

Improvements of GMI aerosol simulation

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- **Dust**
- **Sea salt**
- **Pollutant**

**GMI meeting
June 14, 2007**

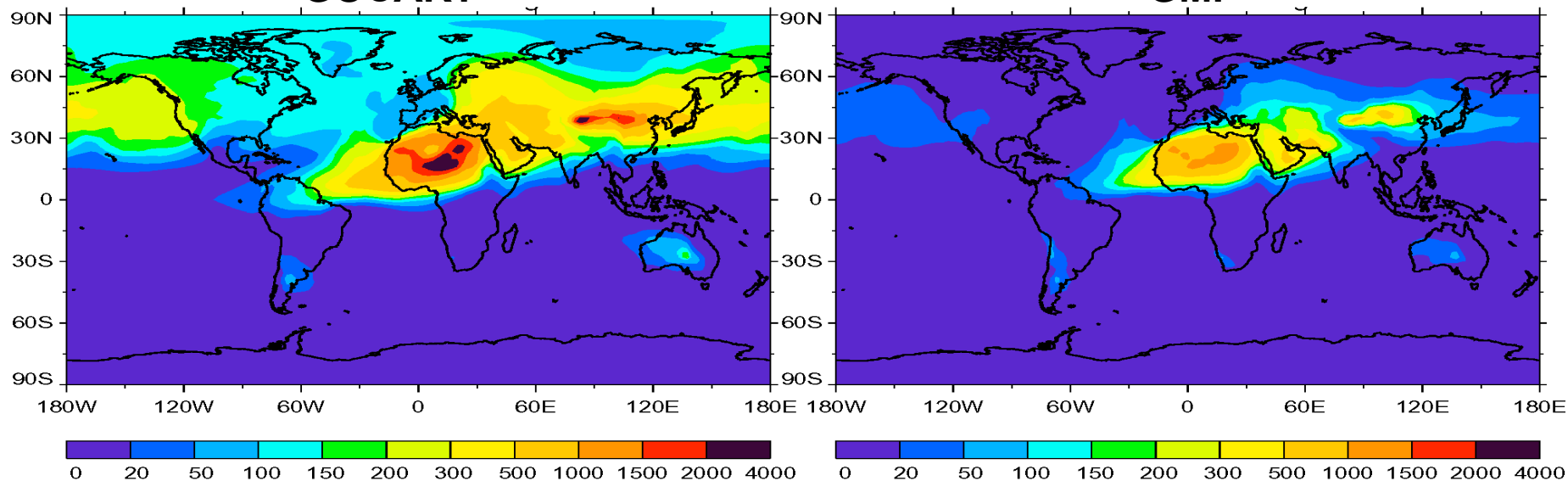
Dust

Column Dust

April 2001

GOCART

GMI

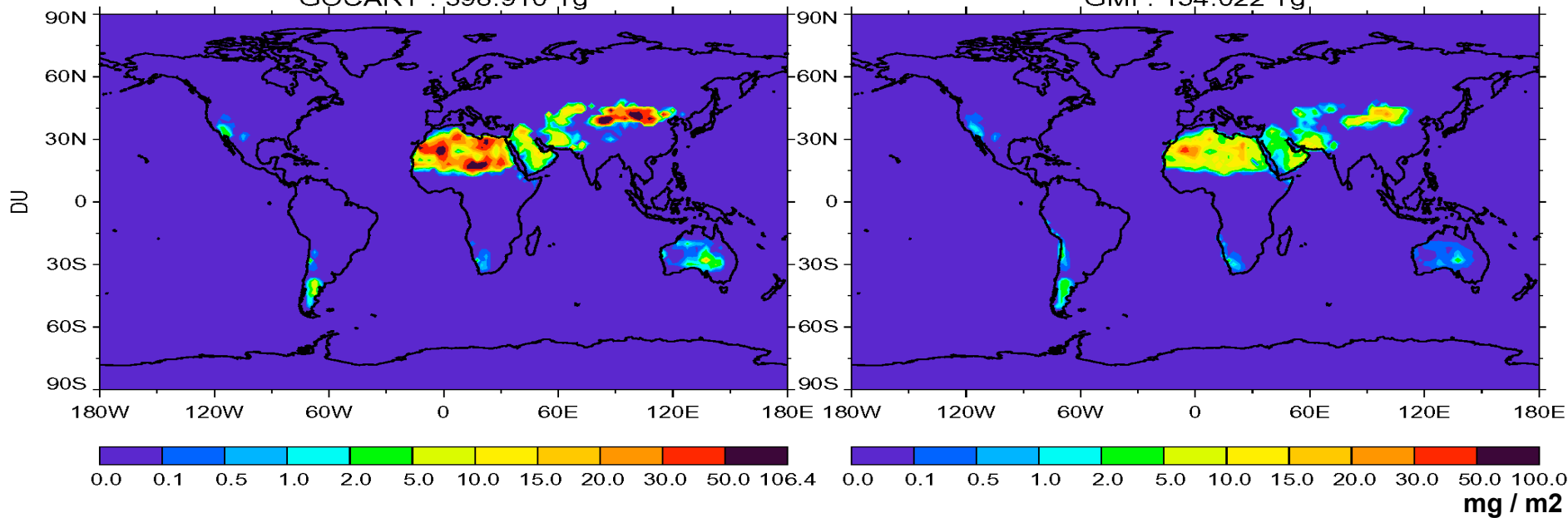


Emission

GOCART : 398.910 Tg

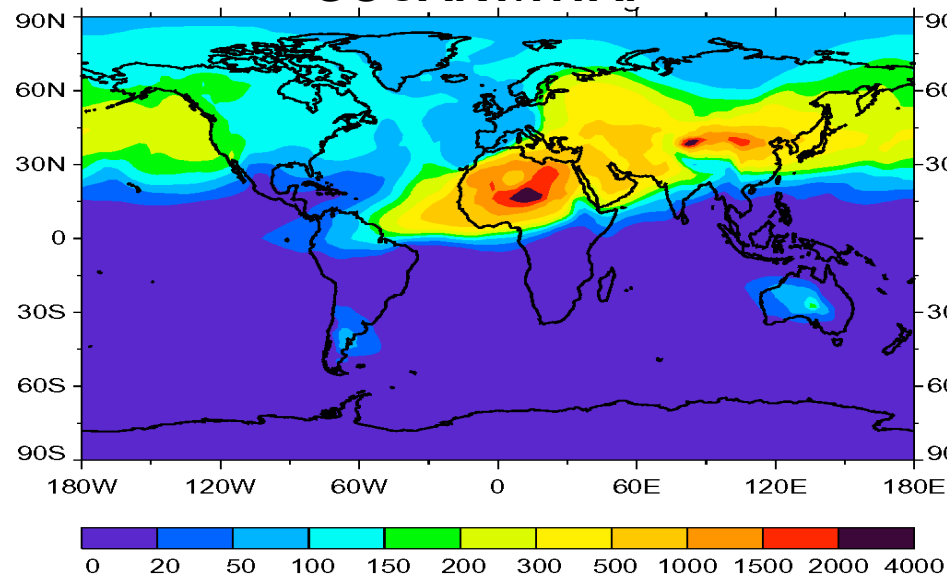
GMI : 154.022 Tg

