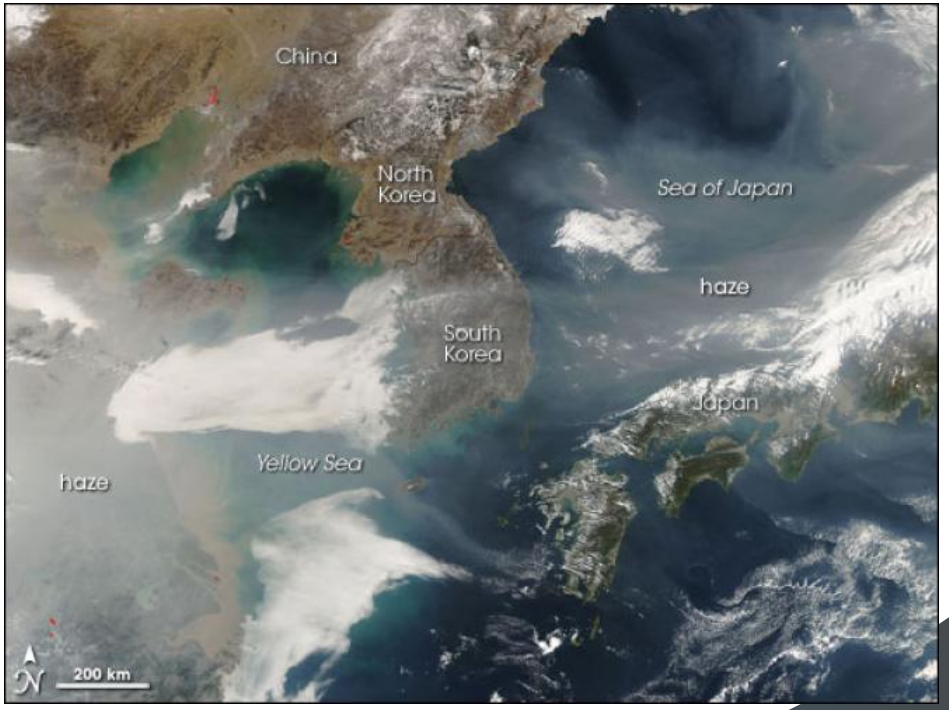
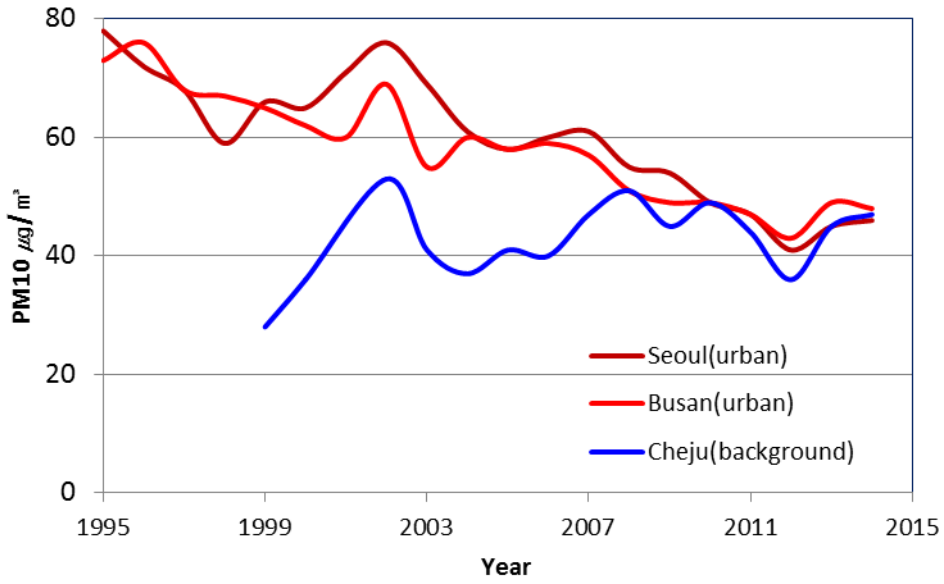
# Short-Term Air Quality Forecasting in Korea utilizing Globemission products




