

Workshop to Promote an Emission Inventory  
9 October 2007, Manila

## Application of an Emission Inventory to Modeling

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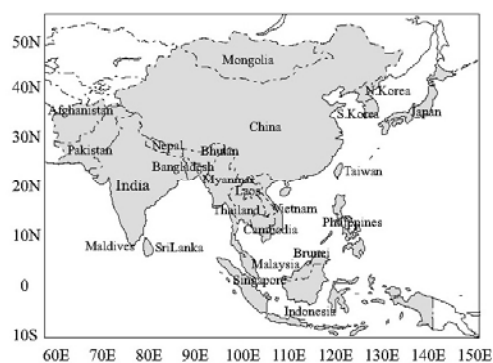
### REAS

(Regional Emission Inventory in Asia)

Ohara, T., H. Akimoto, J. Kurokawa, N. Horii, K. Yamaji, and T. Hayasaka, *Atmos. Chem. Phys.*, 7, 4417-4444, 2007.  
<<http://www.jamstec.go.jp/frcgc/research/d4/emission.htm>>

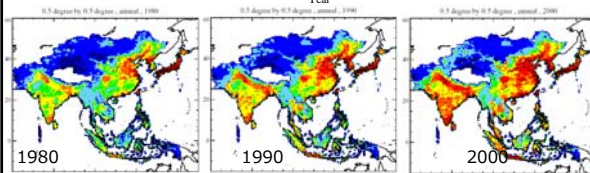
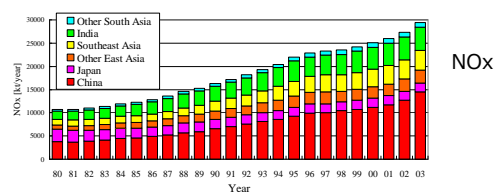
- Years 1980~2000~2020
- Region Northeast, Southeast, and South Asia
- Species SO<sub>2</sub>, NO<sub>x</sub>, CO, BC, OC, CO<sub>2</sub>, NMVOC, NH<sub>3</sub>, CH<sub>4</sub>
- Sources Anthropogenic (Combustion, Industrial Processes, Agricultural)
- Grid 0.5° × 0.5°

### Emission Inventory Region of REAS



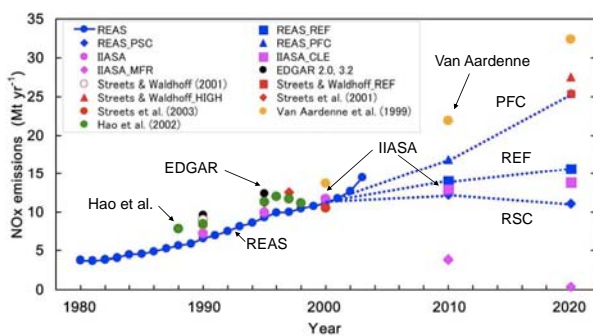
China(30 regions), India(20 regions), Other 26 Asian countries

### Increasing trend of NO<sub>x</sub> Emission in Asia: 1980-2003



10.7 Mt/year (1.0) 16.3 Mt/year (1.5) 25.1 Mt/year (2.3)

### NO<sub>x</sub> Emission trend in China



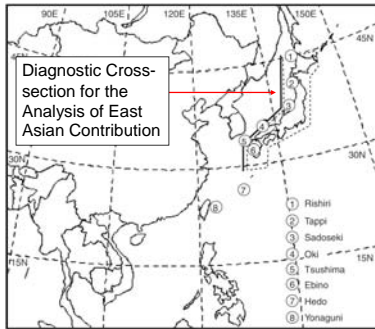
T. Ohara, et al., *Atmos. Chem. Phys.*, 7, 4417-4444, 2007.

