads and the determination of ozone concentration in cities and areas of Extremadura (Spain), as well as the generation of maps of this pollutant. He has also carried out research on biomass, consisting of the anaerobic biodigestion of slaughterhouse waste and the production of biogas for cogeneration, using biogas produced for different applications. This research has culminated with the direction of the AGROGAS project, of the European SUDOE line, which has produced a computer application for technical-economic studies of farms and agricultural companies, which has deserved mention as a project highlighted in the European line (more than 500 farms treated in Spain, Portugal and France). He is the author and co-author of more than 150 publications including books or book chapters (20), indexed articles (50) and other articles, which have received 1,160 citations.

Atmospheric pollution is affected by different individual pollutants (IP) and climatic factors (CF). In this work the formulation of the Rasch model is proposed to get representative measures of atmospheric pollution in two urban locations, Badajoz and Cáceres, and one rural site the Monfragüe Park (southwest Spain). After applying the Rasch methodology, it was obtained a ranking of all days according to their atmospheric pollution level and the influence on the environmental deterioration of each IP and CF (NO_2 , NO , SO_2 , O_3 , CO , benzene, PM_{10} , precipitation, relative humidity, solar radiation, air temperature, and barometric pressure). The most influential items on atmospheric pollution are the O_3 and the CF, mainly the lack of precipitation and those related to ozone generation (air temperature and solar radiation). Other IP exert a lower influence at both urban locations, being irrelevant at the Monfragüe Park. Unexpected behaviors of CF or IP can be also analyzed.

2nd World Congress on Climate Change

The current status and implications of laws and institutions concerning spatial planning to improve urban thermal environment in South Korea

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Due to climate change and urbanization, urban thermal environment has been getting worse every year. As record-breaking heat wave events caused a lot of damage to the Korean cities in 2018, Korean government defined the heat wave as a natural disaster in the Framework Act on the Management of Disasters and Safety in September 2018. Hence, social countermeasures against heat waves are expected to strengthen. In addition, countermeasures in spatial planning should be accompanied to build climate-friendly cities, and the support of laws and institutions is required.

This study aims to analyze the current status of laws and institutions concerning spatial planning to improve the urban thermal environment in South Korea. For this purpose, we reviewed laws, administrative rules and ordinances of local governments related to improvement of urban thermal environment. Furthermore, analysis and evaluation tools of thermal environment were also analyzed. Finally, climate change adaptation policies of local governments responding to heat wave events were reviewed. As results, we found a lack of unity in terms concerning thermal environment, insufficient bases for introducing factor to improve thermal environment, and the need for improvement of analysis and evaluation tools and methods.

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Modeling of Atmospheric Pollution in Urban and Rural Sites Using a Probabilistic and Objective Approach

Fernando López¹, Pablo Valiente², Francisco J.Moral¹ and Francisco¹ J.Rebollo

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Biography

Pablo Valiente González, a graduate in Chemistry and a Doctor from the University of Extremadura (Spain), has worked in the following lines of research: Spectroscopic techniques, Determination of toxic metals and determination of air pollution. This last line focuses on the measurement and analysis of chemical and climatological parameters, assessing their impact on the air quality of urban and rural areas.

He has directed some doctoral thesis and several works on Air Quality. He has participated in several subsidized Research Projects, the latter specifically dedicated to the application of Analytical Techniques and Data Algorithms in the environmental field.

He is the author of several articles, including some related to the spatial and temporal analysis of chemical parameters and climatic variables in air quality.

Atmospheric pollution is affected by different individual pollutants (IP) and climatic factors (CF). In this work the formulation of the Rasch model is proposed to get representative measures of atmospheric pollution in two urban locations, Badajoz and Cáceres, and one rural site the Monfragüe Park (southwest Spain). After applying the Rasch methodology, it was obtained a ranking of all days according to their atmospheric pollution level and the influence on the environmental deterioration of each IP and CF (NO_2 , NO , SO_2 , O_3 , CO , benzene, PM_{10} , precipitation, relative humidity, solar radiation, air temperature, and barometric pressure). The most influential items on atmospheric pollution are the O_3 and the CF, mainly the lack of precipitation and those related to ozone generation (air temperature and solar radiation). Other IP exert a lower influence at both urban locations, being irrelevant at the Monfragüe Park. Unexpected behaviors of CF or IP can be also analyzed.

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