Prepared for Globemission User Workshop
24-25 November 2015, Doha Qatar

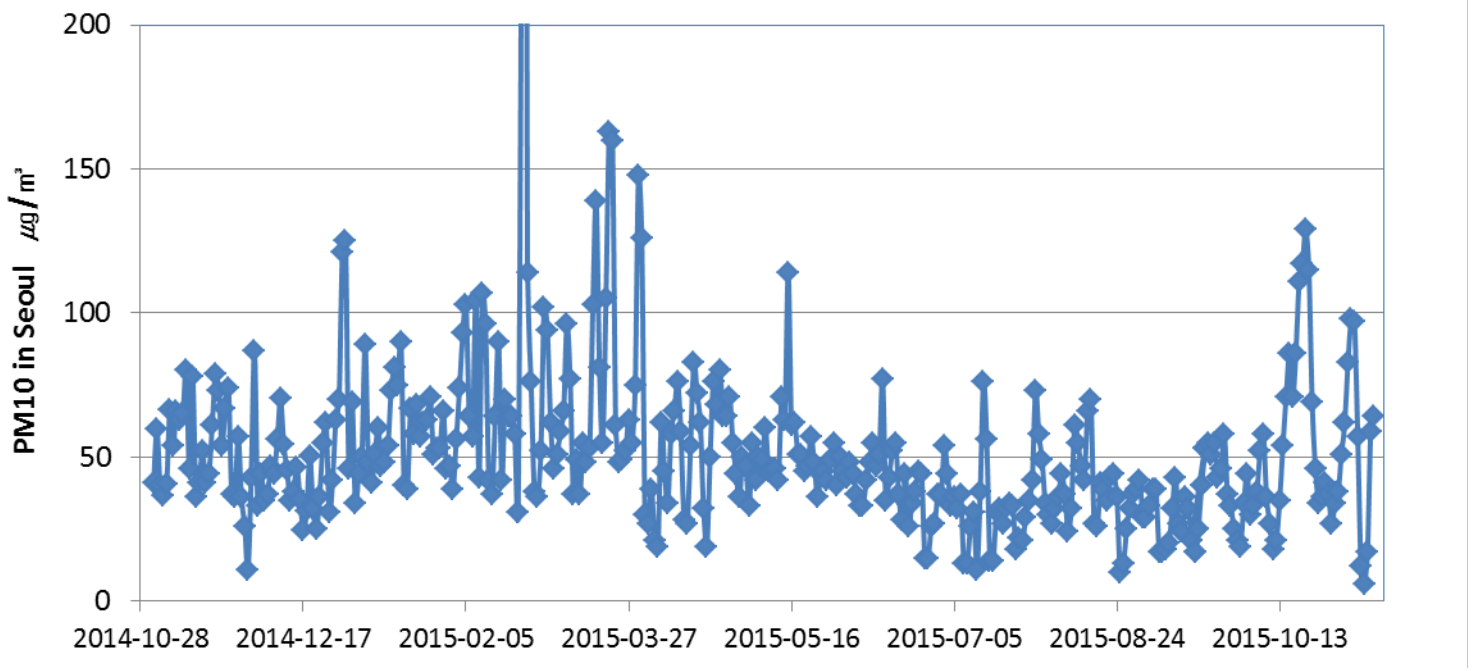
# 1. Backgrounds(1)

- The recent world-wide attention to PM significantly raises public concerns on the PM pollution.
- Mitigation efforts improve PM pollution in 2000's but no further substantial improvement after 2012.




# 1. Backgrounds(2)

**Despite of PM10 concentration improvement, the number exceedance days of PM10 exceeding 100 $\mu g/m^3$ (24 hr average) amounts to 13 days in the year 2015!!**



