DETECTION, ATTRIBUTION, AND PROJECTIONS OF CLIMATE CHANGE AND IMPACTS FOR A RESILIENT SOCIETY

Session Program 19 June 2023

10:30 – 10:40 **WELCOME**
Prof. Dr. Jürgen Böhner, Chair of Physical Geography
Prof. Johanna Baehr, Co-Speaker, Climate Climatic Change and Society

10:40 – 11:10 **No-regret climate change adaptation with a paradigm shift in water-related disasters**
Prof. Eiichi Nakakita

11:10 – 11:30 **SAGA applications in regional climate and environmental modeling – current state of development and implementation**
Prof. Dr. Jürgen Böhner

11:30 - 11:50 **Extreme weather impacts on airflows and air quality at urban scales**
Prof. Tetsuya Takemi

11:50 – 12:10 **On Extreme Ocean Waves Modeling, Prediction, and Prevention – An Overview of Experimental Activities**
Associate Prof. Amin Chabchoub

12:10 – 12:30 **Future projections on the line-shaped convective system associated with the Baiu front in Japan**
Assistant Prof. Yukari Naka

12:30 – 13:30 **LUNCH**

13:30 – 13:50 **Second Hamburg Climate Futures Outlook**
Dr. Anna Pagnone

13:50 – 14:10 **Assessing possible and plausible land future**
Prof. Dr. Uwe Schneider

14:10 – 14:30 **Greenhouse gases-induced marine heatwaves exacerbate climate change impacts in the Arctic**
Dr. Armine Barkhordarian

14:30 – 14:45 **Climate Change Impact Attribution of Himalayan Water Resources**
Dr. Shabeh ul Hasson

14:45 – 15:00 **Extremes in the Earth System – Dynamics, Interactions & Impacts**
Dr. Leonard Borchert

15:00 – 15:30 **COFFEE BREAK**

15:30 – 15:40 **CEN – A Collaboration Platform**

15:40 – 16:00 **Existing Collaborations KU-UHH**
Prof. Matthias Hort, Dr. Shabeh ul Hasson

16:00 – 16:40 **Discussion and the way forward**

16:40 – 17:00 **Wrap up**

SESSION ABSTRACT:

Abstract of the Meteorological hazards such as tropical and extratropical cyclones, heavy rainfalls, high winds, and monsoon dynamics can spawn natural disasters from flooding, inundation, landslide, storm surge, and high waves, and therefore have significant impacts on societies. Detection, attribution, and projection of these hazards and associated disasters determine whether and to what extent their intensity and likelihood have changed due to human influence on climate so far and how they will change in the future under possible and plausible warmer worlds. These findings inform decision-making for a more resilient society. In this session, we will share recent developments and exchange ideas on meteorological, hydrological, and oceanography issues that will be the focus of our research in Germany and Japan. Through discussing those issues deeply, we hope that this session would be the foundation for our future collaborations.

CONTRIBUTORS:

Prof. Eiichi Nakakita has been the Director of the Disaster Prevention Research Institute (DPRI) since 2021, the Deputy Executive Director of Kyoto University, and the special advisor of the Ministry of Education, Culture, Sports, Science, and Technology in Japan since 2022. After graduating from the Graduate School of Engineering, Kyoto University, he worked as an assistant professor until 1985, associate professor until 1991 at the DPRI, and associate professor at the Graduate School of Engineering, Kyoto University until 2000. He has served in his current position at the DPRI since 2004. He concurrently served as a visiting Associate Professor at the University of Iowa and visiting Research Professor at the National University of Singapore. His specialties include radar hydrology and hydrometeorology. He has been involved in various governmental committees on heavy rain and flood forecasting using weather radar and assessment of the impact of climate change on the disaster environment for several years. Additionally, he is engaged in disaster survey teams at home and abroad, such as Hurricane Katrina. He was the former Chairman of the Committee on Hydroscience and Hydraulic Engineering at the Japan Society of Civil Engineers. He has been leading disaster prevention research that combines civil engineering and meteorology.

Prof. Tetsuya Takemi is a professor of severe storm and atmospheric environmental research at the Disaster Prevention Research Institute (DPRI), Kyoto University. After obtaining a Ph.D. degree from Kyoto University in 1999, he joined Osaka University as an assistant professor. Concurrently, he was a visiting scientist at National Center for Atmospheric Research in the USA from 2001 to 2002. He moved to the Tokyo Institute of Technology as a lecturer in 2004. He then joined DPRI, Kyoto University as an associate professor in 2007 and became a full professor in 2021. His major is mesoscale and microscale meteorology focusing on extreme phenomena, such as heavy rainfalls; tropical cyclones; and other severe storms, atmospheric environmental research including turbulence and dispersion dynamics, and numerical modeling of regional meteorology and microscale turbulence. He is also studying applied fields, such as urban meteorology, applied and engineering meteorology, and climate change impact assessment on extreme weather. His academic services include Editor-in-Chief of Scientific Online Letters on the Atmosphere (SOLA), Editor of Advances in Atmospheric Sciences, and Secretary of the Atmospheric Science Section of Asia Oceania Geoscience Society (AOGS). At present, he is the head of the Research Division of Atmospheric and Hydrospheric Disasters in DPRI.

Dr. Amin Chabchoub received an MSc in Applied Mathematics / Mechanical Engineering from the University of Bremen, a Ph.D. from the Hamburg University of Technology, and is currently Associate Professor at the Kyoto University's Hakubi Center for Advanced Research & Disaster Prevention Research Institute. He previously had a tenured Associate Professor appointment in Environmental Fluid Mechanics at the School of Civil Engineering of the University of Sydney and was an Assistant Professor of Hydrodynamics at the Department of Mechanical Engineering of Aalto University. Prior to these faculty roles, he was a Postdoctoral Researcher at Imperial College London, Swinburne University of Technology, and The University of Tokyo. His areas of expertise and research interests include extreme waves, nonlinear dynamics, environmental fluid mechanics, and physical oceanography.

Dr. Yukari Naka is an assistant professor in hydrometeorological disaster research at the Disaster Prevention Research Institute (DPRI), Kyoto University. She received the Kyoto University Mazume Research Encouragement Award and visited the University of Bristol for one month in 2020 on a scholarship. She was a research fellow (DC2) at the Japan Society for the Promotion of Science from 2019 to 2021. In 2021, she obtained a Ph.D. degree in Engineering from Kyoto University. Subsequently, she took up her current post. Her research interests include hydrometeorology, mesoscale convective system, and related disasters, multi-scale connection of climatology and meteorology, and climate change, with a special focus on extreme frontal rainfall.

Prof. Jürgen Böhner is a professor of physical geography and is head of the section Physical Geography at the Center for Earth System Research and Sustainability (CEN) at Universität Hamburg. He graduated from the University of Göttingen in geography, meteorology, and bioclimatology and gained his doctorate in 1993 with a thesis on secular climate changes and recent climate trends in Central and High Asia. Until 2006, he was a scientific assistant and associate professor at the Institute of Geography in Göttingen, coordinating and participating in research projects on Late Quaternary climate variability, climate impact assessment, and environmental dynamics. His publications mirror his major interests in modeling topoclimates and related environmental processes. Presently, Jürgen Böhner is cochair of the Cluster of Excellence Climate, Climatic Change, and Society (CLICCS) and heads several third party-funded research projects that all ultimately aim to operationally couple regional climate and environmental modeling approaches for climate-impact research.

