香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

FUTURE HEAT RISKS ESTIMATED BY KM-SCALE GLOBAL WARMING SIMULATIONS

Speaker

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Abstract

Increases in the frequency and intensity of extreme heat events pose significant threats to both human systems and ecosystems. Effective adaptation and mitigation of heat-related risks require climate information at a kilometer-scale resolution. To improve projections of future changes in heatwaves and associated mortality risks, we analyze historical simulations with CMIP6 historical forcings and future simulations under the Shared Socioeconomic Pathways 5-8.5 (SSP5-8.5) scenario, conducted at atmospheric resolutions of 31 km and 9 km using the coupled Earth system model OpenIFS-FESOM2 (AWI-CM3). The simulations include a 20-year control run representing the 1950s and four 10-year time-slice simulations for the 2000s, 2030s, 2060s, and 2090s. These time slices are initialized from the trajectory of the 31 km SSP5-8.5 greenhouse gas forcing scenario, while employing the same high-resolution ocean component.

Our analysis demonstrates that historical simulations at 9 km resolution more accurately capture the probability distribution functions of surface temperature and regional characteristics of heatwave events compared to the 31 km resolution, particularly across Europe, North America, and large parts of Asia. Projections from the 9 km simulations indicate higher heatwave intensities and associated mortality risks relative to the coarser 31 km simulations. These findings underscore the critical importance of kilometer-scale resolution modeling for improving the accuracy of heat-related health risk assessments, as lower-resolution simulations may systematically underestimate such risks.

Biography

June-Yi Lee is a Professor at the Research Center for Climate Sciences, Pusan National University, Republic of Korea, and is also affiliated with the Center for Climate Physics, Institute for Basic Science, where she serves as Project Leader for Earth System Predictability. Her research interests include Earth system predictability and prediction from subseasonal to multi-year timescales, tropical-extratropical teleconnections, and future changes in extreme weather and climate events. She has published approximately 120 papers on these topics. She received her Ph.D. in Atmospheric Sciences from Seoul National University in 2003. She worked as a postdoctoral fellow at NASA Goddard Space Flight Center from 2003 to 2005, and as a researcher at the International Pacific Research Center, University of Hawaii, until 2013, before joining Pusan National University. She contributed to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Cycle as a Coordinating Lead Author for the Working Group I report and a member of the Core Writing Team for the Synthesis Report. From 2020 to 2024, she served as Co-Chair of the Working Group on Subseasonal to Interdecadal Prediction of the World Climate Research Programme.

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