Improvements of GMI aerosol simulation

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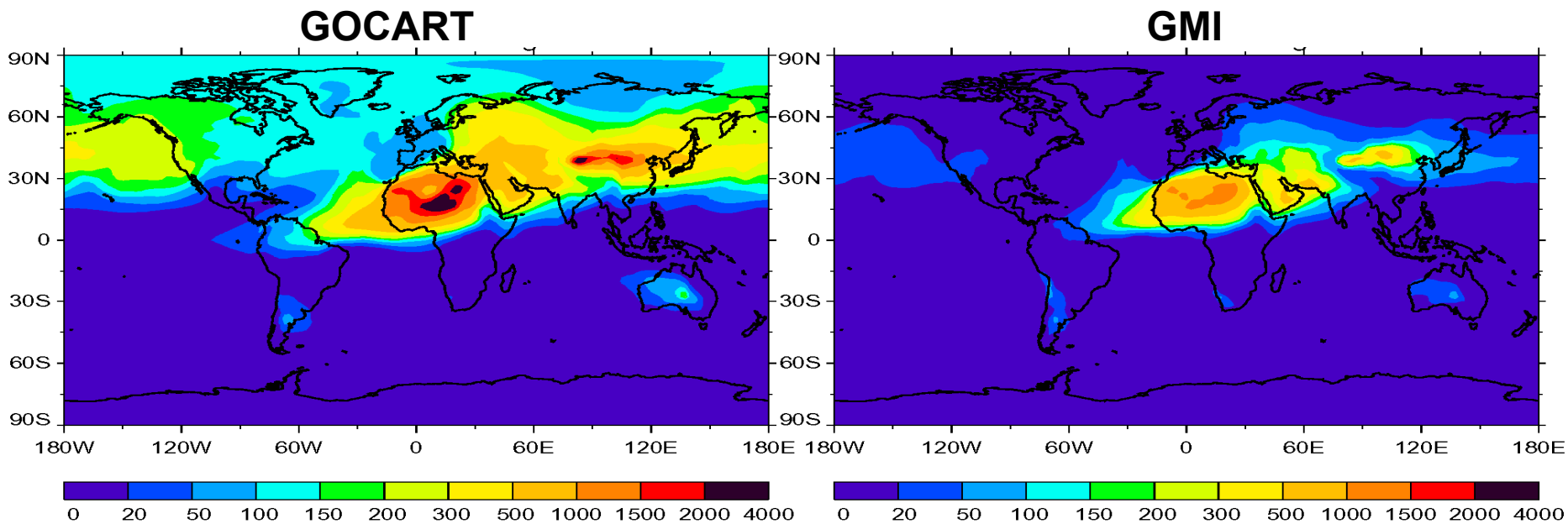
- **Dust**
- **Sea salt**
- **Pollutant**

