

Prediction skill of WRF-ROMS in ensemble forecasting with different microphysics parametrizations: A sensitivity analysis of rainfall prediction in Thailand related to tropical storm events in 2020

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Tropical storm (TS) usually brings heavy rainfall in Thailand, especially during rainy season, which can cause significant damage to coastal areas, cities, and communities in the region. Improving rainfall forecasting during TS occurrence is, therefore, critical to reducing the negative impacts of TS and increasing community safety. Many studies indicated that rainfall prediction skill of a numerical weather prediction model was strongly dependent on cumulus (CU) and microphysics (MP) parameterizations. Because microphysical processes play a crucial role in formation and development of rainfall, accurately representing these processes is important for accurate weather forecasting. In this study, a sensitivity analysis of rainfall forecasts from an ensemble method using a coupled WRF-ROMS model with three different MPs (i.e., Eta, Lin, and WRF Single Moment 3) was conducted. Here, we focused on the impact of MP on rainfall forecasts, hence only a CU scheme was used. Seven extreme rainfall events in Thailand associated with TS in 2020 were selected for a three-day model integration, then the probability of detection (POD) was estimated by comparing the forecasted outputs with daily observations of the National Hydroinformatics Data Center. Overall, employing the ensemble method could yield better POD in capturing moderate (10.1–35.0 mm) and heavy (35.1–90.0 mm) rainfall by up to 8% and 15% (in relative to a single MP run). This work is a preliminary study to show the potential of an ensemble method on rainfall forecast in Thailand. However, the CU selected in WRF can have a significant impact on accuracy and realism of the weather forecast. Therefore, careful consideration of CU and MP combination is subject to further investigation to ensure that the model provides the best possible representation of atmospheric processes and similar rainfall pattern over Thailand.