µg / m²

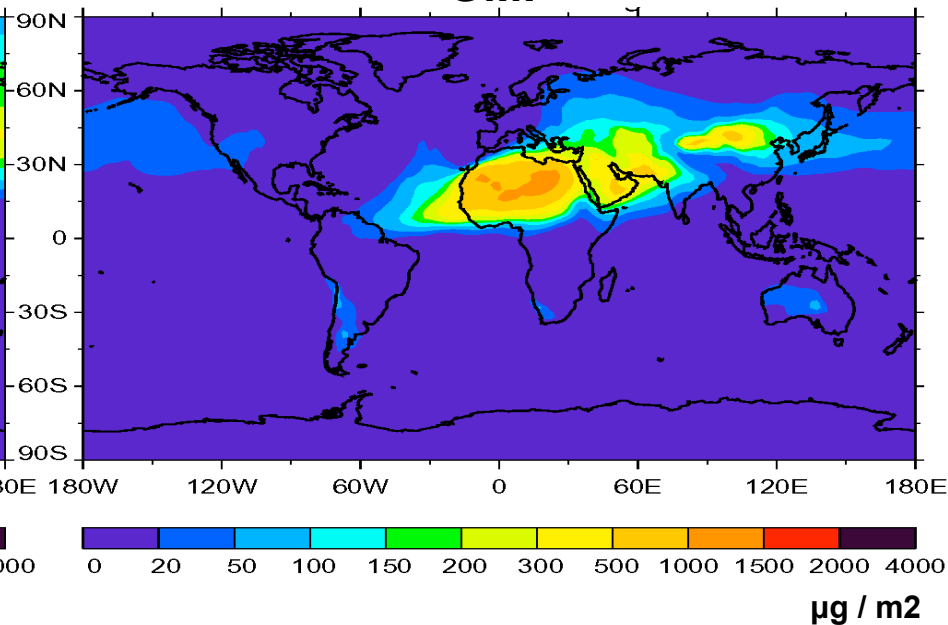


Column Dust

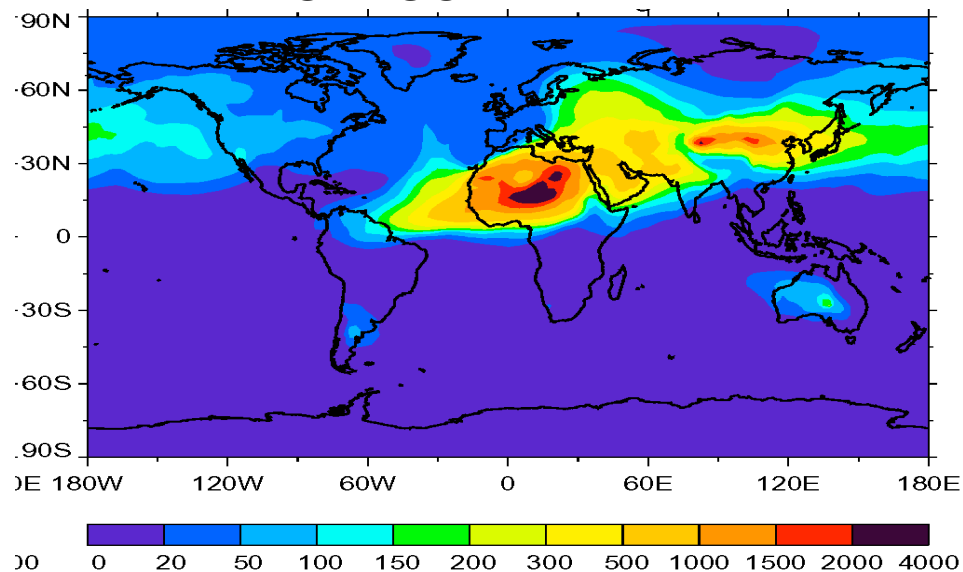
GOCART/HTAP



GMI



GMI/GOCART/HTAP



- Implement Ginoux's dust emission in GMI
- Emission factor reduced

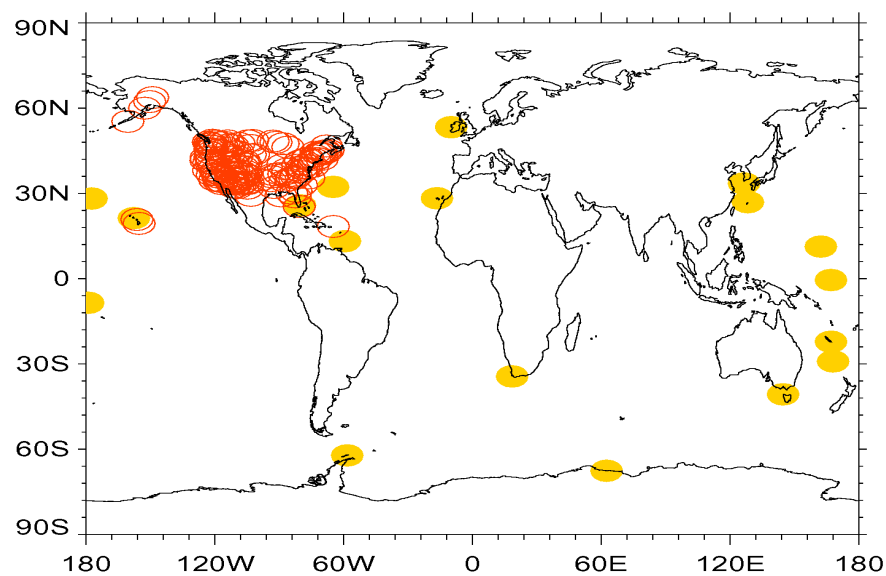
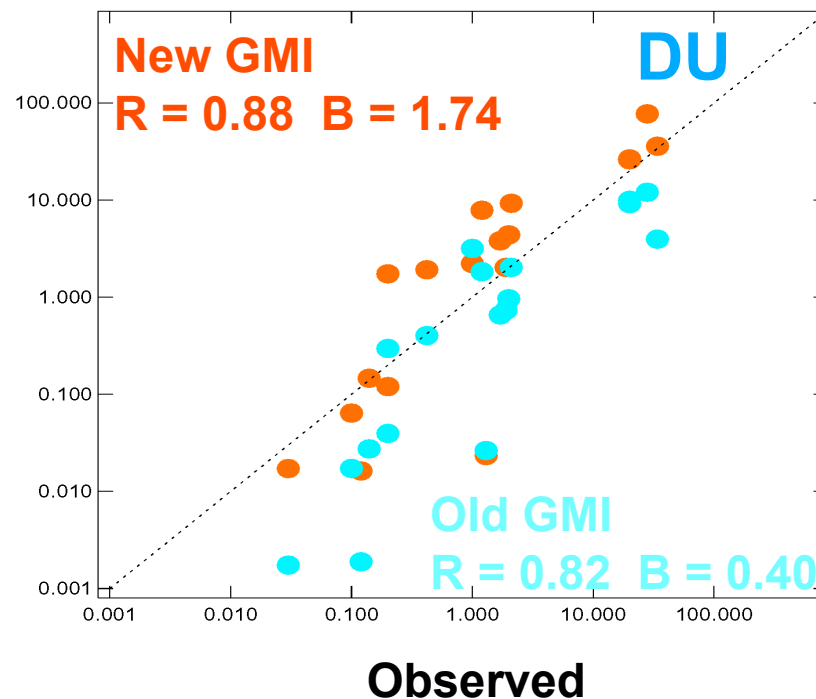
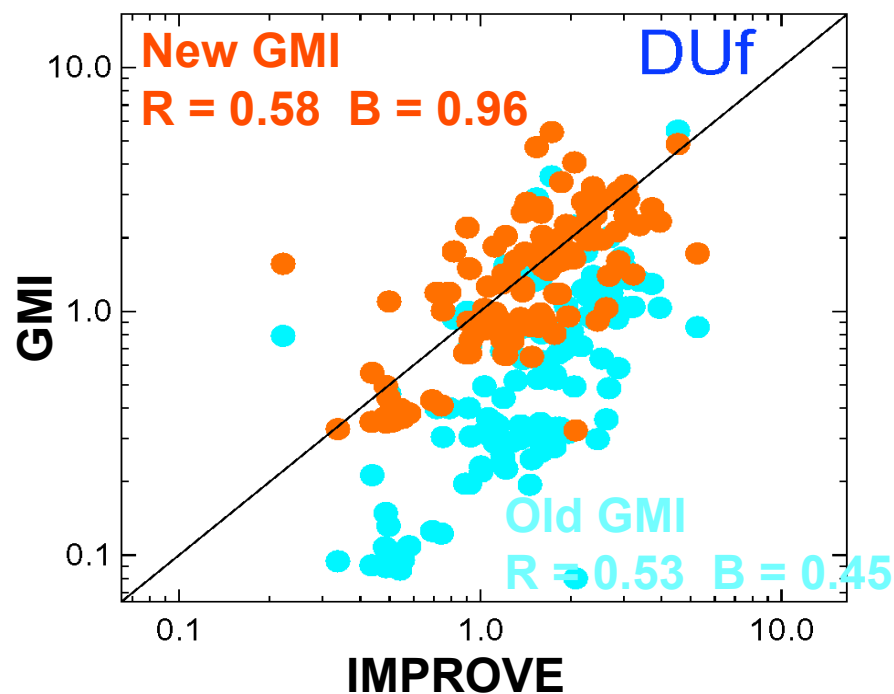
Budget analyses for dust (Tg / April)

	emission	dry	settling	cloud	wet	burden	lifetime
GOCART	348	21	238	52	21	60	5.2
New GMI	318	22	149	28	104	50	4.7
Old GMI	112	60		14	38	25	6.7

GMI

- Large wet deposition
- Small sedimentation

Model-observation comparison for dust



locations

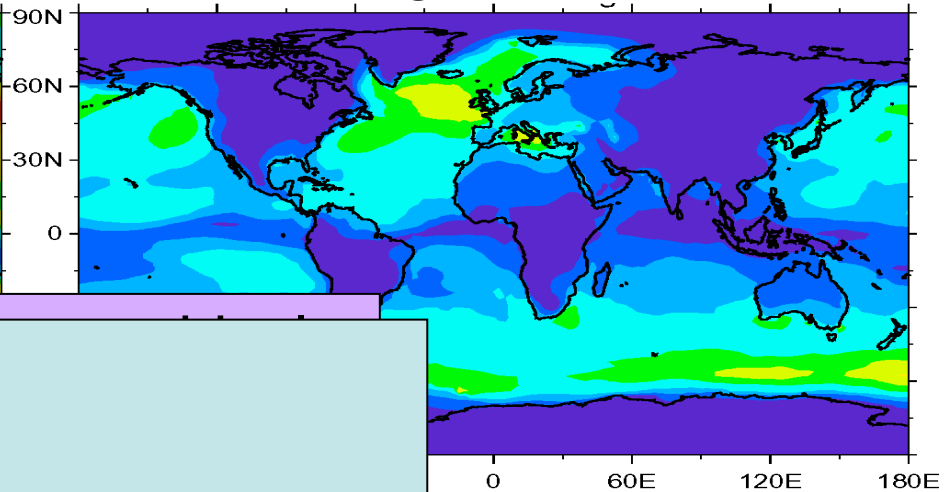
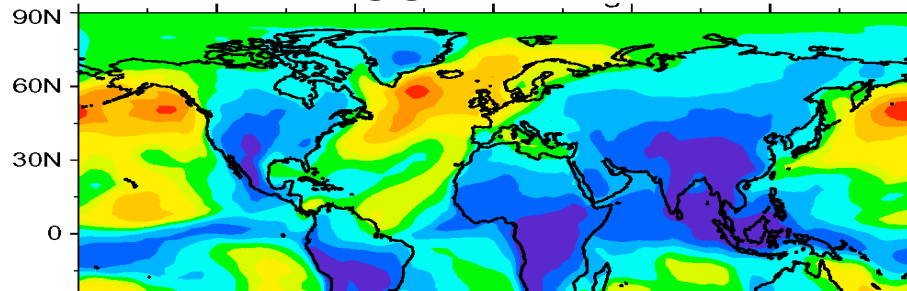
Sea Salt

Column Sea Salt

April 2001

GOCART

GMI



GMI

- Large wet deposition

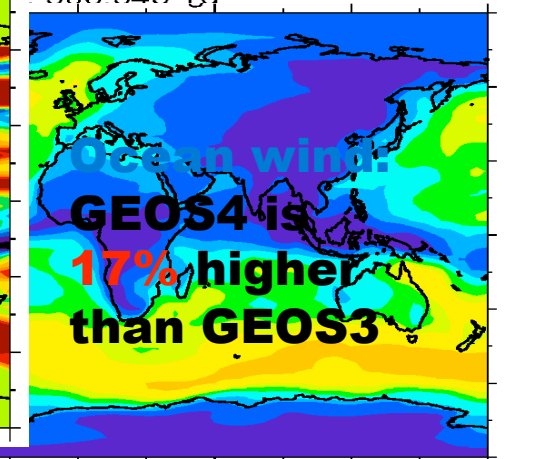
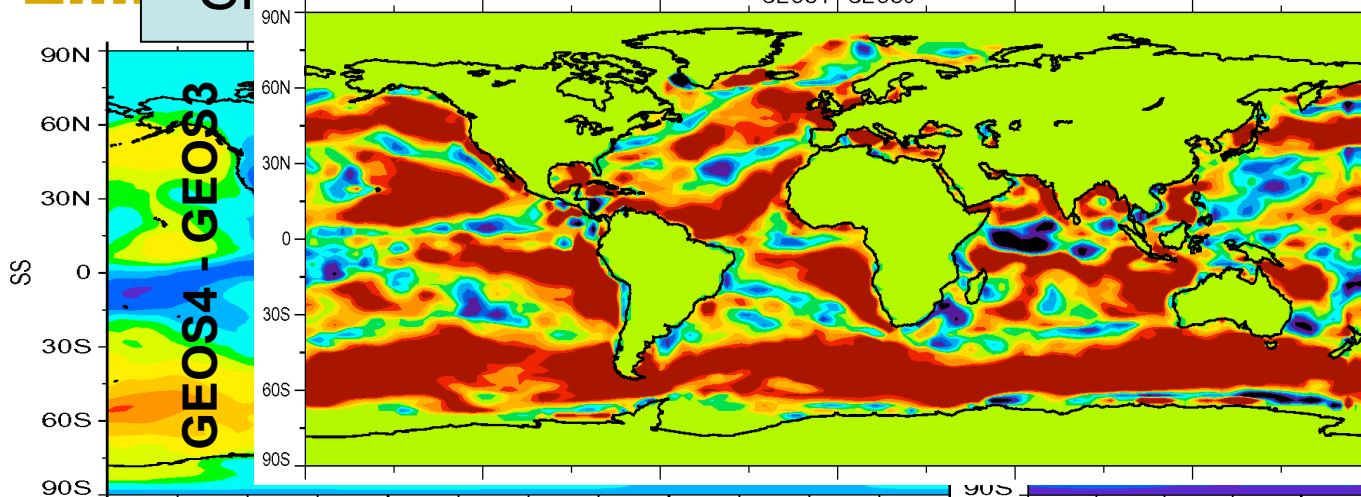
- Small sea salt emission

30 40 60 80 100 150 200 $\mu\text{g} / \text{m}^2$

Emission

GEOS4 - GEOS3

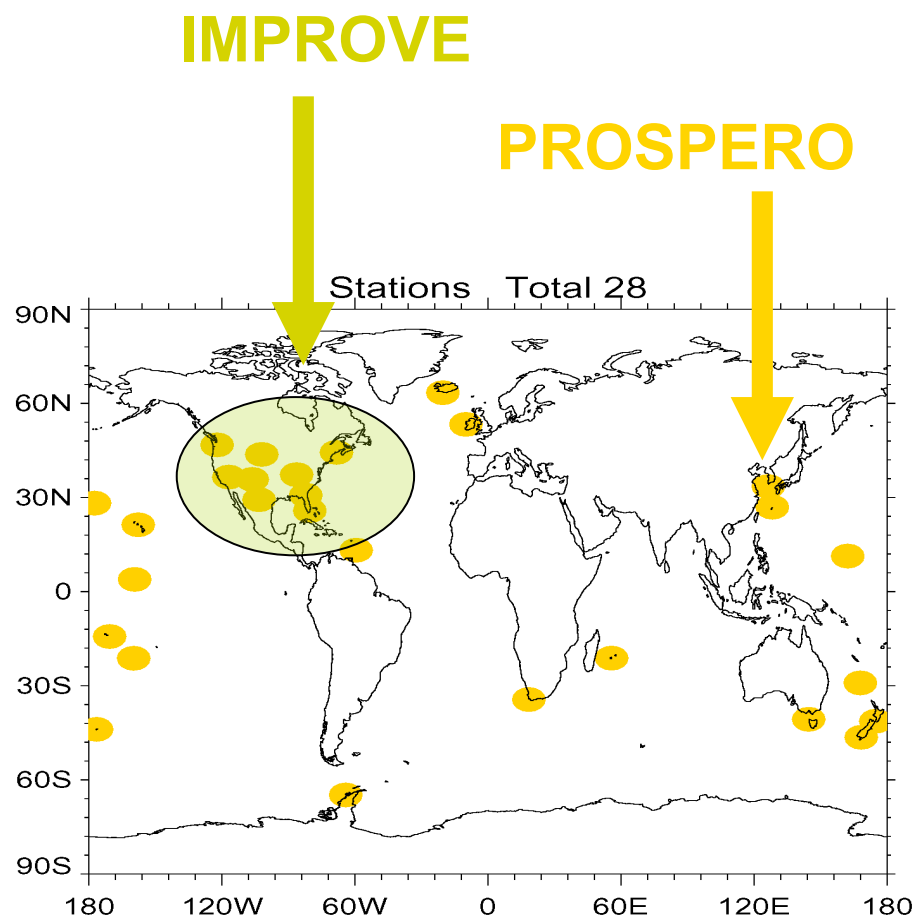
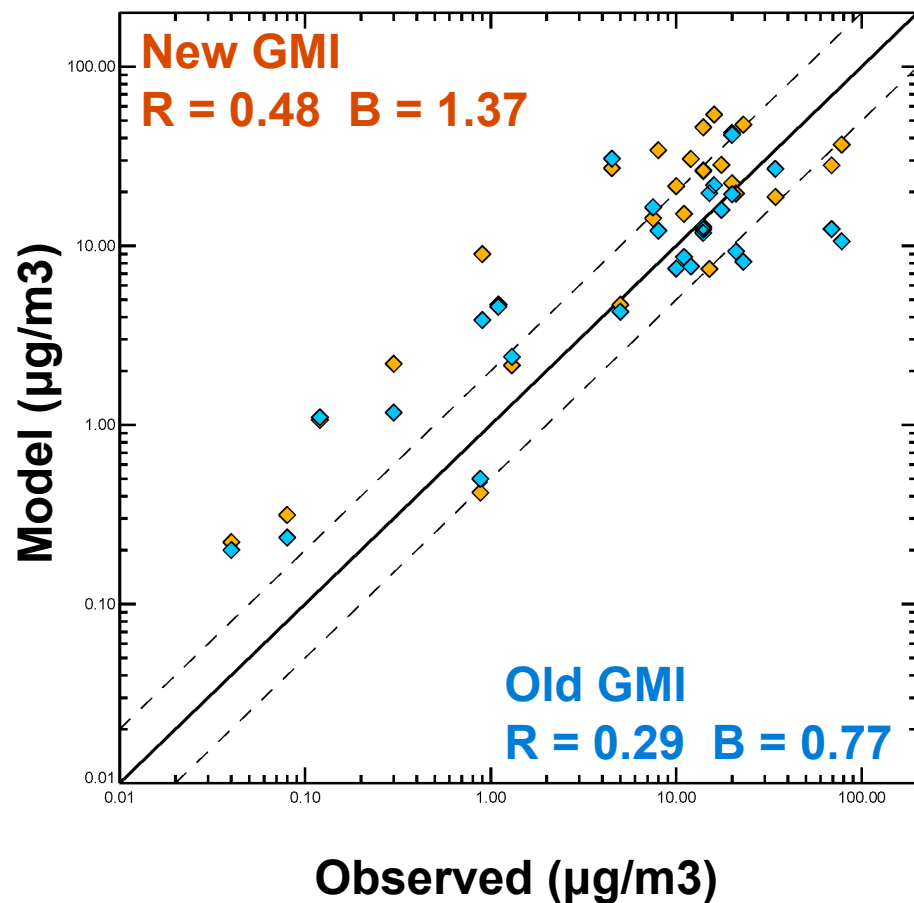
GOCART-HTAP



