Predictions of long-term climate variations and of their impacts on the water resources in the eastern seaboard of Thailand

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Abstract:

The water resources in the eastern seaboard of Thailand are crucial for both industry and agriculture. The availability of sufficient water supply in the area is then an indispensable prerequisite for the further economic development of this region and, being a major industrial zone of Thailand, for the country as a whole. However, this region has been suffering from severe droughts and water shortages in recent years which, in some instances, have hampered the industrial production significantly. Whether these extreme events are a sign of recent climate change affecting southeast Asia, in general, or form just some intermittent outliers within the variability range of the earth's climate system, is still a matter of debate.

Using a long-term climate prediction methodology which is based on the downscaling of climate predictions from several single- and multi-domain GCMs, using the two well-known downscaling methods SDSM and LARS-WG and a newly developed MLR-downscaling technique that allows the incorporation of a multitude of monthly or daily climate predictors from one- or several (multi-domain) parent GCMs, the recent past 20th- century (1971-2000) and the long-term monthly 21st -century climate in the region has been predicted. In addition a new stochastic daily climate generator is developed to rescale monthly observed or predicted climate series to daily series, while adhering to the statistical and geospatial distributional attributes of observed (past) daily climate series in the calibration phase.

Employing this daily climate generator, realizations of future daily climate series from downscaled monthly GCM-climate predictor sets are produced and used as input in the SWAT- distributed watershed model, to simulate future streamflow and other hydrological water budget components in the study region in a multi-realization manner.

The results of the long-term 21th – century downscaled climate predictions provide evidence that, compared with the past 20th - reference period, the future climate in the study area will be more extreme, particularly, for SRES A1B. Thus, the temperatures will be higher and exhibit larger fluctuations. Although the future intensity of the rainfall is nearly constant, its spatial distribution across the region is partially changing. There is further evidence that the sequential rainfall occurrence will be decreased, so that short periods of highs intensities will be followed by longer dry spells. This change in the sequential rainfall pattern will also lead to seasonal reductions of the streamflow and seasonal changes (decreases) of the water storage in the reservoirs. These predicted future climate changes with their hydrological impacts should encourage water planner and policy makers to develop adaptation strategies to properly handle the future water supply in this area, following the guidelines suggested in this study

Keywords: Climate change predictions, downscaling, water resources, eastern seaboard, Thailand

Theme: Climate change and its impacts

Sub-theme: