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Plain Language Summary: Taiwan topography is considered a critical factor affecting the track, intensity, and rainfall for the landfalling tropical cyclone (TC), but the uncertainty of its impact in the simulations has not been thoroughly explored in the literature. Using an ensemble Kalman filter–based vortex initialization method, this paper evaluates the impact of Central Mountain Range (CMR) on the uncertainty in forecasting track, intensity, and rainfall of Typhoon Fanapi (2010) and explores the sources of the uncertainty in the simulation.

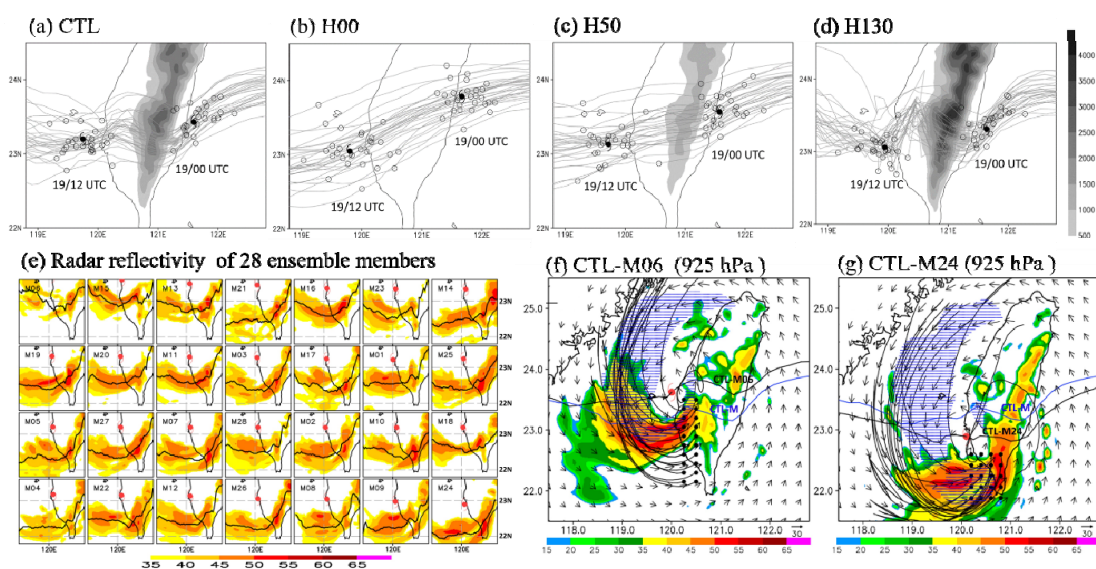


Figure 1. The ensemble tracks of Fanapi in the experiment of (a) CTL, (b) H00, (c) H50, and (d) H130. The TC centers of each ensemble member (open circles) and ensemble mean (TC marks) are plotted. Terrain heights (m) are shaded by gray. (e) The simulated maximum radar reflectivity (dBZ; shaded) and the axis of the TC rainband (black lines) as the storm center departs from Taiwan. Twenty 6-h backward air parcel trajectories are overlaid on the simulated wind (m s^{-1} ; wind vector) and maximum radar reflectivity (dBZ; shaded) for ensemble members of (f) CTL-M06 and (g) CTL-M24.

- The ensemble members with faster translation speed are influenced earlier by terrain and show an earlier southward track deflection and the weakening of intensity, resulting in a significant increase of uncertainty in track and intensity, especially in the experiments with higher terrain.
- The rainfall uncertainty in southern Taiwan is dominated by the uncertainty of the simulated TC rainband, and the latitude of the TC track can be regarded as a good predictor of the rainband's location at departure time.
- The presence of Taiwan topography does not only change the characteristics of the simulated rainfall, but it also induces the asymmetric flow, which increases the variability in the location of the TC rainband and further affects rainfall uncertainty.