GMI meeting
June 14, 2007

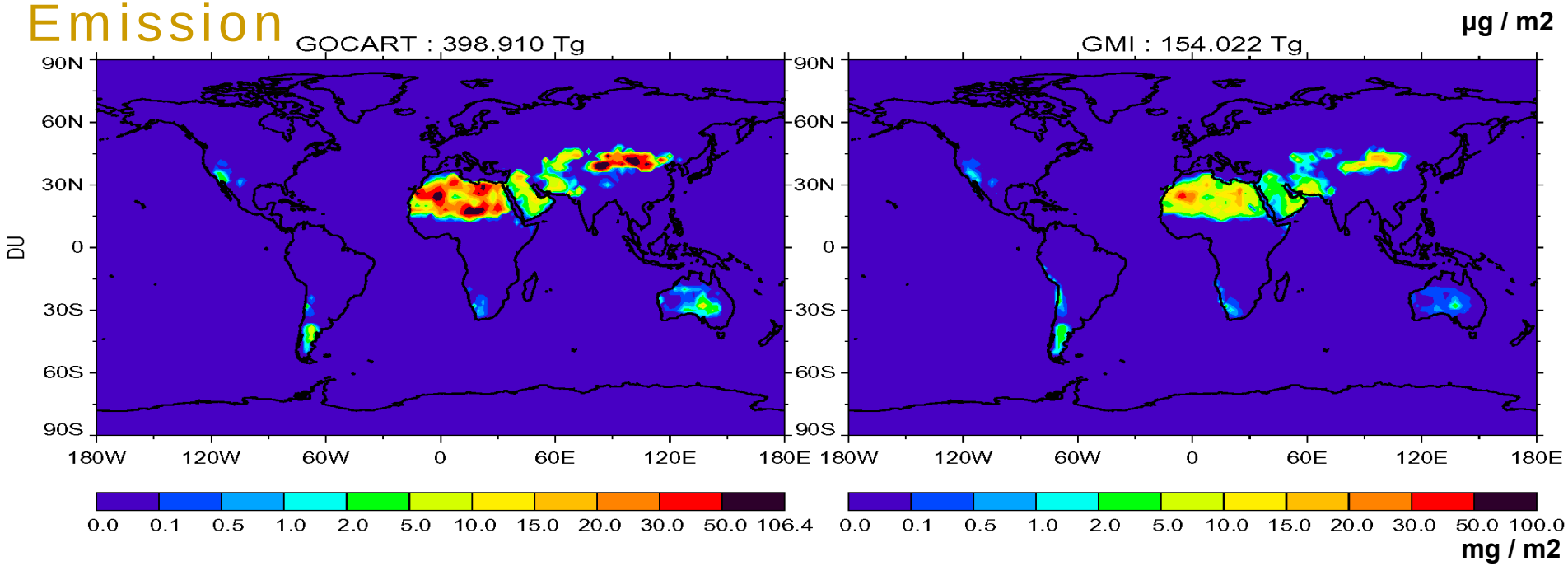
Dust

Column Dust

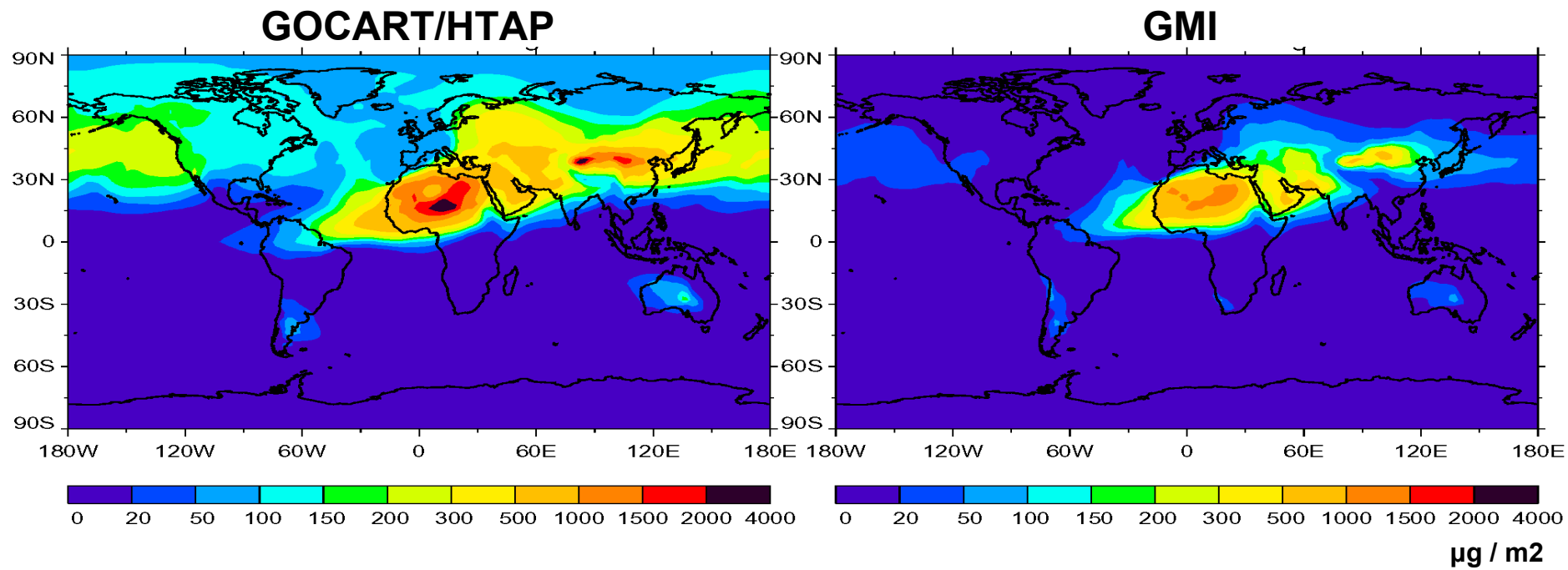
April 2001

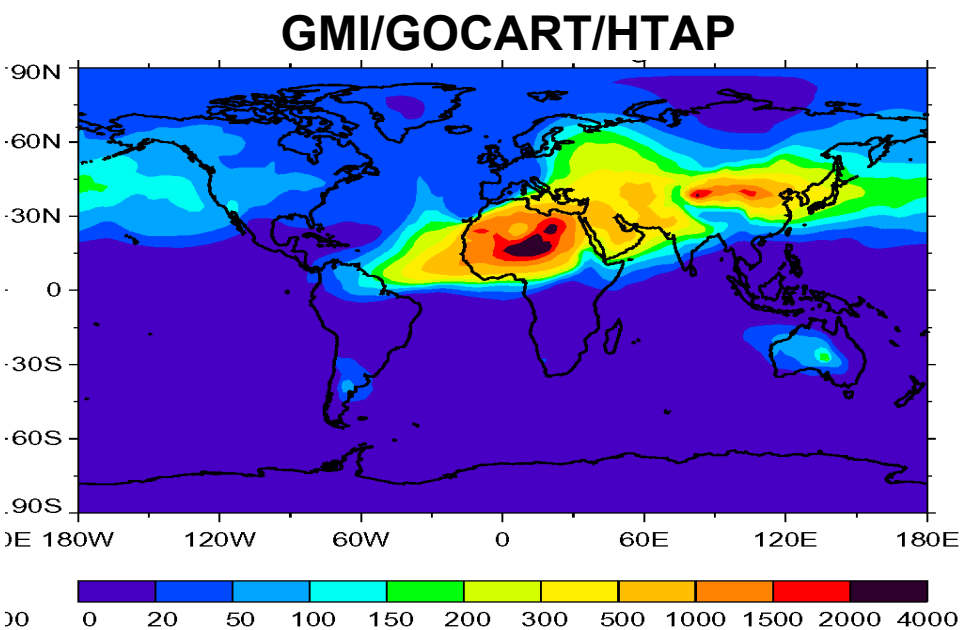


Emission



Column Dust





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

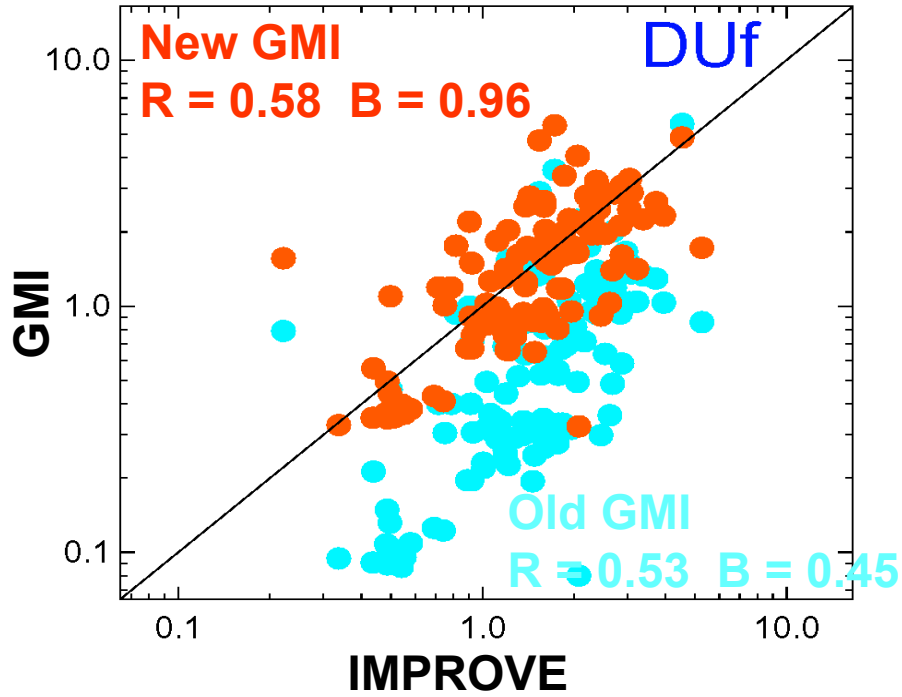
Budget analyses for dust (Tg / April)

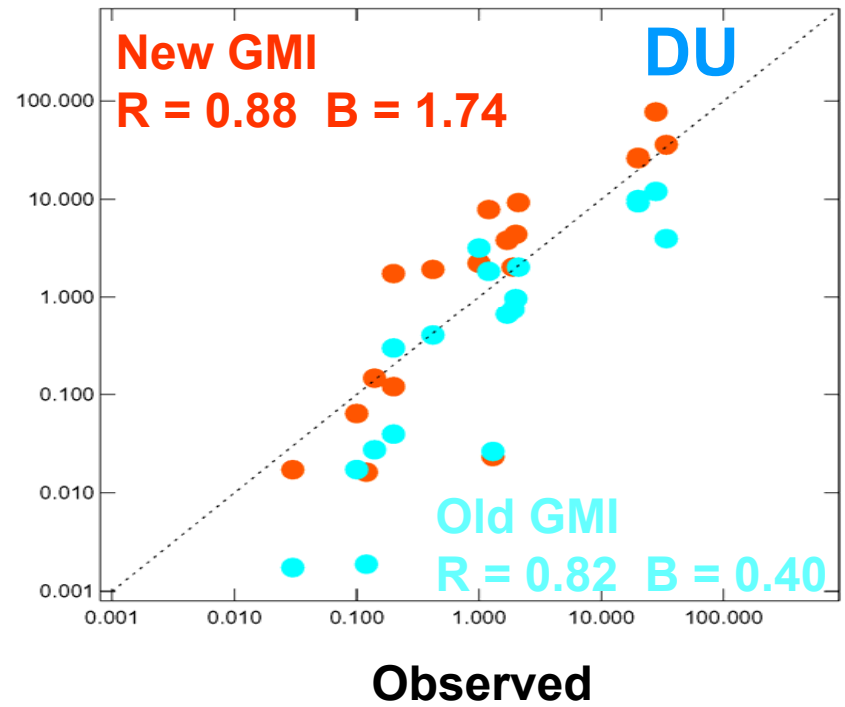
	emission	dry	settling	cloud	wet	burden	lifetime
GOCART	348	21	238	52	21	60	5.2
New GMI	318	22	149	28	104	50	4.7
Old GMI	112	60		14	38	25	6.7

