The new processing for rainfall of landfalling TCs under the UPDRAFT WWRP/WMO project

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The western North Pacific and East Asian regions are affected the most by tropical cyclones (TCs) in the world. TCs bring severe damage along their tracks, in particular, when they make landfall. Heavy rainfall accompanying landfalling TCs is of particular importance to both research and operational communities due to its severity of impact and its intrinsic uncertainty and limited predictability. With the fast growth of population and infrastructure along the coastal region around Pacific Ocean, it is an urgent need to accurately predict rainfall intensity and distribution from landfalling TCs.

Little progress has been made in improving TC intensity forecast in the past three decades. It is generally believed that TC intensity change involves small-scale dynamical and physical processes in the TC circulation and also multi-scale interactions. The advancements in skillfully predicting rainfall associated with landfalling TCs by numerical weather prediction (NWP) models have been very slow despite the continuous improvements in numerical models, observing systems, and data assimilation techniques. This is largely due to the lack of deep understanding of the physical processes that govern TC rainfall and their representation in NWP models.

According to the societal need and common interests by research and operational communities in improving the forecast of rainfall associated with landfalling TCs, the WMO/WWRP UPDRAFT was established to advance the understanding and prediction of rainfall associated with landfalling TCs. This project will evaluate the forecast skill of state-of-the-art research and operational NWP models in forecasting rainfall associated with landfalling TCs. The data from specially designed field campaign will be used in understanding the key dynamic and physic processes associated with rainfall in landfalling TCs. In the first two years of operation, we have successfully captured a triple-eyewall TC using detailed radar operation. The study revealed the tangential wind maximum, second tangential wind maximum and two moat regions which provide valuable observation evidence for triple-eyewall research.