Understanding the complexities and uncertainties of climate change for effective adaptation to changing extreme weather events

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Keywords: *tropical cyclone, extreme weather event, climate change*

Abstract

The issue of climate change involves a range of hierarchical complexities and uncertainties that occur in the understanding of key climate and societal processes, and affect decision making for mitigation of anticipated climate change and adaptation to changing environments. This talk focuses on adaptation to changing extreme weather events, and in particular, tropical cyclones that severely affect coastal regions through their strong winds and torrential rains. It presents a concept of pattern scaling to cope with the complexities and uncertainties of possible intensification of tropical cyclones in a manageable way.

Climate change studies typically assess a wide range of greenhouse-gas-emission scenarios by using a simplified climate model and pattern scaling that is based on ensemble projections with complex climate models for a few representative scenarios. The simplified model uses the global mean surface temperature as a key predictor variable, and the pattern scaling specifies the spatial distributions of different climate variables with prescribed spatial patterns that are assumed to not depend much on specific scenarios and time points. The combination of a simplified model and pattern scaling provides an effective tool to deal with many possible emissions pathways reflecting social uncertainties, as well as dealing with the disparities among state-of-the-art complex climate models related to their insufficient understanding of small-scale physical phenomena. Although mean temperature and precipitation are typical variables specified by pattern scaling, this study extends the range of application to extreme winds and precipitation caused by tropical cyclones on the basis of theoretical models.

This talk will briefly describe the methodology and results from a case study in the western North Pacific, and discuss its applications and limitations. Also, this talk will discuss implications for resilience to climate stress in the context of the realization of smart cities, considering the current climate conditions and future projections.