# 1. Backgrounds(3)

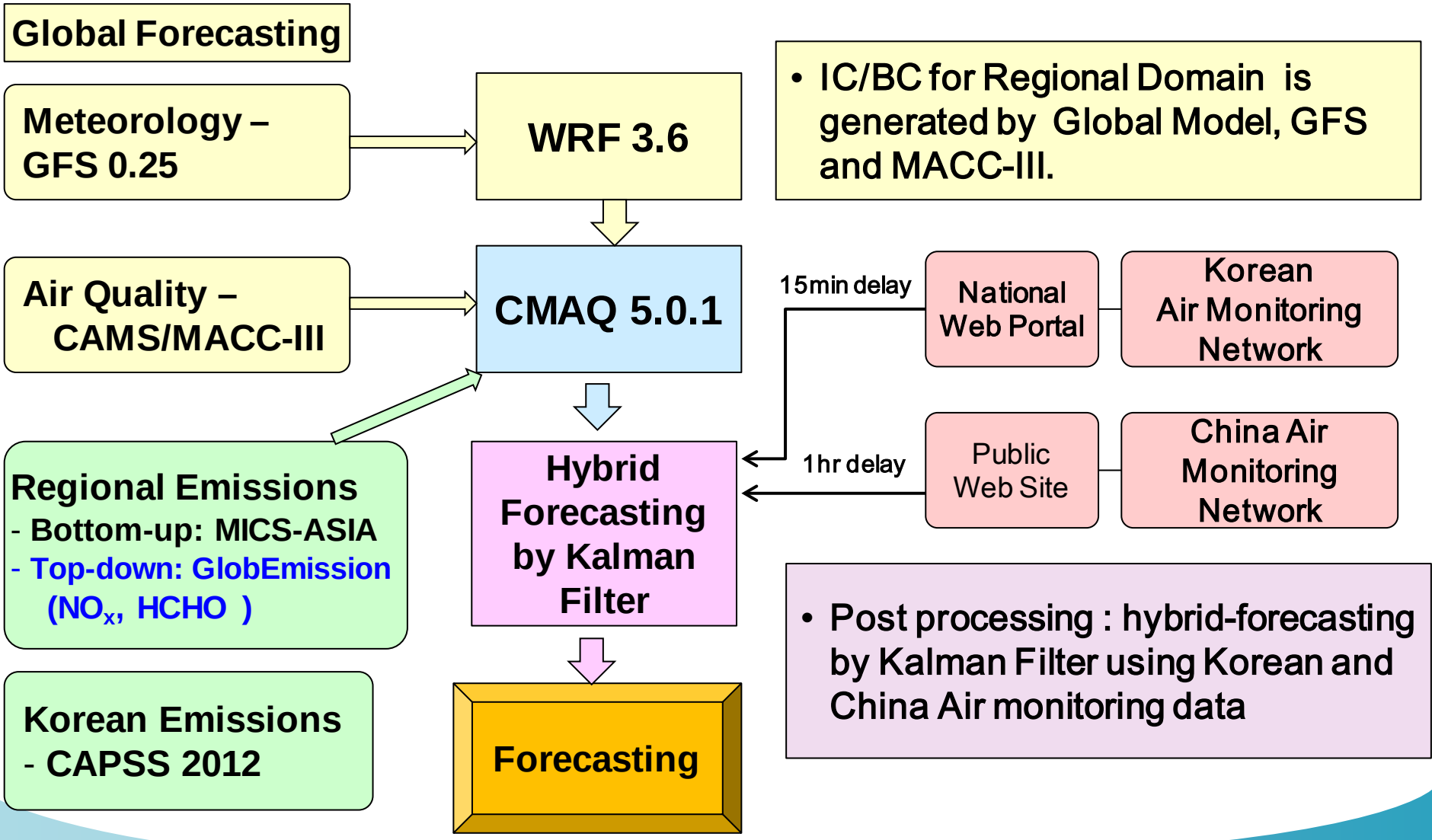
- Further significant improvement requires the reduction of transport of PM10 from China → it will take another 10 years or more.

- The 24 hour PM10 and PM2.5 forecasting has started in 2015 to provide advisories for sensitive groups → It gained a lot of attention from the public and now it is extended to 48 hour forecasting.

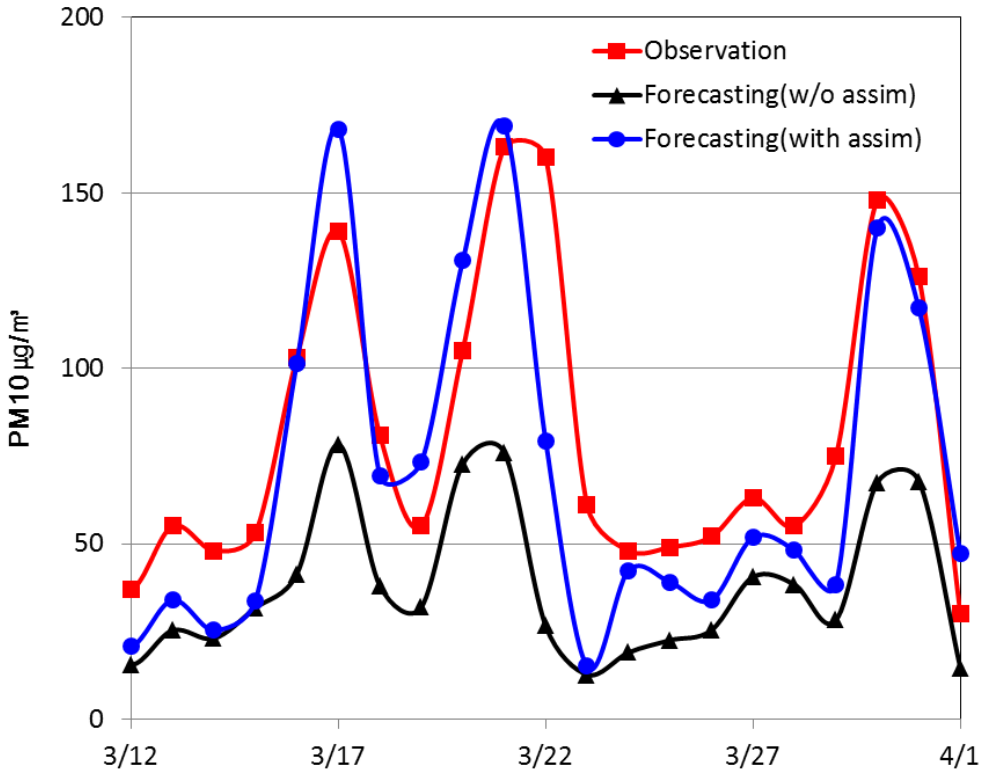
# 2. Korean Air Quality Forecasting System