Ocean wind!
GEOS4 is
17% higher
than GEOS3

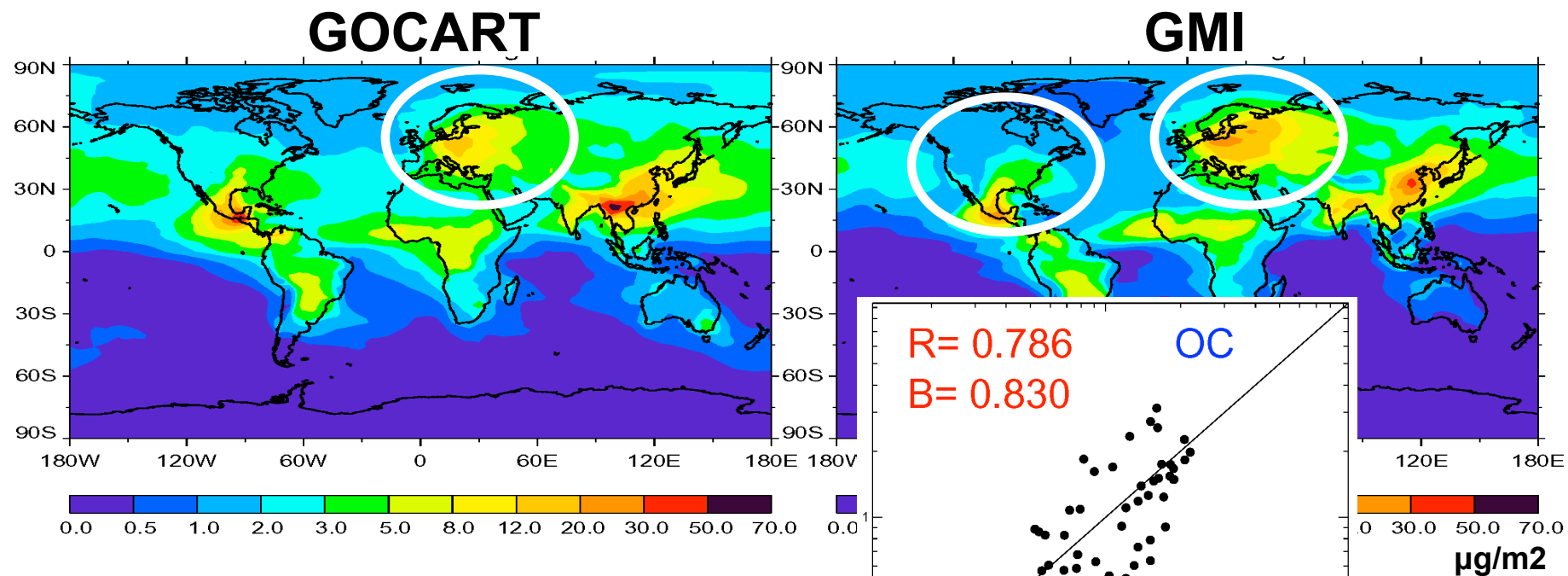
0 2 5 10 20 30 40 60 80 100 150 200 mg / m^2

Model-observation comparison for sea salt



Pollutant

Column Organic Matter



1. Differ in emission and wet scaven

2.	emission (TgC/month)	burden(1g)	lifetime(days)
GOCART	6.42	1.28	6.0
GMI	6.47	1.03	4.8

Tg/yr

**Global total POM
emission**

**Fossil fuel POM
emission over xxSR6**

Modle	SR1	NASR6	EUSR6	SASR6	EASR6
TM5	67.6	1.1	1.3	2.4	2.7
GOC	84.7	1.0	1.1	2.3	3.0
LLN	31.7	1.5	1.6	3.7	3.7
MOZ	62.1	4.2	8.3	4.4	9.9
CAM	51.5	1.4	2.0	3.4	4.2
INC	65.8	1.1	1.3	2.4	3.6
SPR	57.3	2.3	3.5	5.0	5.0
GMI	111.3	1.4	13.9	0.3	10.4

Michael Schulz

SR6: 20% reduced fossil fuel emission

Tg/yr

**Total global POM
emission**

**Fossil fuel POM
emission over xxSR6**

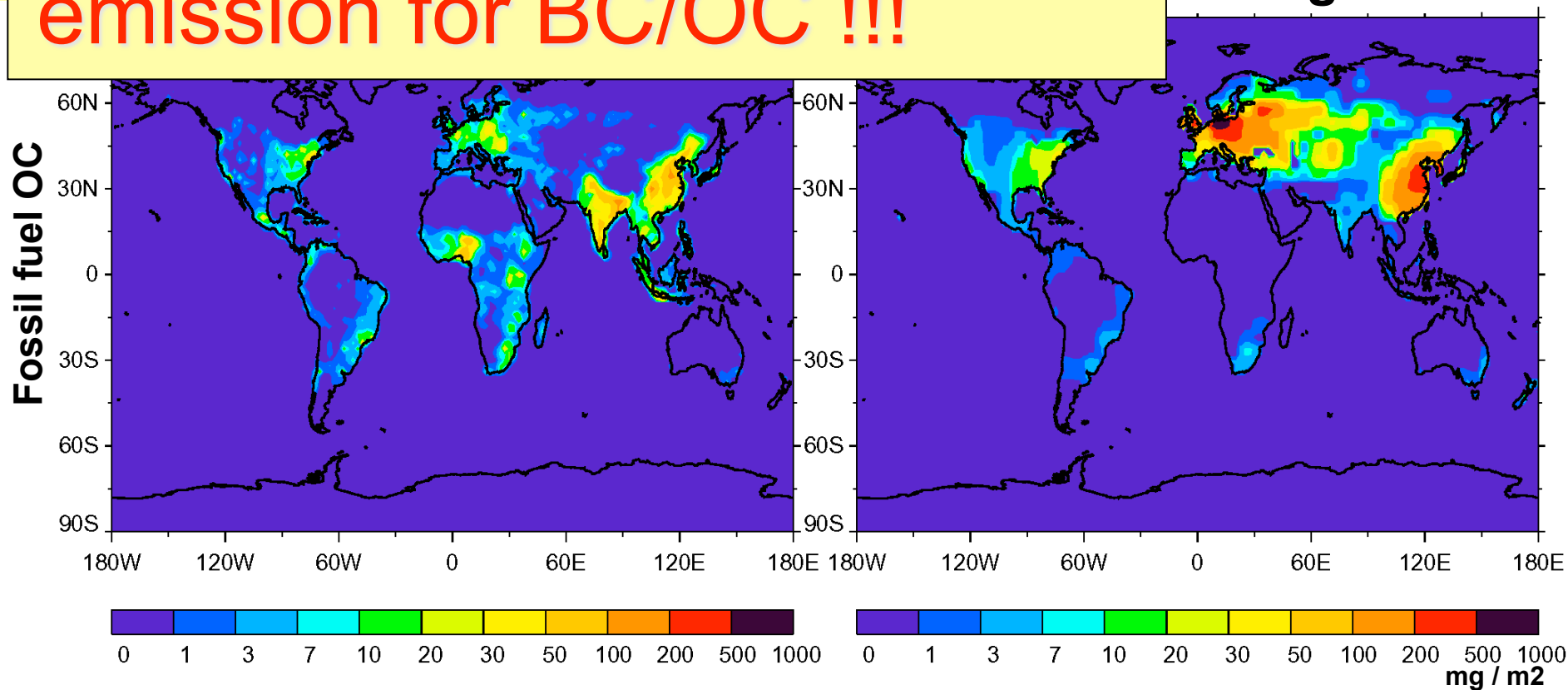
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SPR	57.3	2.3	3.5	5.0	5.0
GMI	111.3	1.4	13.9	0.3	10.4

SR6: 20% reduced fossil fuel emission

HTAP comparison for OM emission (Tg/yr)

