Prediction skill of WRF cycling 3DVAR on summer extreme rainfall events in Thailand: A case study in Chi and Mun basins during a tropical storm event

Thippawan Thodsan+, Kritanai Torsri*, Rati Sawangwattanaphaibun, Thakolpat Khampuengson
Pattarapoom Peangta, Apiwat Faikrua, Kanoksri Sarinnapakorn

Hydro Informatics Innovation Division, Hydro-Informatics Institute (HII), Ministry of Higher Education, Science, Research and Innovation, Bangkok, Thailand

* *Corresponding author*: kritanai@hii.or.th, +Presenter, thippawan@hii.or.th

Initial conditions are factors that affect short-term weather forecast, which is useful for planning daily activities and making short-term decisions. Fundamentally, blending observations from various sources with a numerical weather model can produce a more accurate depiction of the initial atmospheric state, which could allow a more accurate forecast to be generated. This study was conducted to quantify the impacts of data assimilation on heavy rainfall prediction in Thailand using a three-dimension variation of the WRFDA-3DVAR. In this case, 24-hr model integration was employed with the finest horizontal resolution of 3-km grid spacing for two heavy rainfall events occurring in Chi and Mun basins, which were regularly affected by tropical cyclones during summer season. Three assimilation experiments with different data sources were conducted consisting of (1) Global Weather Surface (GWS), (2) Automatic Weather Data (AWD) from the National Hydroinformatics Data Center (NHC), Thailand, and (3) the combination of GWS and AWD. As a basis of comparison, 3-hr accumulated rainfall forecasts were computed considering three different types of rainfall intensity (i.e., 1 mm, 5 mm, and 10 mm) and compared with in-situ observations. Overall, the model yielded higher skill in predicting the 3-hr accumulated rain intensity in all categories compared to without data assimilation. Obviously, the better improvement of the model was seen for the accumulated rainfall of the 5-mm category over 15 hours lead time with the highest fraction skill score of about 0.65 when both GWS and AWD were integrated into the model. The study suggested a potential of implementing the WRF cycling 3DVAR and the use of the NHC's AWD combined with GWS to reduce errors in the initial conditions used by the model, which can improve the accuracy of the short-term weather forecast in Thailand, particularly during the high-impact weather situations.

AOGS2023 20th Annual Meeting
Asia Oceania Geosciences Society
SINGAPORE | 30 Jul to 04 Aug 2023