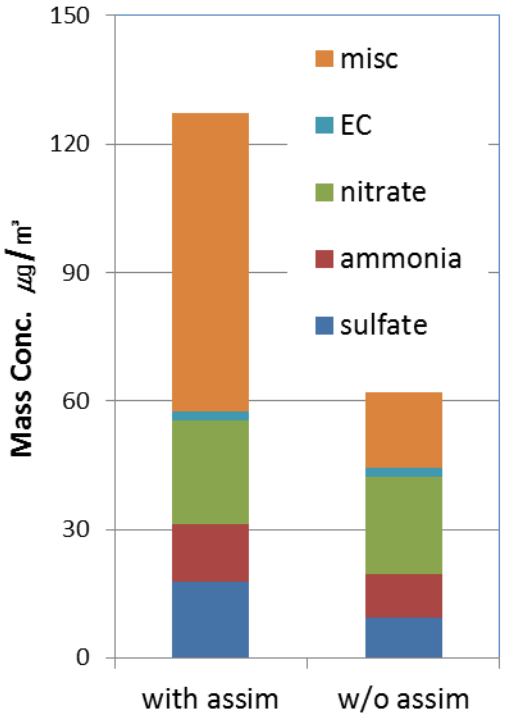
- Korean Air Quality Forecasting Center leads the numerical forecasting and three collaborating institutes submit their own forecasting results to the center to aid the forecasting.
- The collaborating institutes are
  - Anyang University
  - Ajou University
  - Inha University