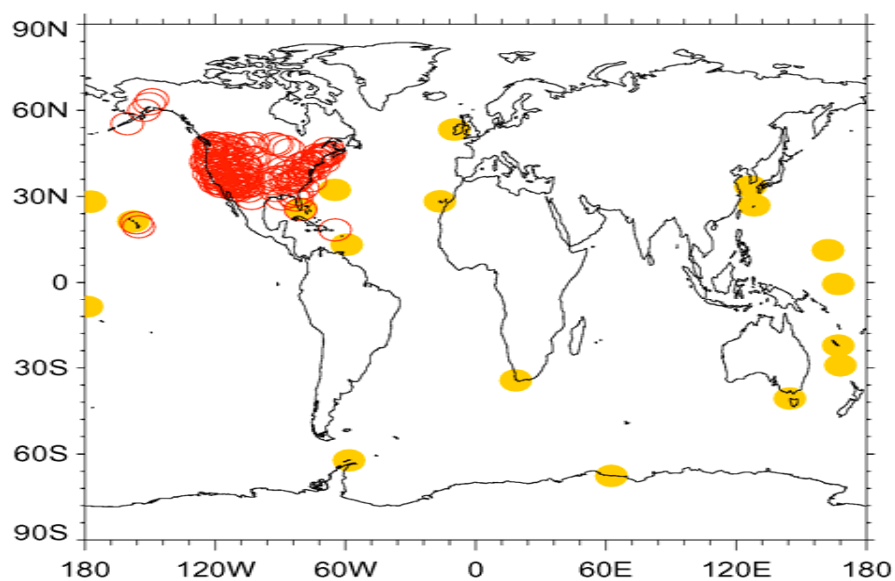
GMI

- Large wet deposition
- Small sedimentation

Model-observation comparison for dust





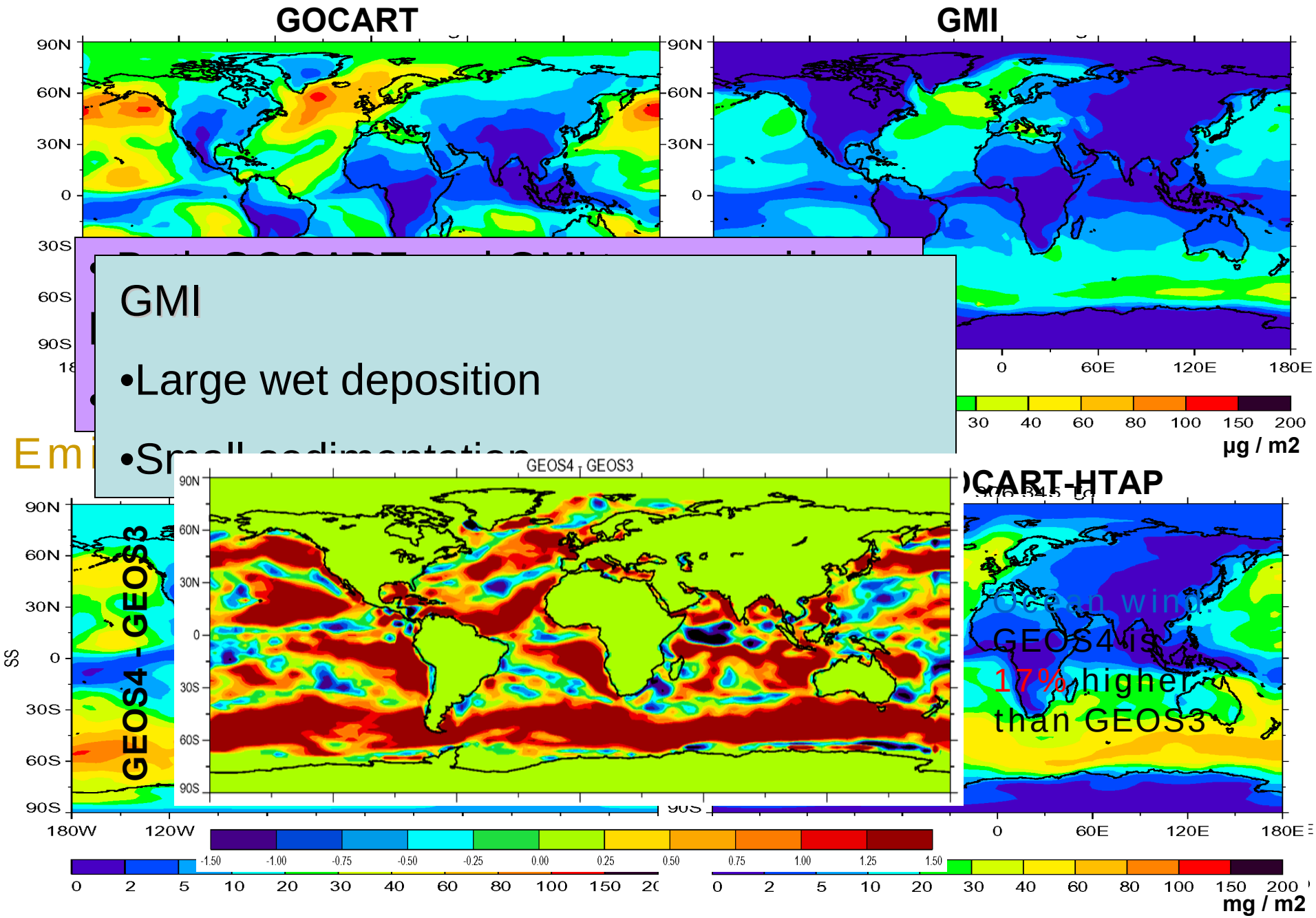


locations

Sea Salt

Column Sea Salt

April 2001



GMI

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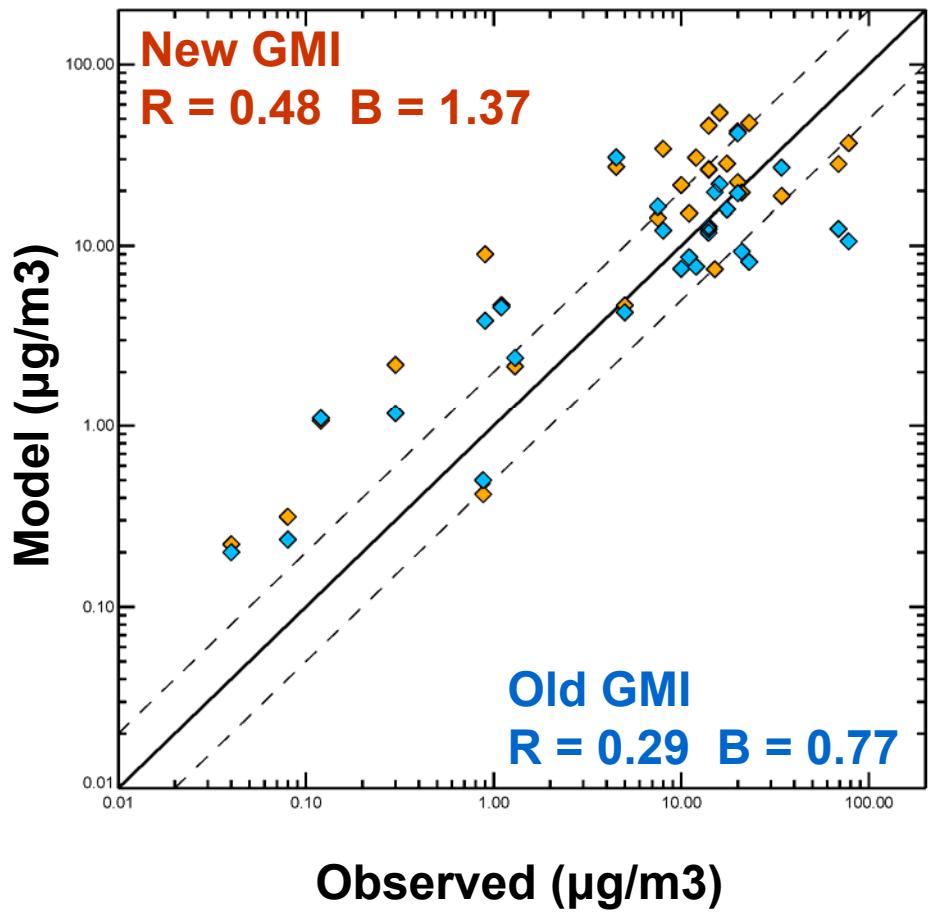
