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Sustainable Development and Survivable Societies

Interdisciplinary Seminar (1 session course)

[#41-(1)]

Regional Climate Downscaling over Southeast Asia: Understanding and projecting climate extremes

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<Summary>

Extreme weather and climate events have been identified as drivers of impacts for a number of key risks from climate change across Asia including the Southeast Asia (SEA) region. Given the high exposure and vulnerability of the region to extreme events, it is vital for countries in SEA to implement adaptation measures to lower their risk. Detailed information of future scenarios of weather and climate extremes is needed for appropriate adaptation measures. However, currently, such information is still lacking in the region or generally based on global climate models (GCMs) that may have large uncertainties in a complex region such as SEA. In this study, simulations over Southeast Asia (15°S-40°N, 80°-145°E) were conducted using the Regional Climate Model version 4.3 (RegCM4.3) under the framework of the Southeast Asia Regional Climate Downscaling/ Coordinated Regional Climate Downscaling Experiment - Southeast Asia (or SEACLID/CORDEX-SEA) project. Forced by the European Centre for Medium-Range Weather Forecasts (ECMWF) Interim Reanalysis (ERA-Interim), 18 experiments were carried out using different combinations of cumulus parameterization and ocean flux schemes. Twelve extreme indices for both rainfall and temperature were estimated from the model output. A statistical omega index was used to measure the degree of similarity among the 18 experiments in phase and shape. The results showed relatively high

similarities among the experiments over mainland Asia compared to those over the Maritime Continent for both seasonal and inter-annual variability. The extreme rainfall indices had a lower omega compared to that of temperature. Observed daily rainfall and temperature data at 52 meteorological stations over the SEA region were used to validate the simulated extreme indices. The results showed that extreme temperature indices were generally underestimated across the region. Systematic biases for each simulated rainfall index were also identified. A score ranking system was established to compare the relative performance of the 18 experiments over the 52 selected stations objectively. The study focuses on how simulation of present-day extremes is influenced by the choices of various physical parameterizations in order to determine which schemes are well suited to simulate the climate extremes over the region.

Related References:

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2. Juneng, L., F. Tangang, J. X. Chung, S. T. Ngai, T. W. The, G. Narisma, F. Cruz, T. Phan-Van, **T. Ngo-Duc**, J. Santisirisomboon, P. Singhruck, D. Gunawan, E. Aldrian, 2016: Sensitivity of the Southeast Asia Rainfall Simulations to Cumulus and Ocean Flux Parameterization in Reg CM 4. Climate Research, 69, 59-77. doi:10.3354/cr01386.
3. Cruz, F. T., G. T. Narisma, J. B. Dado, P. Singhruck, U. A. Linarka, T. Wati, F. Tangang, L. Juneng, T. Phan-Van, **T. Ngo-Duc**, J. Santisirisomboon, D. Gunawan, E. Aldrian, 2016: Sensitivity of Temperature to Physical Parameterization Schemes of Reg CM 4 over the CORDEX-Southeast Asia Region, under revision.