Prof. Uwe Schneider is an agricultural and resource economist who is also trained in agronomy and environmental sciences. His interdisciplinary research focuses on possible and plausible land use futures and land sector contributions to sustainable development. He has designed and programmed a variety of mathematical models to depict agricultural decisions and their consequences at local, regional, and global scales. These consequences include land use synergies and conflicts between the production of food, timber, and bioenergy; the preservation of ecosystems, climate, and other resources; and the provision of livelihoods, climate mitigation, and other ecosystem services. Prof. Schneider and his colleagues also quantify the market and welfare effects of agricultural and environmental policies. Prof. Schneider has decades-long expertise in advanced mathematical programming with GAMS and has contributed several open-source software tools. As a member of Hamburg University's Cluster of Excellence "Climate, Climatic Change, and Society", he co-chairs the project Sustainable Land-Use Scenarios: Soil, Biodiversity, Water, Food and Energy Security. At Hamburg University, he teaches courses on sustainability, mathematical programming, and agricultural sector modeling.

Dr. Shabeh Ul Hasson is an interim professor for terrestrial remote sensing and head of the Hydroclimatology and Remote Sensing of Mountain Environment (HAREME) Lab at the Institute of Geography, University of Hamburg. He is also a member of the CLIVAR/GEWEX Monsoons Panel and various other community projects. He represented the postdoc council at the Hamburg Research Academy and served as a postdoc in the A4-theme "African Asian Monsoon Margins" of the cluster of excellence project CLICCS. He received his Ph.D. in Earth Science from the University of Hamburg. With a multidisciplinary background ranging from kilometer-scale dynamical downscaling, and hydrological modeling to terrestrial remote sensing, his research focuses on the detection, attribution, and projections of mean and extreme climatic changes and their transition into hydrological disasters at the monsoon margins and in complex terrain.

Dr. Armineh Barkhordarian is a senior researcher at the Institute of Oceanography at the University of Hamburg. She received her Ph.D. in Climate Science from the University of Hamburg. Her M.S. degree is in Meteorology, and her B.S. degree is in Physics with a major in Solid-State Physics and a minor in quantum mechanics and Crystallography. She had professional appointments at the Helmholtz-Zentrum Hereon, NASA Jet Propulsion Laboratory, and the University of California (Los Angeles). She has expertise in Statistical Climatology and the application of statistical methods to the detection and attribution of climate change analysis. She has experience in extreme event attribution analysis (e.g., droughts, marine heatwaves), the impact of compound extremes on crop failure, and emergent constraints on climate–carbon cycle feedbacks in ESMs.

Dr. Anna Pagnone holds a master's degree in environmental physics and a doctorate in physics. In her thesis, she investigated the oceanic iron cycle and its relation to the climate system. She worked with a biogeochemical model, performed laboratory experiments, and took part in an expedition to the Southern Ocean on board the research vessel Polarstern. At the University of Hamburg, she researches plausible climate futures and is co-editor of the Hamburg Climate Futures Outlook 2023 (https://www.cliccs.uni-hamburg.de/research/climate-futures-outlook.html). This is a synthesis project bringing together more than 60 natural and social scientists researching climate change. She is interested in the interactions between climate and society and in science communication.

Dr. Leonard Borchert is a researcher and lecturer at the Research Unit Sustainability and Climate Risk at Universität Hamburg. He studies extremes in the climate system as well as their interactions with society. As such, his research is highly interdisciplinary, drawing on approaches from economic, agricultural, and physical sciences. This is also reflected in his teaching activities; he offers highly interdisciplinary classes such as "Interactions between natural and social systems". A climate scientist by training, Dr. Borchert applies global Earth System Model simulations to understand and predict climate extremes, and then draws on empirical evidence and model data to trace interactions and cascading effects into society. One current research focus of his is assessing the value of near-term climate predictions up to 10 years into the future for society and understanding changes in global and regional agricultural yields under global warming. Dr. Borchert holds a BSc. In Geosciences from the University of Bremen, an MSc. in Integrated Climate System Sciences from Universität Hamburg, and a Ph.D. in Earth System Science from Universität Hamburg in cooperation with the Max Planck Institute for Meteorology (MPI). He has held postdoc positions at MPI as well as Sorbonne Université and IPSL in Paris, France. Keywords: Climate modeling, climate prediction, impact studies, climate risk, extremes.