### Analysis of the seasonal variation of ozone in the boundary layer in East Asia using a Community Multi-scale Air Quality Model

K. Yamaji, T. Ohara, I. Uno, H. Tanimoto, J. Kurokawa, H. Akimoto, *Atmos. Environ.*, 40, 1856-1868, 2006.

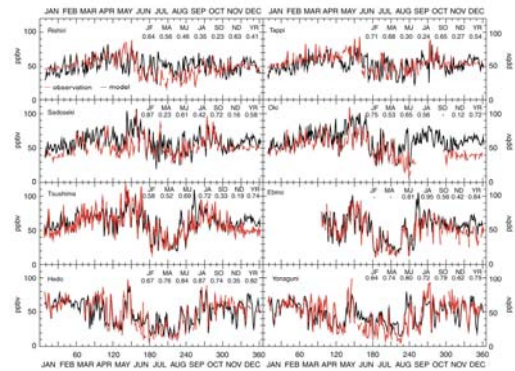
- Model: CMAQ v. 4.4 + SAPRC-99
- Meteorological Field: RAMS for 2002
- CMAQ Resolution: 80 km × 80 km
- Emission data: ACCESS 1° × 1° for 2000 : Streets (2003)
- Boundary Conditions: CHASER : Sudo et al. (2002)

### Model Domain for the CMAQ Simulation and Observational Sites for Model Validation



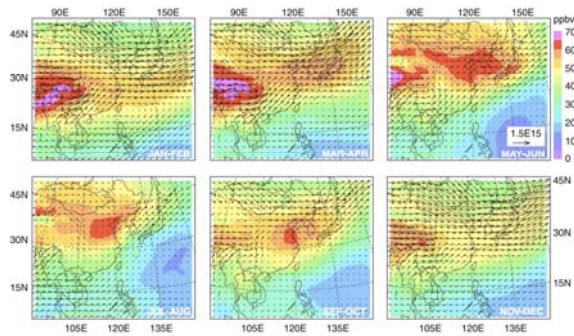
Yamaji et al, Atmos. Environ, 40, 1856-1868, 2006.

### Validation of CMAQ for Surface Ozone by EANET Data



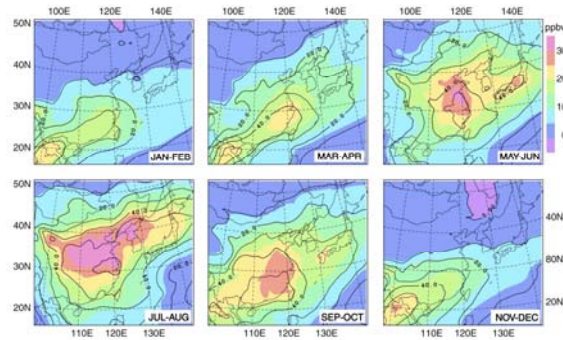
Yamaji et al, Atmos. Environ, 40, 1856-1868, 2006.

### Spatial Distribution of Ozone Concentration and Ozone Flux in the Boundary Layer (below 2 km) Averaged for Two Months



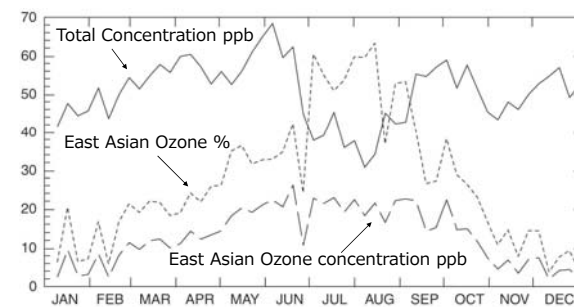
Yamaji et al, Atmos. Environ, 40, 1856-1868, 2006.

### Spatial Distribution of Chemically Produced Ozone by East Asian Emissions in the Boundary Layer (below 2 km)



Contours are the East Asian Emission's contribution to the concentration.

### Zonal Averaged Concentration and Chemically Produced Ozone due to East Asian Emissions on the Diagnostic Cross-section



Yamaji et al, Atmos. Environ, 40, 1856-1868, 2006.

