

Impacts of Hemispheric Transport of Air Pollution on Asia



Meiyun Lin¹, Tracey Holloway¹, Taikan Oki²

¹Center for Sustainability and the Global Environment, Univ. of Wisconsin-Madison, WI, USA

²Institute of Industrial Science, Univ. of Tokyo, Tokyo, Japan

Email: mli26@wisc.edu (Meiyun Lin)

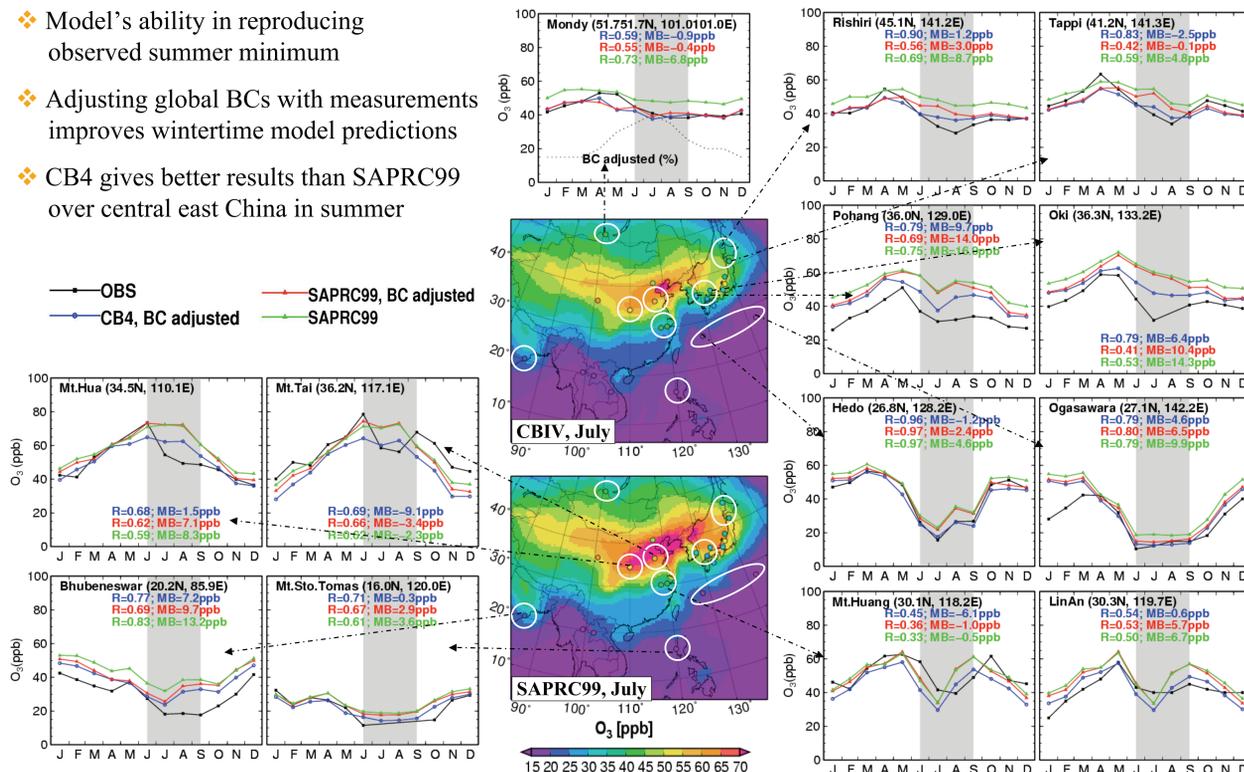


THE NELSON INSTITUTE FOR ENVIRONMENTAL STUDIES
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Abstract: This study employs the CMAQ regional model driven with boundary conditions (BCs) from the MOZART global model to examine impacts of hemispheric transport of air pollution on Asia. CMAQ predictions at 81 km and 27 km horizontal scales are evaluated with recently available ground-based and satellite measurements in East Asia. After evaluating the model, we employ the full-chemistry regional model to calculate source-receptor (S/R) relationships for reactive nitrogen and sulfur deposition in East Asia.

