Projected Future Mean Precipitation in Southeast Asia Depicted by An Ensemble of Downscaled CMIP5 GCMs from SEACLID/CORDEX Southeast Asia

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Changes in future climate is on an inevitable course, and changes in precipitation will be impacting the water resource and ecosystem directly. This can be detrimental to Southeast Asia, should the impact of such changes is not well mitigated and adapted. While current General Circulation Models (GCM) provide useful information on future climate changes, its resolution is often insufficient for the needs of regional climate change impact, adaptation and vulnerability assessment (IAV). To fulfil such needs, dynamically downscaling information from GCMs for a certain region of interest using a Regional Climate Models (RCM) is widely being implemented. Aiming to provide Southeast Asia (SEA) region with the latest regional-scale climate change information for free, SEACLID/CORDEX SEA with the collaboration from various countries downscaled multiple CMIP5 GCMs with various RCMs over the SEA region. Thus, this study aimed to 1) assess the performance of these downscaled products in simulating present day precipitation and 2) create an ensemble to 3) provide an analysis on future precipitation changes in SEA. For these purposes, a total of 9 sets of simulations downscaled using 3 different RCMs from 8 GCMs conducted by SEACLID/CORDEX SEA were used. The 3 RCMs used were RegCM4, RCA4 and WRF, while the 8 GCMs downscaled were CNRM-CM5, CSIRO-Mk3.6.0, EC-EARTH, MPI-ESM-MR, GFDL-ESM2M, IPSL-CM5A-LR, HadGEM2-ES and HadGEM2-AO. These simulations are complete transient runs with two future climate change scenarios, the Representative Concentration Pathways (RCP) 4.5 and 8.5, spanning from before 1970s to 2100. The downscaled simulations cover the Southeast Asia region, with grid spacing of 25km × 25 km. Comparison with the reference data for the present-day period (1986 – 2005), most of the simulations conducted by SEACLID/CORDEX SEA were able to reproduce the present day seasonal precipitation and circulation at 850hPa climatology, as well as the precipitation annual cycle reasonable well, except for IPSL-CM5A-LR downscaled using RegCM4. Thus, an ensemble was constructed from the remaining 8 simulations of SEACLID/CORDEX SEA for further assessment on the projected future precipitation in SEA. Result shows that generally fewer precipitation is expected for the future over the maritime continent. For the region over the SEA mainland, more precipitation is expected for the Boreal winter monsoon season, while less precipitation is expected over a large area for the Boreal summer monsoon season. Such changes in precipitation can be related to the weakening of the strength of monsoonal wind as well as the weakening of Hadley circulation over the SEA region.

Keywords: Climate change, precipitation, CORDEX SEA, Southeast Asia