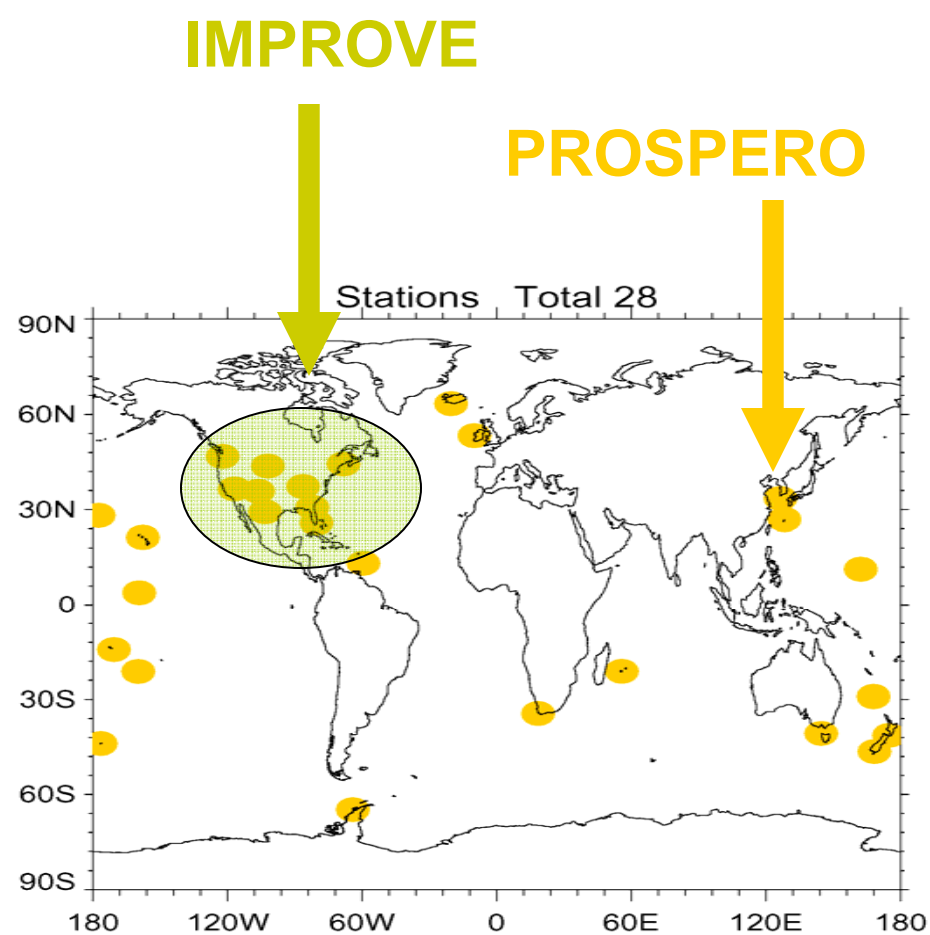
- Small sedimentation

Ocean wind

GEOS4 is 17% higher than GEOS3

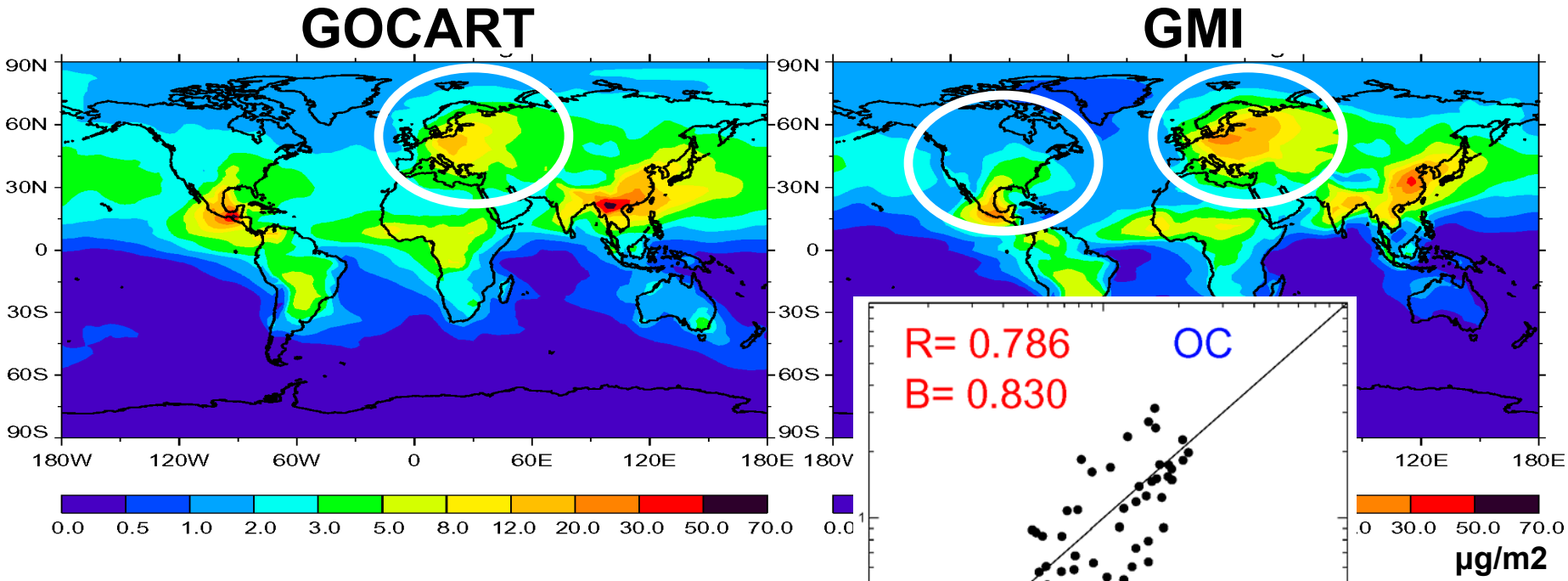
Model-observation comparison for sea salt





Pollutant

Column Organic Matter



1. Differ in emission and wet scaver

2.

