What can we learn from the comparisons of aerosol simulations by GMI and GOCART

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Mian Chin, Xiaohong Liu, Joyce Penner, Minghuai Wang, Thomas Diehl, Jose Rodriguez, Bryan Duncan, Susan Strahan Use GMI as a test bed to identify and reduce uncertainties in global aerosol simulations

Approach

Compare aerosol simulations from two offline global aerosol models: GMI and GOCART

Similarity of the simulations: same spatial resolution; same driving assimilation meteorological fields (GEOS4); and same dynamical transport.

Differences in the simulations: different emission, wet scavenging, chemistry, and aerosol optical properties. (Simulations indicate uncertainties due to these processes)

≻The study period is April 2001



µg / m2

	burden (Tg)	lifetime (days)
GOCART	67.9	5.1
GMI	20.7	4.2



mg / m2

Emission Dust

GOCARTGMIGinoux's algorithmGinoux's algorithmOnline calculationRead in Ginoux's dataset(from archived winds, soil characteristic, etc.)(every 6 hours)



Model-Observation Comparisons (Dust)



Model-Observation Comparisons (Dust)





	burden (Tg)	lifetime (days)
GOCART	18.1	0.74
GMI	4.8	0.47

Emission





Model and observation comparison (Sea-salt surface mass)



Ocean Wind (sqrt(u**2+v**2))



Max: 12.5 m/s Avg: 5.5

Max: 10.4 Avg: 4.7

GEOS4 is 17% higher than GEOS3

AOT at 550nm





GOCART





Comparison (model and AERONET)



Compared with AERONET measurement, model AOT is globally higher for GOCART and lower for GMI.











Sea-salt mass extinction coefficient used in UMI and GOCART





Summary

- 1. There are significant difference between aerosol mass and AOT distributions simulated by GOCART and GMI, even if we use the same meteorological fields.
- 2. GOCART has an advantage in calculating emissions of DMS, dust, and sea salt on line and the emission reality is relied on the driven meteorological fields;
- 3. The lifetimes of aerosols in GMI are significantly lower than those in GOCART, which suggests the importance of different treatment of wet removal.
- 4. Model evaluation using AOT from satellite and AERONET is necessary, but not sufficient.