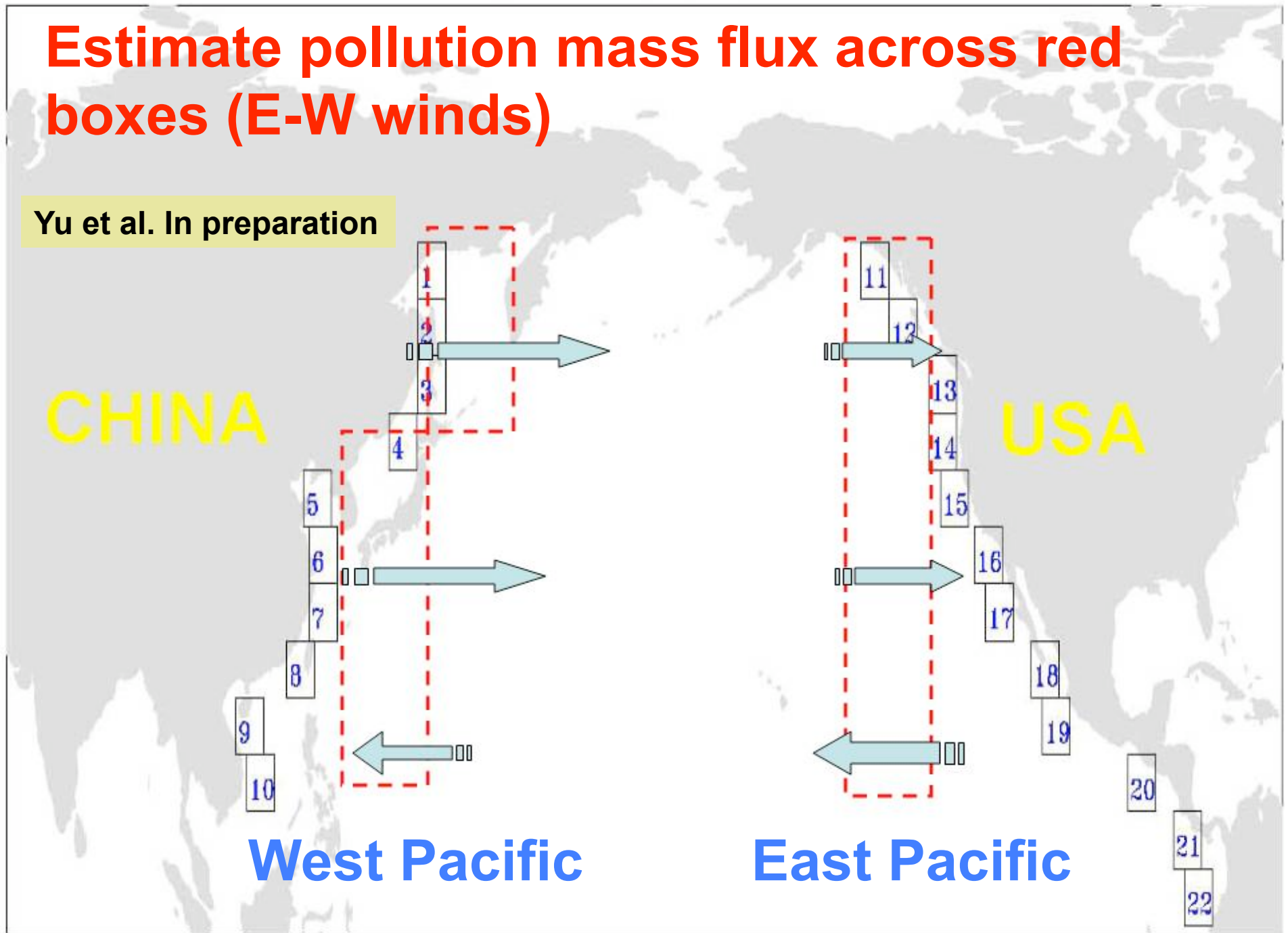
Model	SR1	NASR6	EUSR6	SASR6	EASR6
mean	60.1	1.8	2.7	3.4	4.7
OM	44.0	1.4	1.8	2.2	10.4
OC	2.52	0.3	0.4	0.5	3.3

Need to update fossil fuel emission for BC/OC !!!



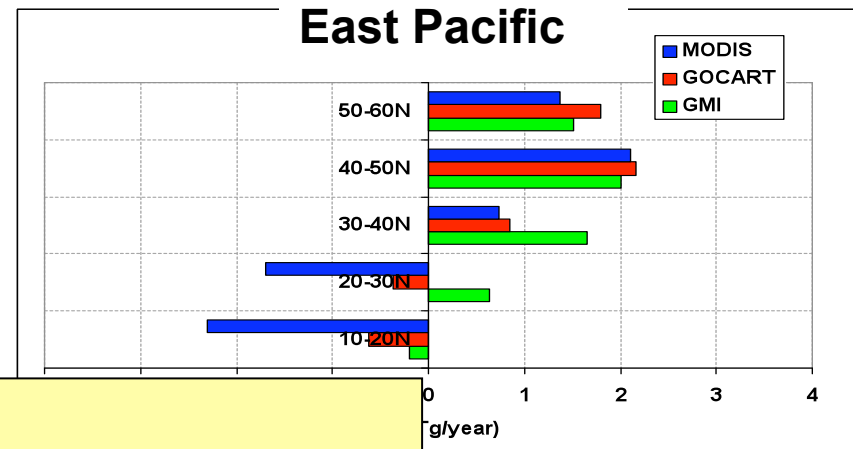
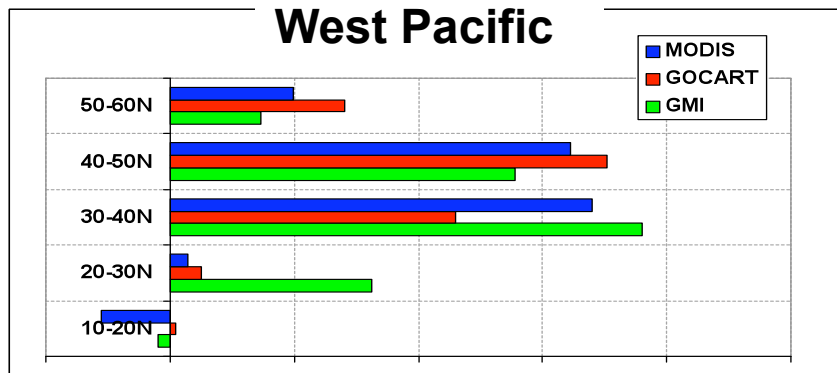
Estimate pollution mass flux across red boxes (E-W winds)

