A Dynamical Initialization Scheme for Tropical Cyclones under the Influence of Terrain

Hao-Yan Liu¹, Yuqing Wang¹, Jing Xu¹, and Yihong Duan¹

¹State Key Laboratory of Severe Weather, Chinese Academy of Meteorological Sciences, China Meteorological Administration, Beijing, China
²International Pacific Research Center and Department of Atmospheric Sciences, School of Ocean and Earth Science and Technology, University of Hawaii at Manoa, Honolulu, Hawaii

E-mail: yuqing@hawaii.edu

Method

- SINT1: DX > 450 km, the same as general DI scheme (white);
- SINT2: 150 km < DX < 450 km & H < 1 km, remove topo-variable before vortex separation (light gray);
- SINT3: DX <150 km, or 150 km < DX < 300 km & H > 1 km, semi-idealized integration without the terrain is used to deepen the vortex (dark gray).

DX is the distance between the TC center and the terrain, H is the maximum height of the terrain.

Result

Initial condition (SLP & surface wind)

- (a) CTRL (SINT2)
- (b) DI (SINT2)
- (c) CTRL (SINT3)
- (d) DI (SINT3)

Forecast track and intensity

- CTRL
- DI

Rainbands Structure

- Obs
- CTRL
- DI

Errors of Track and intensity

- (a) and (b) for total cases
- (c) and (d) for SINT1 cases
- (e) and (f) for SINT2 cases
- (g) and (h) for SINT3 cases

Temporal evolution of absolute position (a, c, e, g) and intensity (b, d, f, h) errors for 9 TCs affected by terrains over the western North Pacific in 2015 in the hindcasts from CTRL (red dashed) and DI runs (black solid), and official forecasts from CMA (blue dashed) and JTWC (green dashed), as well as from HWRF model (yellow dashed): (a) and (b) for total cases, (c) and (d) for SINT1 cases, (e) and (f) for SINT2 cases, and (g) and (h) for SINT3 cases.