# 2.1 Inha University Air Quality Forecasting



# 2.2 INHA forecasting results with Data Assimilation

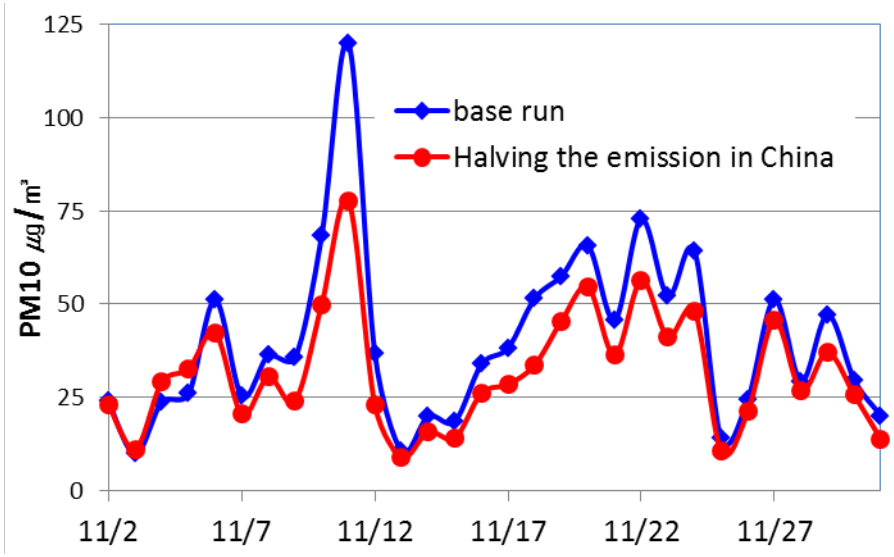


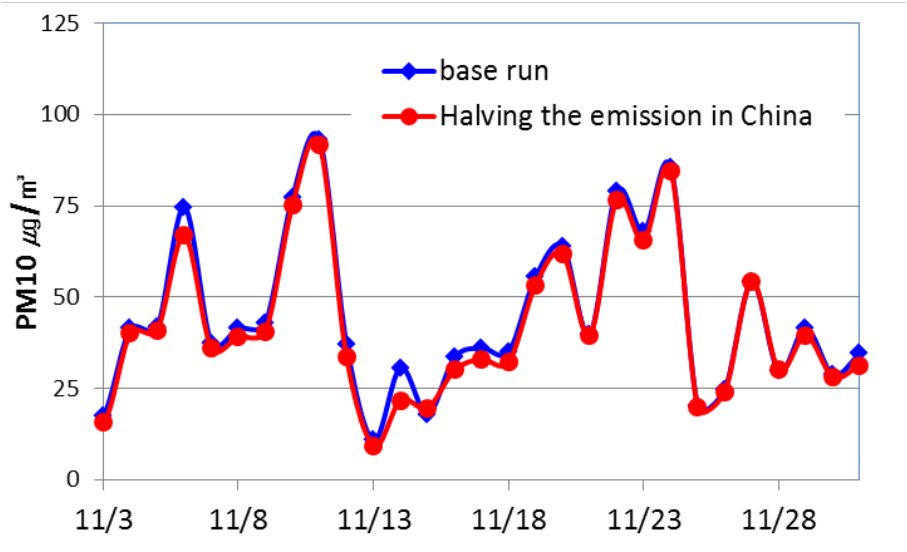




PM composition

# 2.3 Initial condition generation by Data Assimilation

- The initial conditions are reset every 36 hours using Data Assimilation(DA) → refrain the effect of emission uncertainties in the wind region.



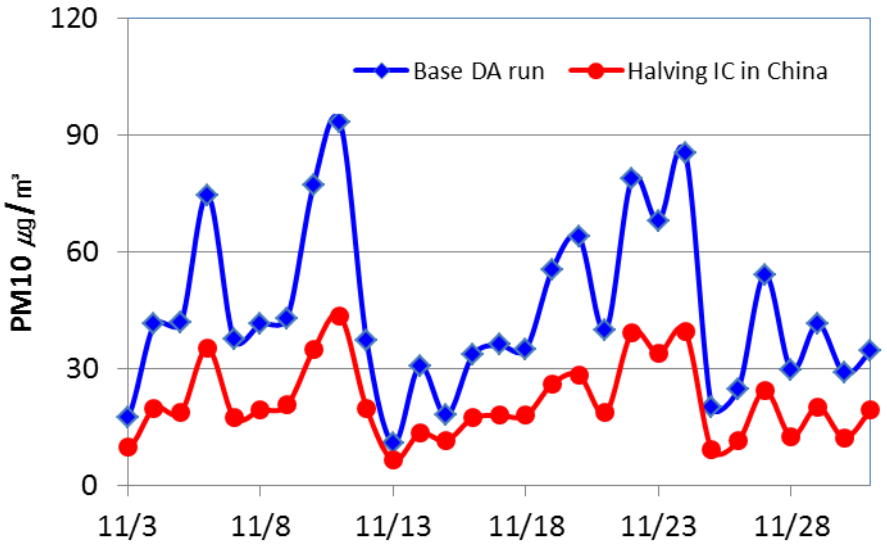



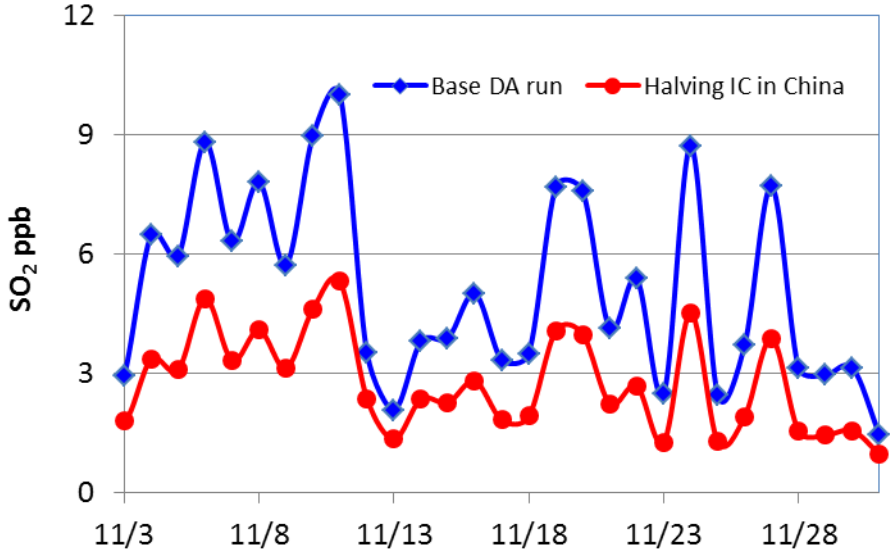

Continuous Run
-without DA IC

Reseting IC every 36 hrs
- with DA IC

# 2.4 Effect of ICs in short term forecasting

- Forecasting is more sensitive to the initial conditions than the emissions in China in short-term forecasting.

