Estimating impact of observations on Typhoon Sinlaku (2008) using the WRF-LETKF system

Masaru Kunii and **Takemasa Miyoshi**
University of Maryland, College Park
kunii@atmos.umd.edu

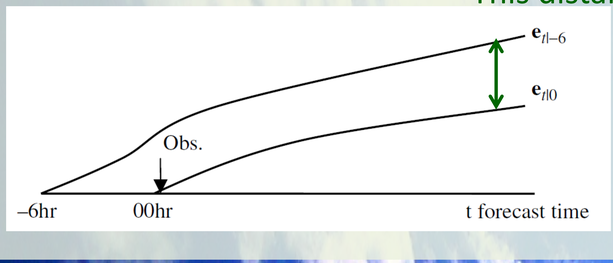
1. Goals:

- Apply the ensemble sensitivity method (Liu and Kalnay 2008) to the WRF-LETKF system (Miyoshi and Kunii 2012).
- Estimate observation impact on TY Sinlaku (2008).

2. Ensemble sensitivity method:

➢ Observation impact is calculated without an adjoint model.

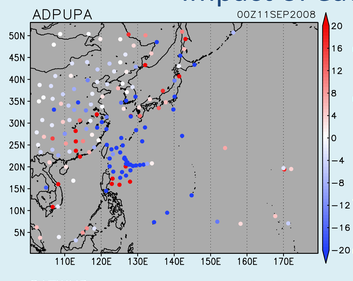
This distance comes from OBS at 00 hr.

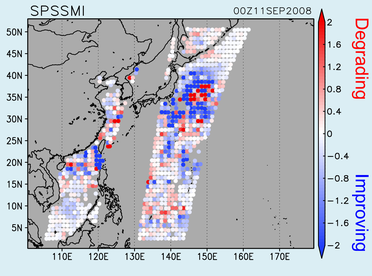


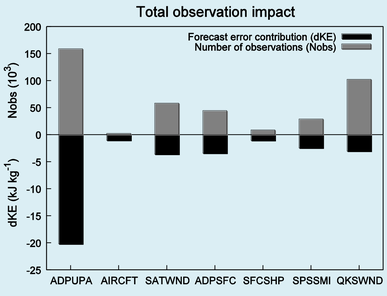
$$J = \frac{1}{2}\left(\mathbf{e}_{t|0}^{\mathrm{T}}\mathbf{e}_{t|0} - \mathbf{e}_{t|-6}^{\mathrm{T}}\mathbf{e}_{t|-6}\right)$$
$$\cong \left[\mathbf{e}_{t|-6} + \frac{1}{2}\mathbf{X}_{t|-6}^{\mathrm{f}}\tilde{\mathbf{K}}_0\mathbf{v}_0\right]^{\mathrm{T}}\mathbf{X}_{t|-6}^{\mathrm{f}}\tilde{\mathbf{K}}_0\mathbf{v}_0$$

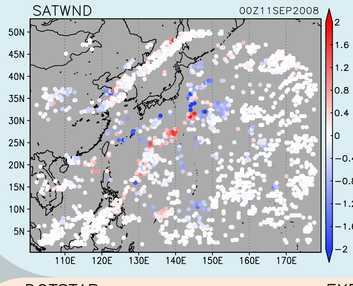
3. Results:

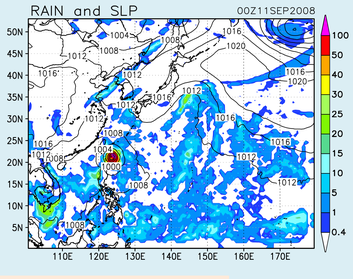
Impact of each observation



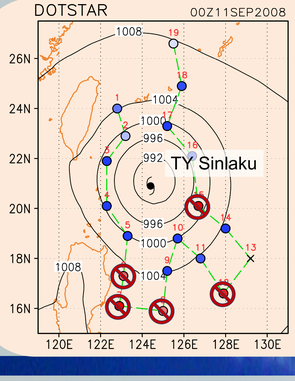


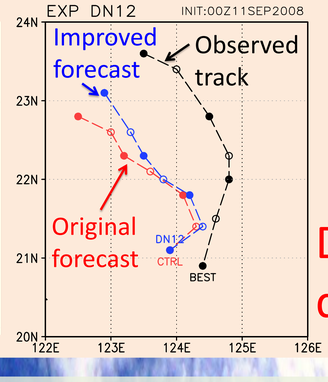






- All types of observations reduce the 12-h forecast error.
- Upper soundings (ADPUPA) have the largest impact.





Denying negative impact dropsondes improves forecast.

4. Conclusion:

- The ensemble sensitivity method provided impact estimates of each observation successfully.
- The estimated impact was verified by the data-denial experiment in the case of Typhoon Sinlaku (2008).