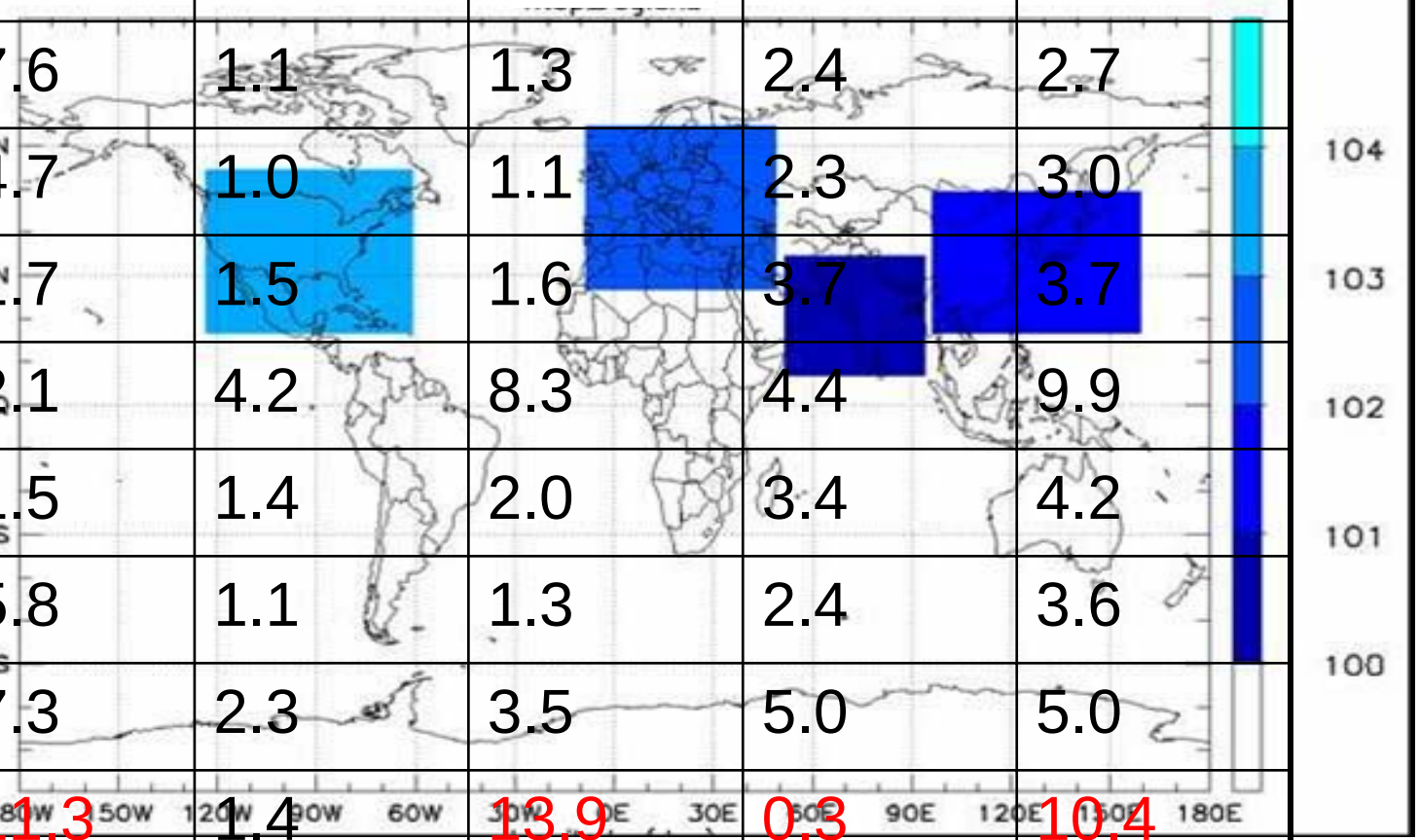
	emission (TgC/month)	burden(Tg)	lifetime(days)
GOCART	6.42	1.28	6.0
GMI	6.47	1.03	4.8

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

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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

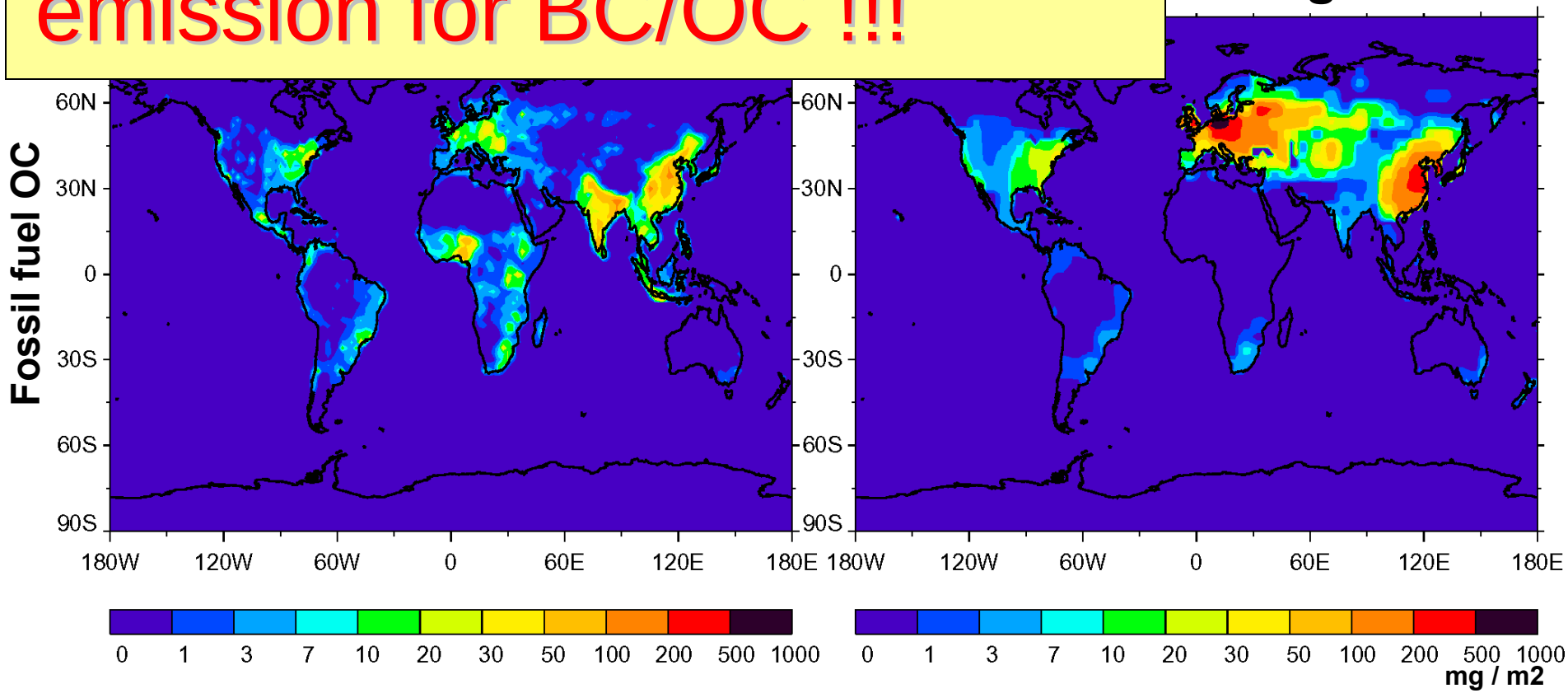
SR6: 20% reduced fossil fuel emission

HTAP comparison for OM emission (Tg/yr)