Yu et al. In preparation

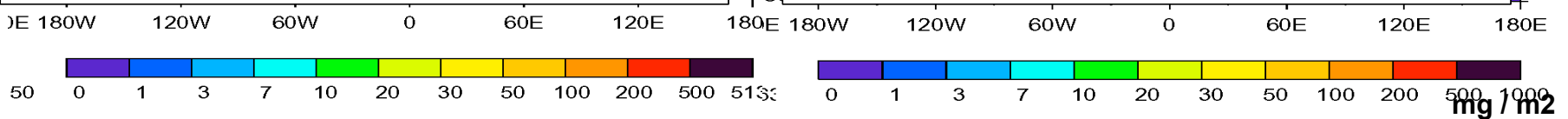
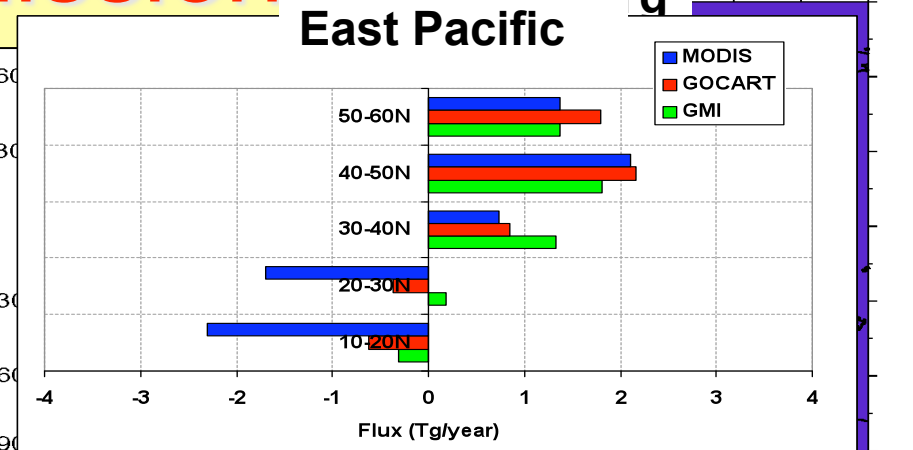
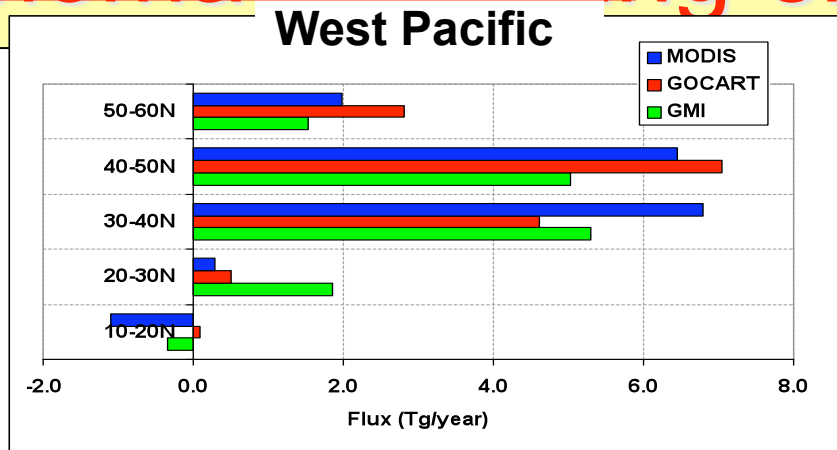


Pollutant fluxes of MODIS / GOCART / GMI

Year 2004

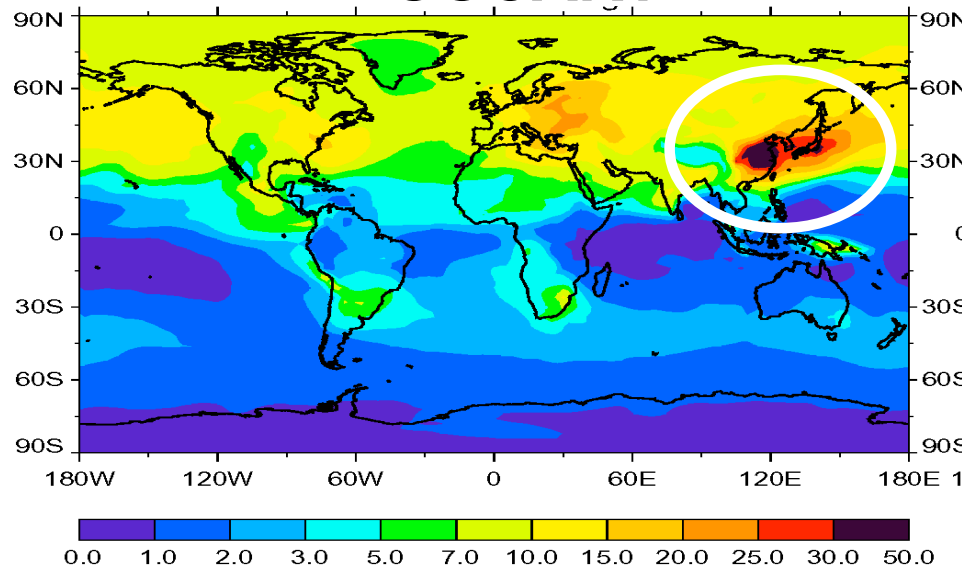


Need to use real-time
New BC/OC emission
biomass burning emission!!!

