

## **TC Precipitation in Typhoon Fanapi (2010): Coupled Modeling and ITOP Observations**

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Extreme precipitation and flooding associated with tropical cyclones (TCs) is a major cause for lost of lives and property damage at landfall worldwide. Quantitative precipitation forecast in TCs is still a challenge, especially at long lead times beyond 2-3 days. Typhoon Fanapi (2010) was one of the best-observed tropical cyclones (TCs) over the western Pacific during the Impact of Typhoon on Ocean in Pacific (ITOP) field campaign. It made landfall in Taiwan on 19 September 2010. Observations of TRMM rainfall and in-situ air-sea enthalpy fluxes derived using dropsondes and AXBTs are used in this study to identify and quantify model biases in precipitation and air-sea fluxes. It is found that uncoupled atmospheric model with unrealistically warm SST produces excessive surface latent and sensible heat fluxes lead to a vicious cycle: Excessive heat and moisture fluxes resulted stronger convection and precipitation (>145% cumulative rain compared with TRMM data), large evaporative cooling and stronger surface winds, and event larger air-sea heat and moisture fluxes. Coupled atmosphere-wave-ocean can correct a significant part (reduced model bias by more than 50%) of the model biases in air-sea fluxes and rainfall, which is a good starting point to break up the vicious cycle. This systematic observational and modeling study is conducted to better understand the physical processes controlling air-sea interaction and their impact on TC prediction. This talk will provide 1) a brief overview of progress and challenges in TC precipitation forecast, 2) model biases in rainfall and air-sea fluxes identified using the satellite, airborne, and in situ observations in Typhoon Fanapi, and 3) discussions on need for new tools and ways forward.