Model	SR1	NASR6	EUSR6	SASR6	EASR6
mean	60.1	1.8	2.7	3.4	4.7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10.4
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.3

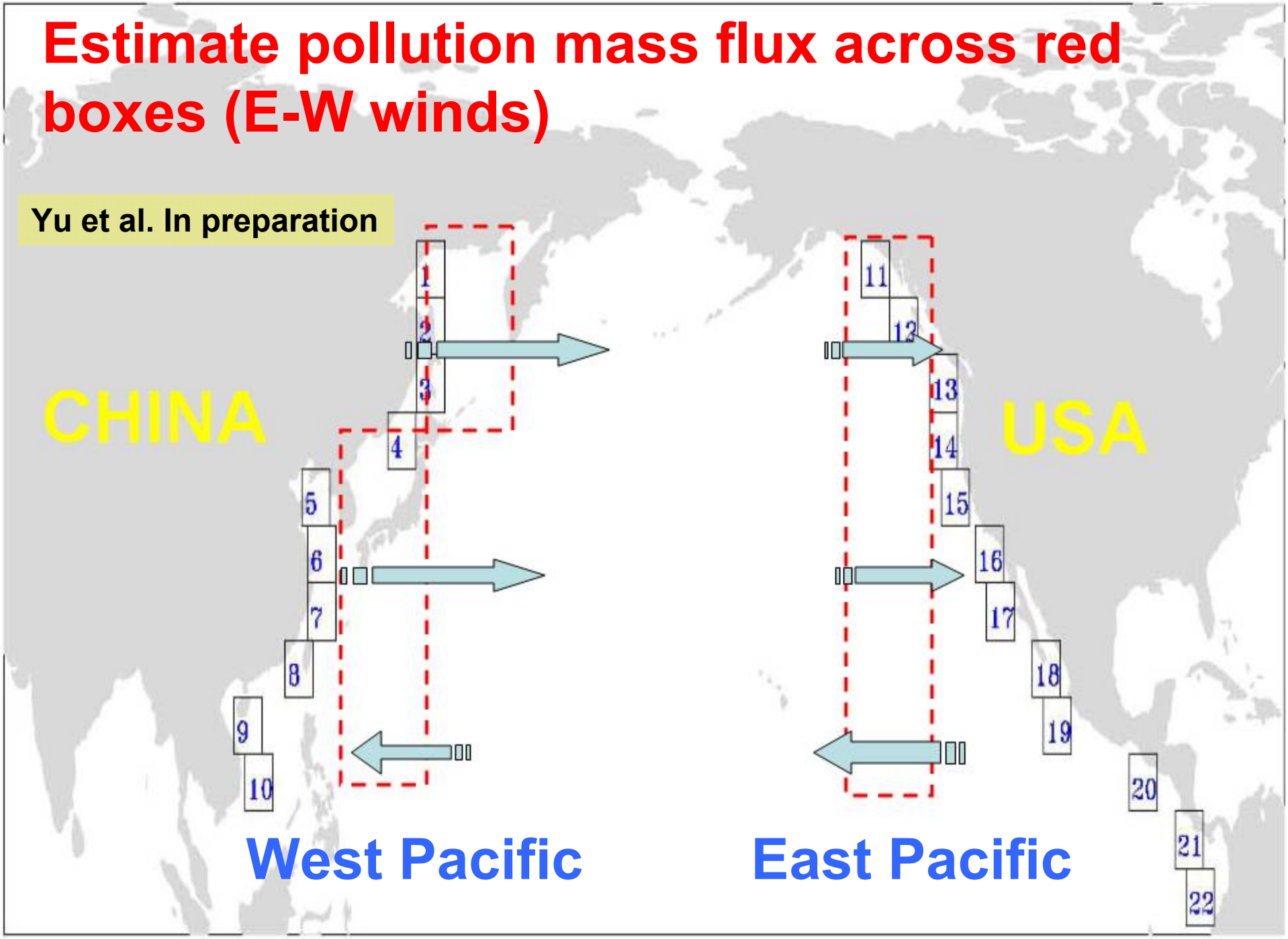
Need to update fossil fuel emission for BC/OC !!!

2.52 Tg



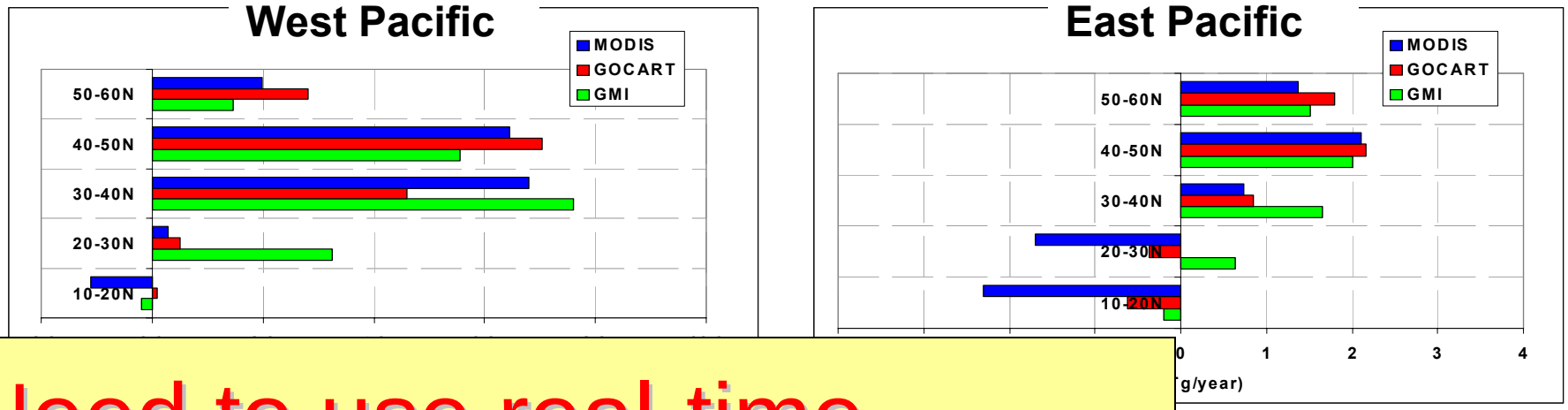
Estimate pollution mass flux across red boxes (E-W winds)