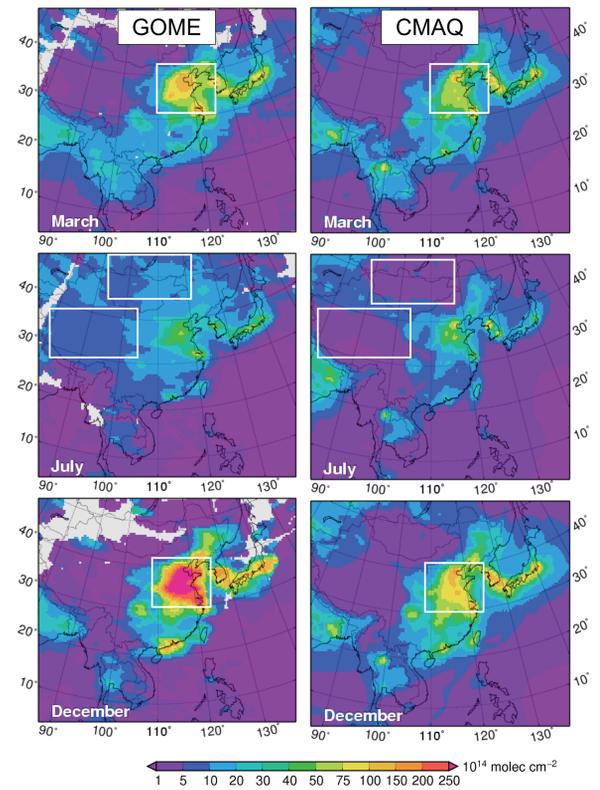
Impacts of global BCs and photochemical mechanism on regional predictions of ozone seasonality in East Asia

- Model's ability in reproducing observed summer minimum
- Adjusting global BCs with measurements improves wintertime model predictions
- CB4 gives better results than SAPRC99 over central east China in summer



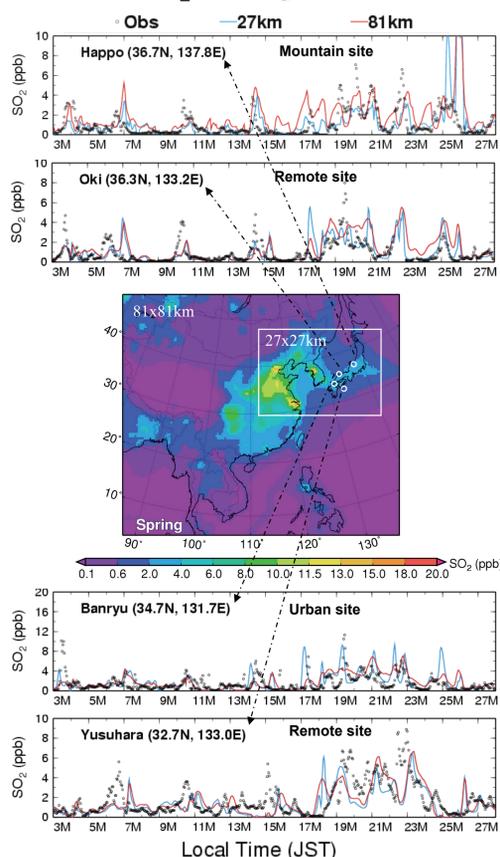
Ozone measurements are obtained from EANET (2002), Carmichael G.R., et al. (2003), Li J., et al. (2007), Kim J., et al. (2006), Pochanart P. et al. (2003), Wang T., et al. (2001).

Satellite measurements of NO₂ vertical column densities from GOME and the calculated values from CMAQ