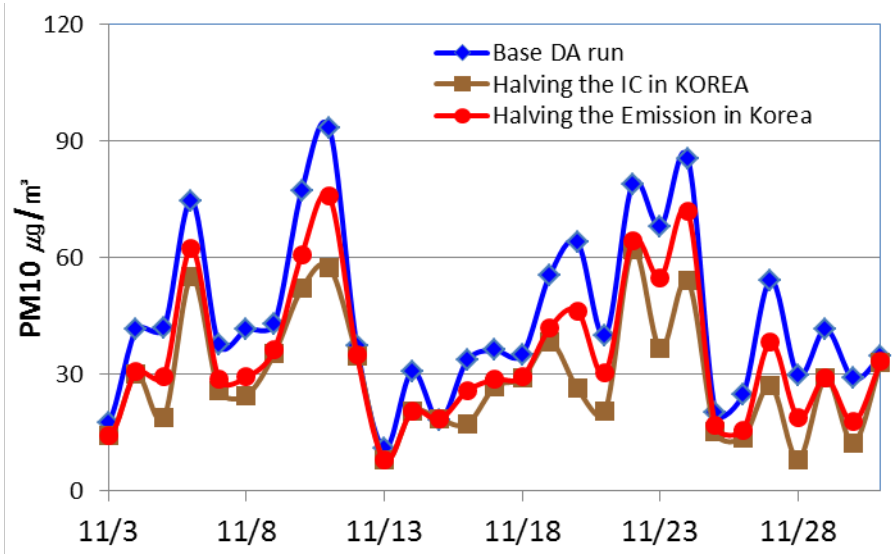


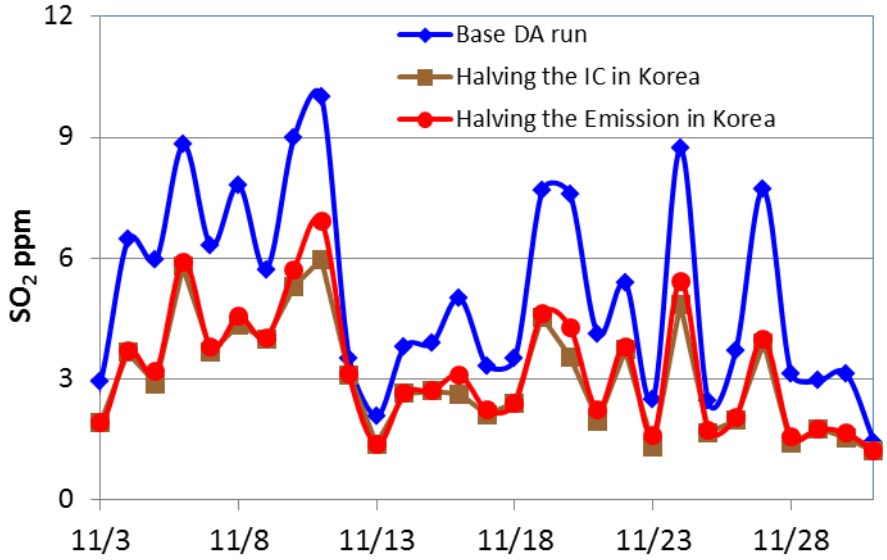




- The influence of initial conditions begin to diminish as the forecasting time increases over 48 hrs.

# 2.5 Effect of Local Emissions and Initial Conditions

- Forecasting is as sensitive to the local emissions conditions as the local initial conditions even in short-term forecasting.