Yu et al. In preparation



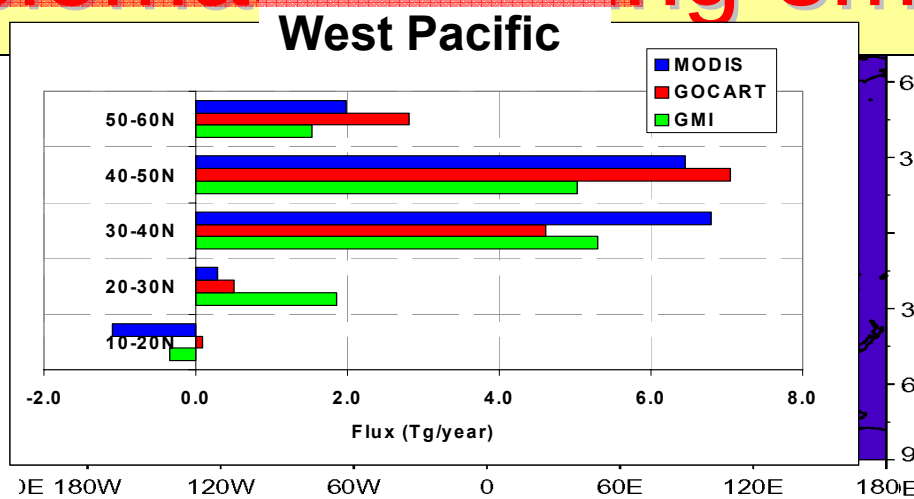
Pollutant fluxes of MODIS / GOCART / GMI

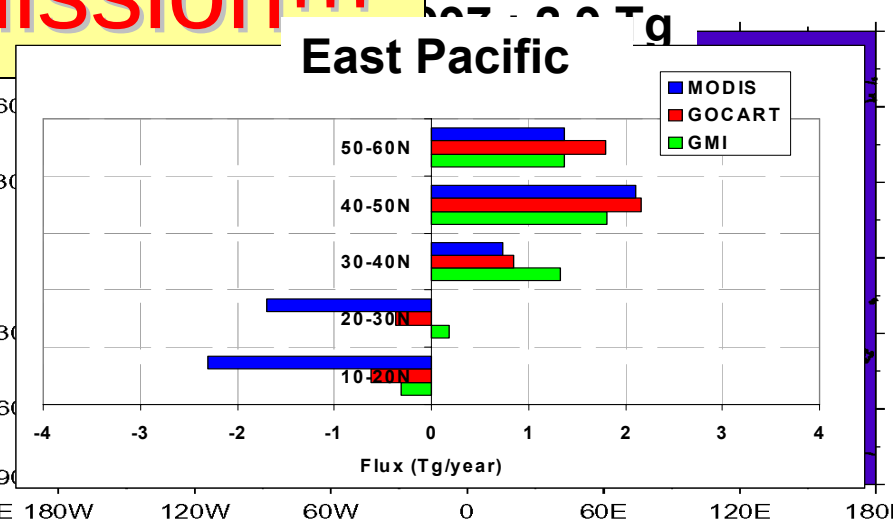
Year 2004

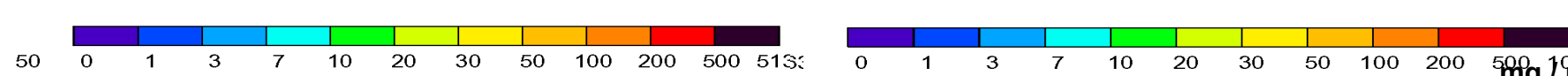


Need to use real-time biomass burning emission!!!