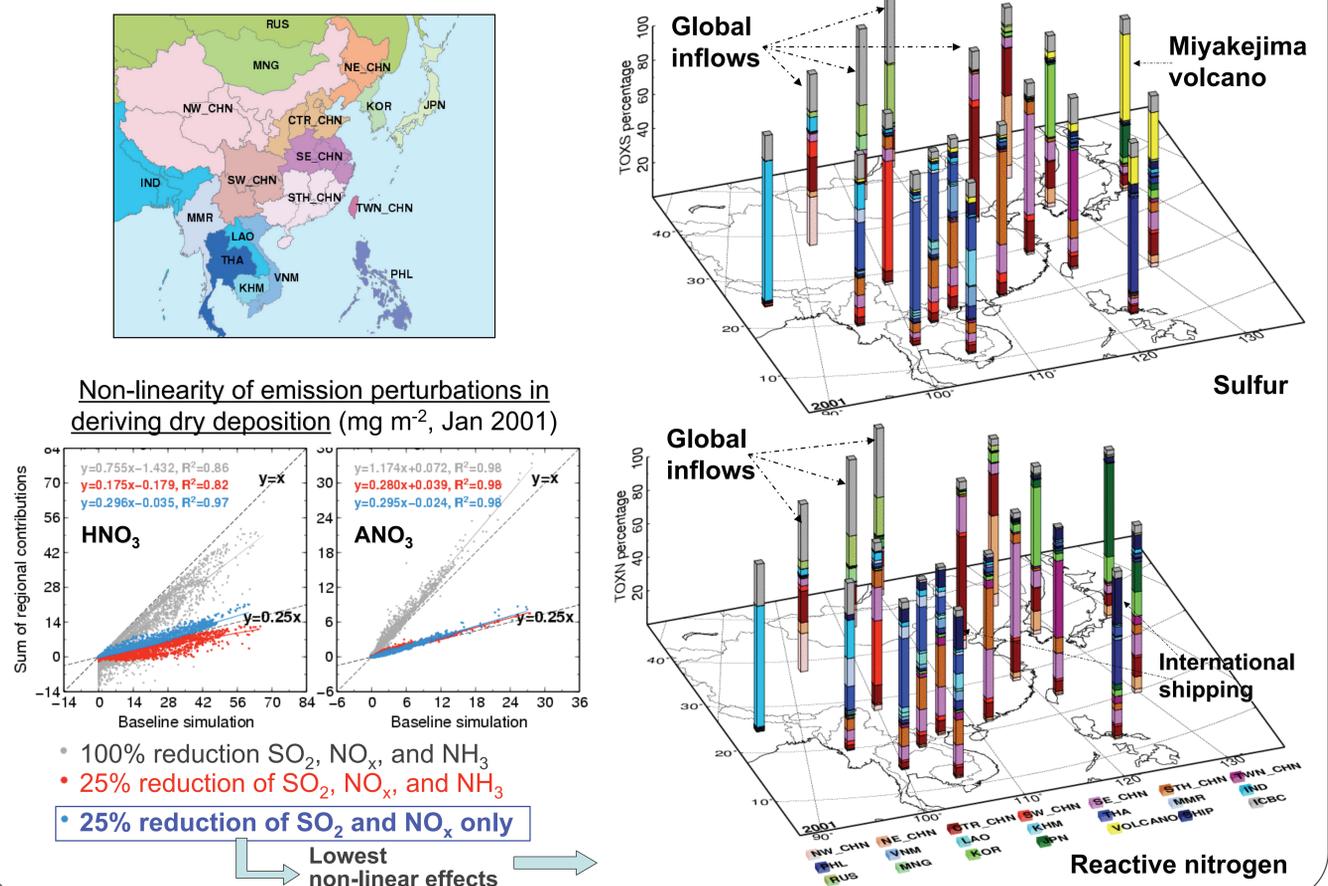


- Uncertainty in March: agriculture soil emissions associated with fertilizer application over CE China
 - Uncertainty in July: biogenic soil emissions associated with rain-induced pulsing on mid-latitude
 - Uncertainties in December: bottom-up emission inventory and GOME retrieval over CE China
- GOME retrieval is from Richter A., et al., 2005.

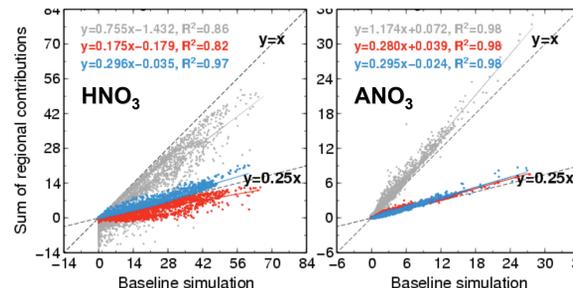
Impacts of model resolution on predicting diurnal variation of SO₂ mixing ratios



Source-receptor Relationships of sulfur and reactive nitrogen deposition in East Asia



Non-linearity of emission perturbations in deriving dry deposition (mg m⁻², Jan 2001)



- 100% reduction SO₂, NO_x, and NH₃
- 25% reduction of SO₂, NO_x, and NH₃
- 25% reduction of SO₂ and NO_x only

Lowest non-linear effects