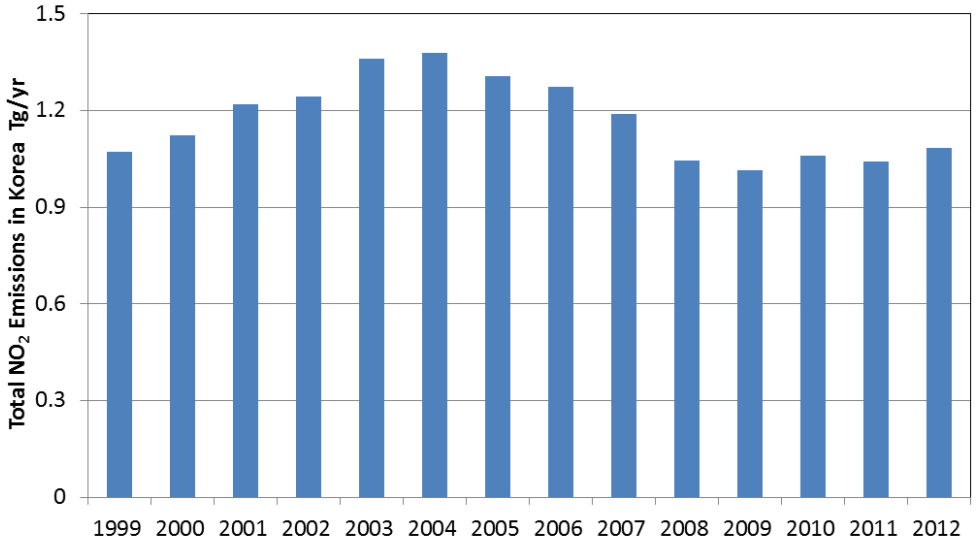




Need an accurate LOCAL(Korean) Emissions

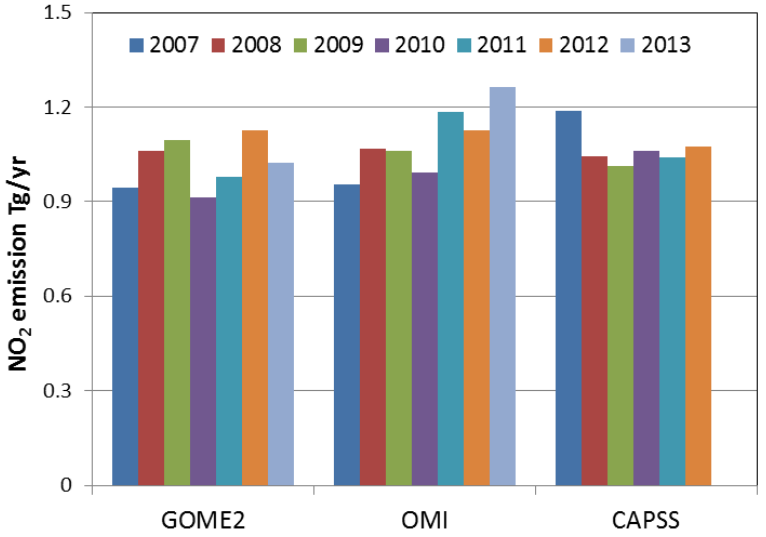
**This is Why WE are interested in Globemission Project.**

# 3. Korean Source Inventories and Globemission

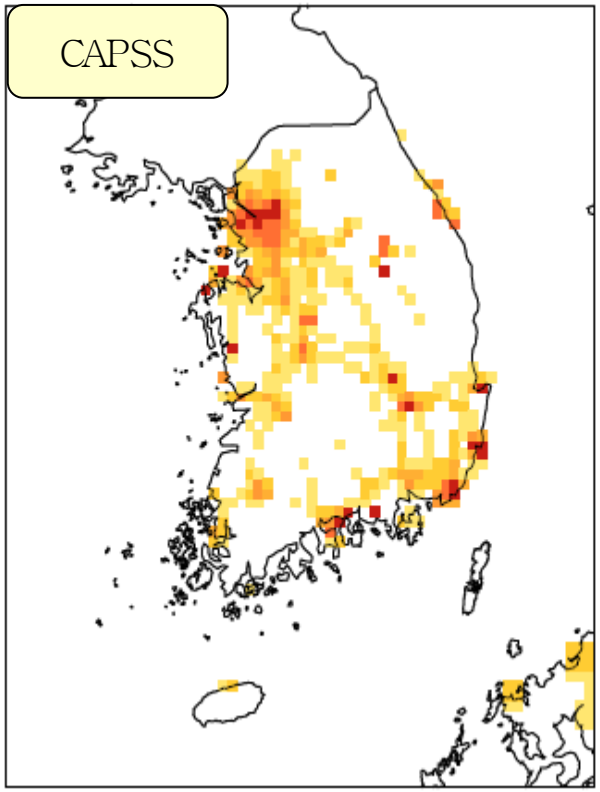
- CAPSS(Korean Source Inventory) annually compiles all the point and non-point sources which includes ship, mobile, air plane, farming, fugitive, emissions.