New BC/OC emission

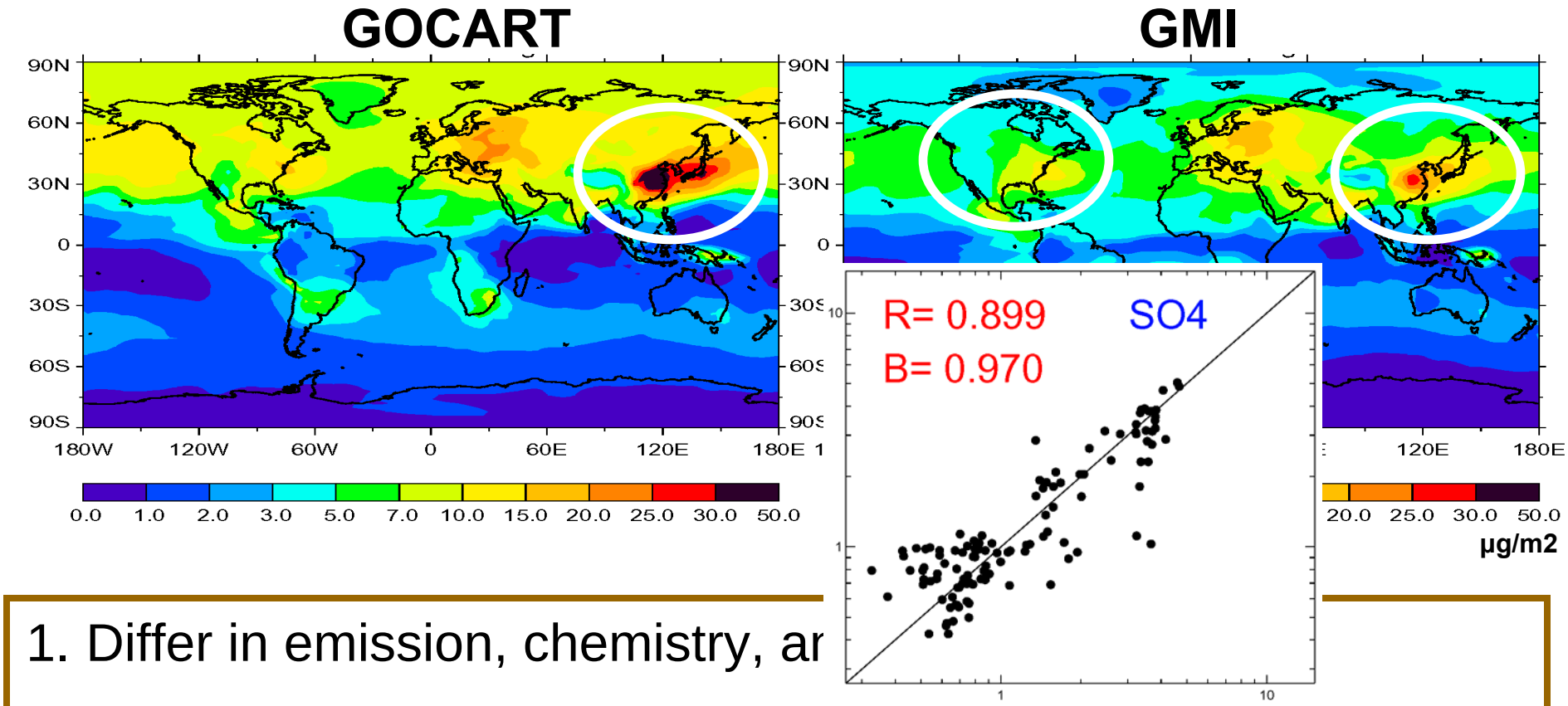






mg / m2

Column Sulfate

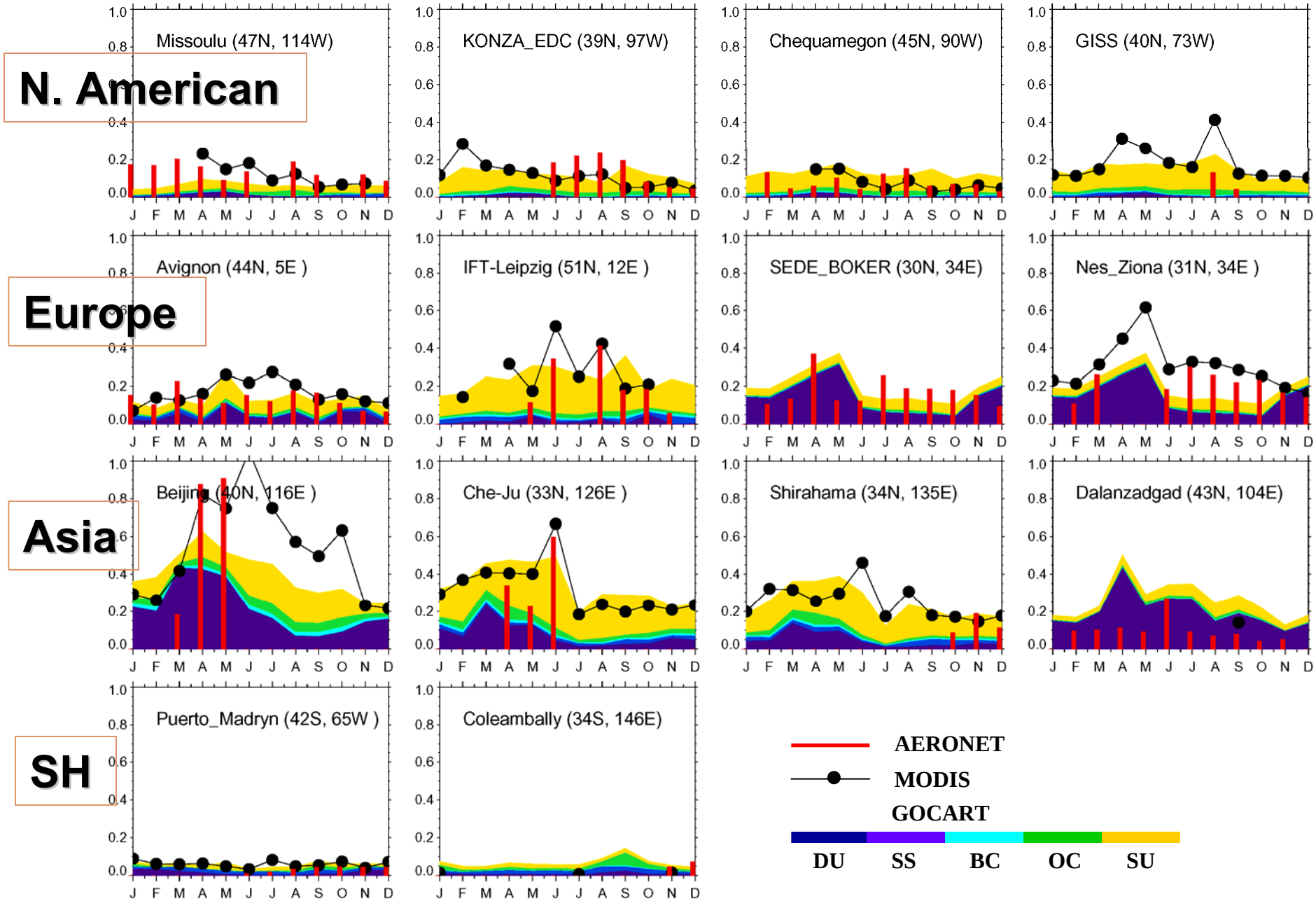


1. Differ in emission, chemistry, ar

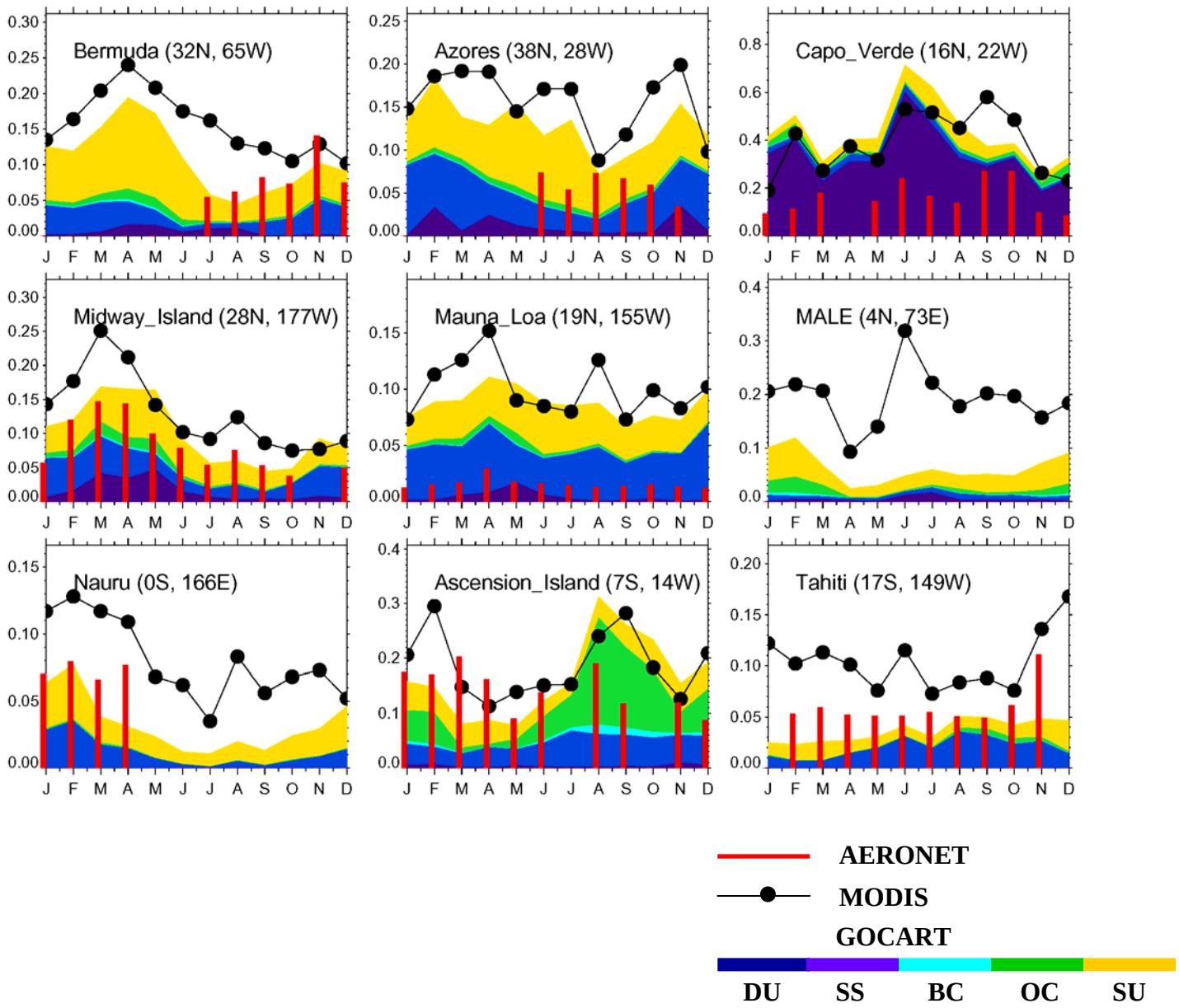
2.

	burden(Tg)	lifetime(days)	emission(TgS/month)		
			DMS	SO2	SO4
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 …