Impact of the Local Spectral Width of GPS RO Bending Angles from COSMIC on Typhoon Track Forecast

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Introduction

- Global Positioning System (GPS) radio occultation (RO) data are beneficial for numerical weather prediction (NWP) due to the advantage of high vertical resolution, global coverage, all-weather sensing.
- The width of the local spectrum (LSW) of wave optics (WO) transformed signal represents the uncertainty of bending angles retrieved by WO and can be utilized to improve the assimilation of GPS RO data.

Quality Control by LSW

- Replace the QC conditions in WRFDA by rejecting those RO data with LSW/2 lower than 35% at height below 3 km.

Dynamical Obs. Error by LSW

- Good correlation between observation error and LSW.
- Use linear regression formulas at height below 6 km.

Model

Typhoon WRF (TWRF) Model

- Designed for typhoon forecast in the neighborhood of Taiwan (Hsiao et al. 2012)
- Fixed domain with $\Delta x = \Delta y = 45$ km, 45 vertical levels with model top at 30 hPa
- Using WRF-3DVAR and two 6-h update cycles (partial cycling) and then 72-h forecast
- GPS RO operator: local refractivity

Experimental Design

- I.C. & B.C.: NCEP GI.S / 0.5° × 0.5° analysis
- Observation: GTS; COSMIC GPS RO data (wetPrf)
- Periods: Typhoon Sinlaku, Hagupit, Jangmi (09.08 18Z - 09.28 00Z) in 2008

Local Spectral Width

- The LSW is large in the lower troposphere.
- It causes larger retrieval uncertainty and larger biases against global analyses.

Results

- Mean track error difference from CONTROL run

Examples

Reference