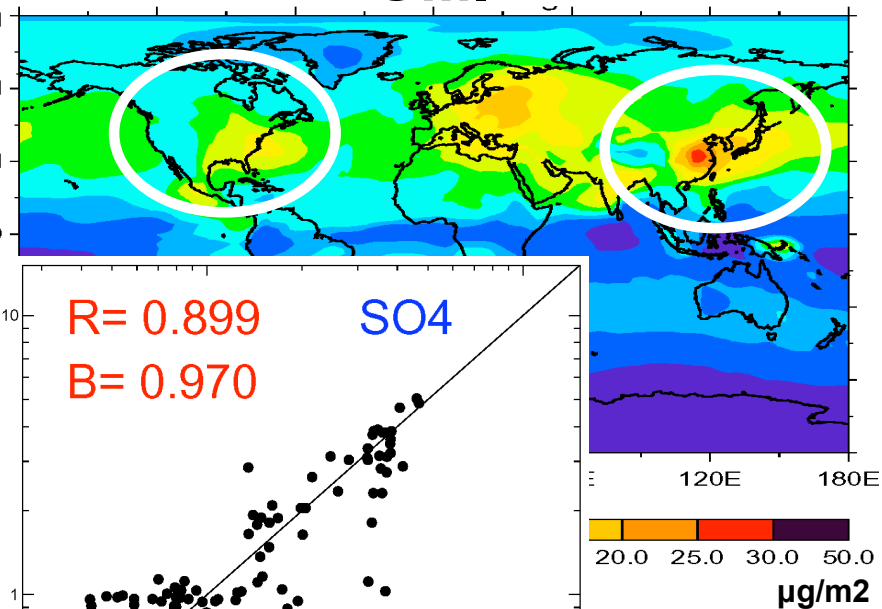


Column Sulfate

GOCART



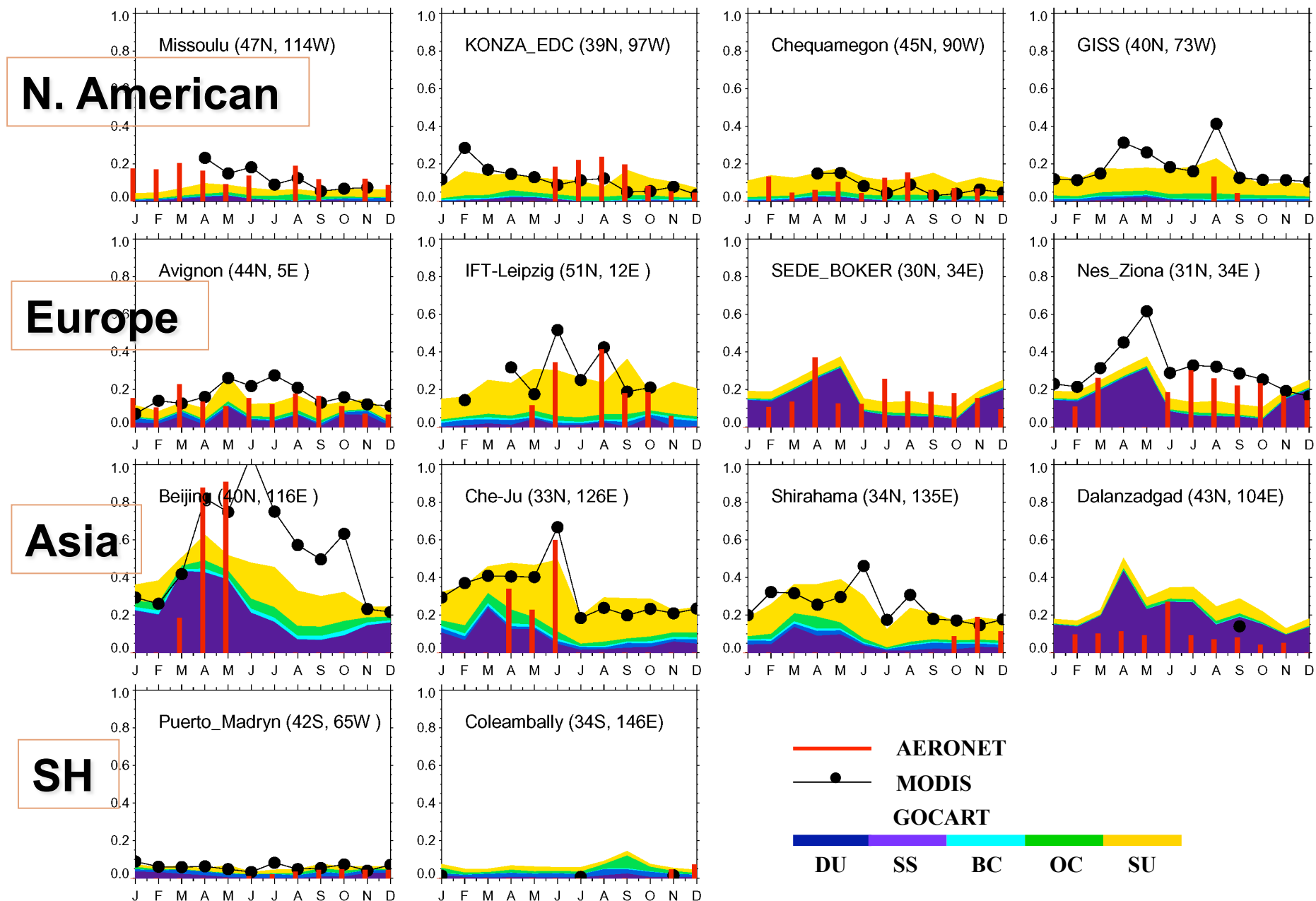
GMI



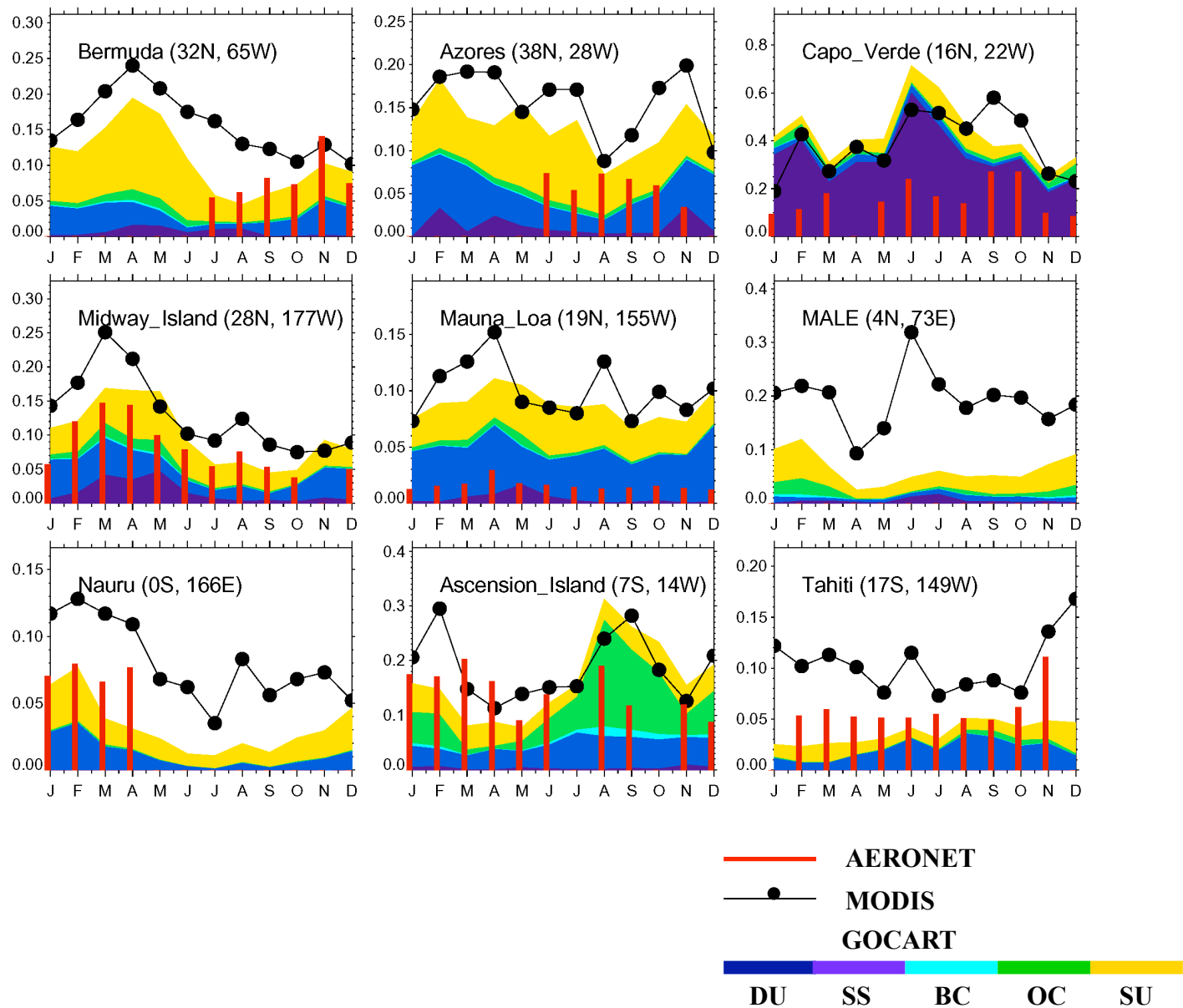
1. Differ in emission, chemistry, and

2.	burden(Tg)	lifetime(days)	emission(TgS/month)		
			DMS	SO ₂	SO ₄
GOCART	2.55	6.0	1.22	6.45	0.19
GMI	2.00	3.7	1.91	6.04	

AOT (550nm) over land stations



AOT (550nm) over ocean stations



Summary

1. Strengths and weaknesses of GMI aerosol simulation have been investigated.
2. Emission algorithms of dust and sea salt emission have been implemented on GMI.
3. Fossil fuel and biomass burning emissions for BC/OC have been updated.

Questions that remain

1. update emissions for sulfate ?
2. high wet deposition ?
3. low sedimentation ?
4. convection ?
5. and more ...