# Role of EMC-CPC in OSSE to design Future Observing System

Michiko Masutani

## Full OSSE

- Full OSSE requires simulation of all observational data
- A Full OSSE can provide detailed quantitative evaluations of the configuration of observing systems.
- No special data assimilation system for OSSE is required for Full OSSE
- A Full OSSE can use an existing operational system including diagnostic tools and utilities. OSSE can also help the development of an operational system

**Full OSSE can be conducted most effectively with partnership with the operational forecasting Centre.**

## Recent OSSE at JCSDA

- Wind data from Doppler Wind Lidar (DWL) in International Space Station (ISS) orbit
- Conduct OSSE to Evaluate of Infrared sounders on the geostationary Hyper-spectral Environmental Suite (HES) and Microwave sounders
- Global OSSE experiments to assess the impact of additional future Global Navigation Satellite Systems (GNSS) Radio Occultation constellations. COSMIC-2 and beyond.

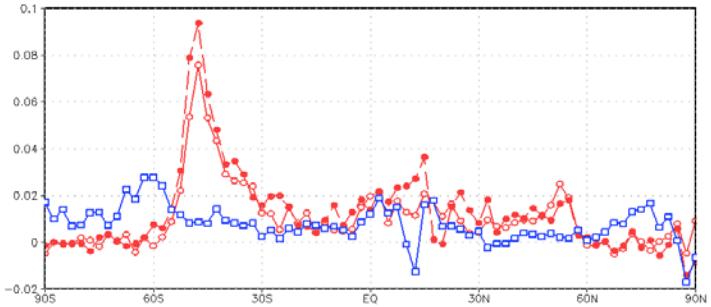
**Strong focus on data over tropic and space based observation. Observation in polar data will be reduced. Ground based observation need attention.**

# Space based Doppler Wind Lidar (DWL) in ISS orbit

Current plan at NASA uses ISS orbit

Need to improve assimilation of DWL on ISS orbit

Impact on V 850 hPa
Using NCEP GSI with 3D var in 2012 T511 NR.




Analysis impact (reduction of RMS Diff from NR, compared to control experiment (existing obs only). Only results from coherent Lidar are presented.
DWL with two looks to produce vector wind measurement.
Red, Solid line,open circle:ISS orbit (WISCR)T126 experiment
Red, Dashed line, closed circle: ISS orbit(WISCR) T254 experiment
Blue, Solid line, open circle: Polar orbit (Two side look subset of GWOS) T126 experiment

Change in NCEP/GDAS system since 2012.
Need reevaluation to justify the mission.

- Increase horizontal resolution of the first segment of the forecast from Eulerian T574 (~27 km) to Semi-Lagrangian T1534 (~13 km)

Stochastic physics in EnKF forecasts

- EnKF hybrid system
  -Allow non isotropic back ground error covariance
- GPS RO bending angle rather than refractivity
- Satellite monitoring stats code included in Ops.

Forecast impact using 2012 NCEP 3D var was positive but very small (less than 1%).

DWL monitoring system and preprocessor o DWL must be ready in time for ADM-Aeolus mission in late 2016.

Seeking for NASA-NOAA funding follow up OSSE for DWL in ISS orbit

# OSSE to improve other Arctic observing system
# Proposal to NCEP/EMC-CPC partnership

DWL on ISS orbit and sounding from Geostational Satellite do not cover polar region. Complementary OSSE to evaluate observation in polar region will be valuable.

- NWP model and data assimilation has improved and are capable of providing reliable forecasts about 8 days in advance. The impact of Arctic weather on the midlatitudes becomes important to extend forecast capability.
- Due to increasing activities in the Arctic region the economic impact of the region has increased and the cost of unreliable forecasts.
- Forecast evaluation of arctic weather is not fully conducted although Alaska is in US territory.

**Possible OSSEs for Arctic region**

- **OSSE to Polar Communication and Weather (PCW) mission**
- **OSSE to evaluate optimize location of profiler observation**
- **OSSE to evaluate AIR craft data and ship observation**
- **Impact of Ice observation to NWP**
- **Conduct global OSSEs and promote regional OSSEs at universities.**

**Diagnostics and forecast verification study for arctic region**

- **Development of verification tool for arctic region.**
- **Evaluation of impact of arctic system to midlatitude weather**
- **Evaluation of OSSE results of GPS RO observations toward COSMIC2 and beyond in arctic region.**

Orbit for PCW