### Modeling Study of Ozone Seasonal Cycle in Lower Troposphere over East Asia

J. Li, Z.-F. Wang, H. Akimoto, C. Gao, P. Pochanart, X.-Q. Wang, J. Geophys. Res., 2007 (accepted).

Model: NAQPMS + CBM-Z

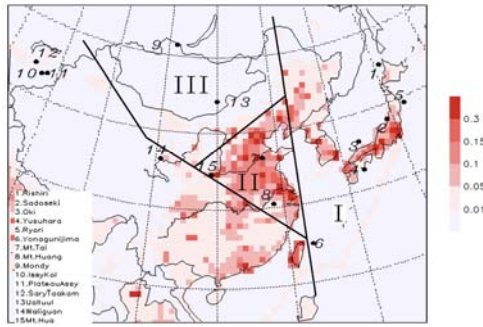
Meteorological Field: MM5

CMAQ Resolution: 81 km × 81 km

Emission data: 0.1° × 0.1° : Streets (2003)  
0.5° × 0.5° : REAS (2003)

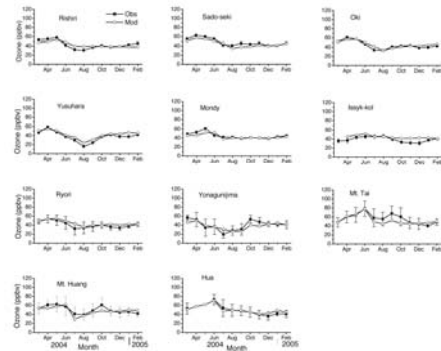
Boundary Conditions: GEOS-CHEM : Jacob (permission)

### Model Domain and Observational Stations used for Model Validation



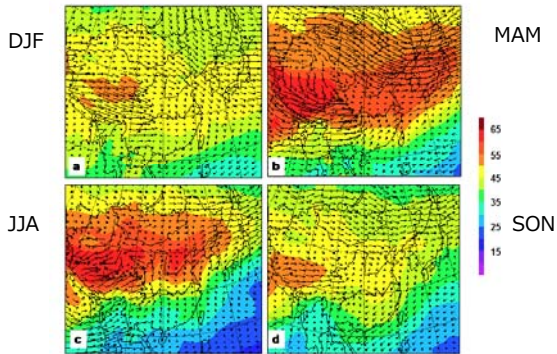
Jie Li et al., J. Geophys. Res., 2007.

### Validation of Regional Model (NAQPMS) for Surface Ozone by Observation



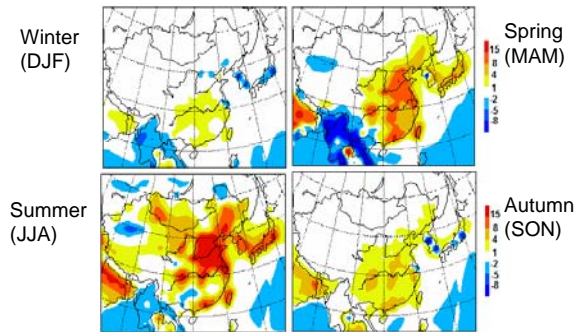
Jie Li et al., J. Geophys. Res., 2007.

### Seasonal mean ozone mixing ratios (ppb) and ozone horizontal fluxes in the boundary layer



Li et al., J. Geophys. Res., 2007.

### Seasonal mean net photochemical production of ozone in the boundary layer



Li et al., J. Geophys. Res., 2007.

### Summary of the ozone budgets for the three mountain sites calculated by the NAQPMS model (Unit: Kt/day)

Station Name	Month	Transport <sup>a</sup>	Chem <sup>b</sup>	Deposition <sup>b</sup>
Mt. Tai	January	0.9	0.4	-1.2
	March	0.9	2.4	-1.5
	April	-5.1	10.2	-1.8
	May	-0.6	12.7	-2.1
	June	0.6	25.4	-2.6
	July	-4.0	20.7	-2
	Mt. Hua	January	3.0	0.3
March		1.1	1.0	-1.5
April		0.3	3.9	-1.8
May		2.4	5.5	-1.9
June		-1.3	12.1	-2.1
July		-2.1	10	-1.5
Mt. Huang		January	5.6	0.6
	March	4.4	1.4	-1.4
	April	4.7	7.1	-1.7
	May	8.1	10.4	-1.8
	June	4.2	9.1	-1.9
	July	-5.2	7.8	-0.9

Li et al., J. Geophys. Res., 2007.

Thank You for your Attention !