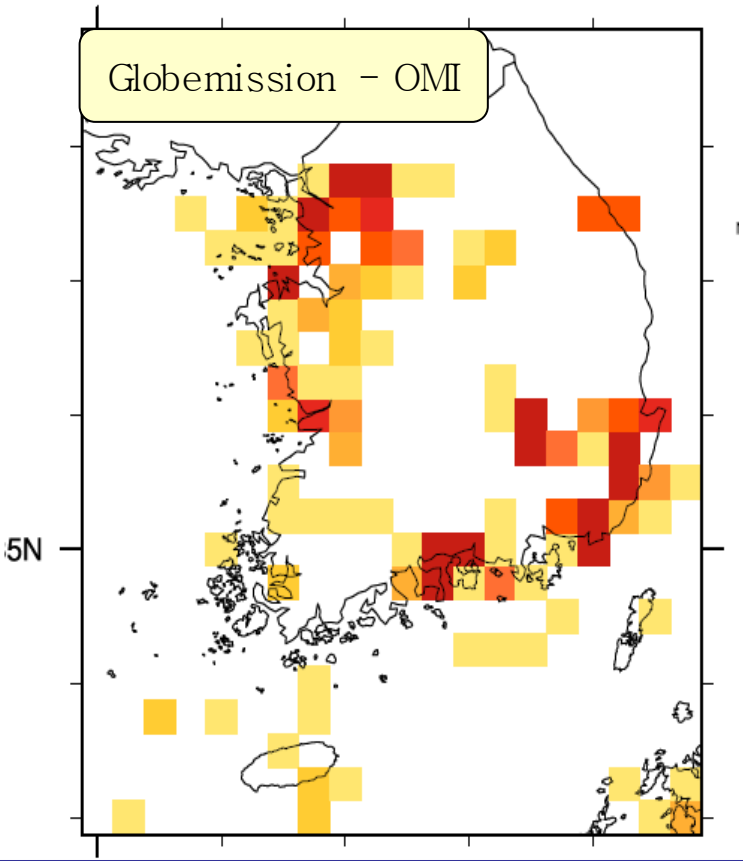



- Total Korean Emission derived by GOME compares better with CAPSS.



# 3.1 Spatial Distribution of Korean $NO_2$ Emissions

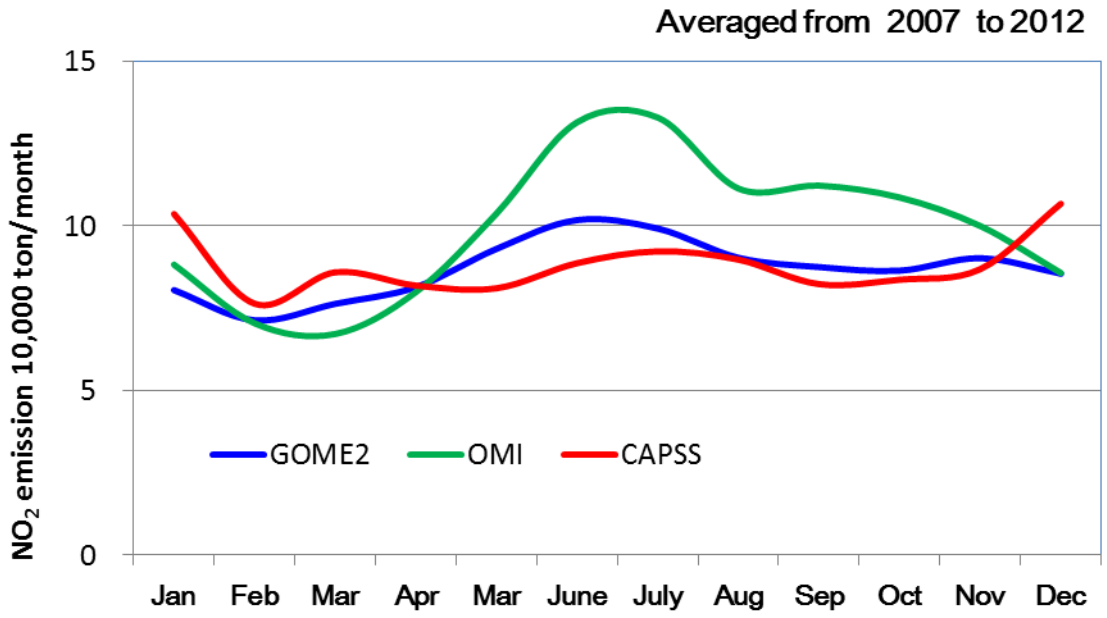



- Globemission overestimates large sources compared to CAPSS.
- The location of large sources identified Globemission may be slightly off from the real location.

# 3.2 Seasonal Distribution of Korean Emissions

- GOME2 compares better with CAPSS(Korean bottom-up emission).
- CAPSS shows a larger $NO_2$ during winter time due to a high activity of combined Combined Heat and Power Plant. → Is it true? Globemission does not show this.



# 4. Conclusions and Recommendation

- The monthly emission of $NO_2$ and HCHO in Korea by Globemssion certainly help Korean Air Quality Forecasting.
- The $NO_2$ emission in the winter time by CAPSS is not shown in Globemission and need a further verification.
- Extension of Globemission to PM emissions would greatly contribute to Air Quality Forecasting.