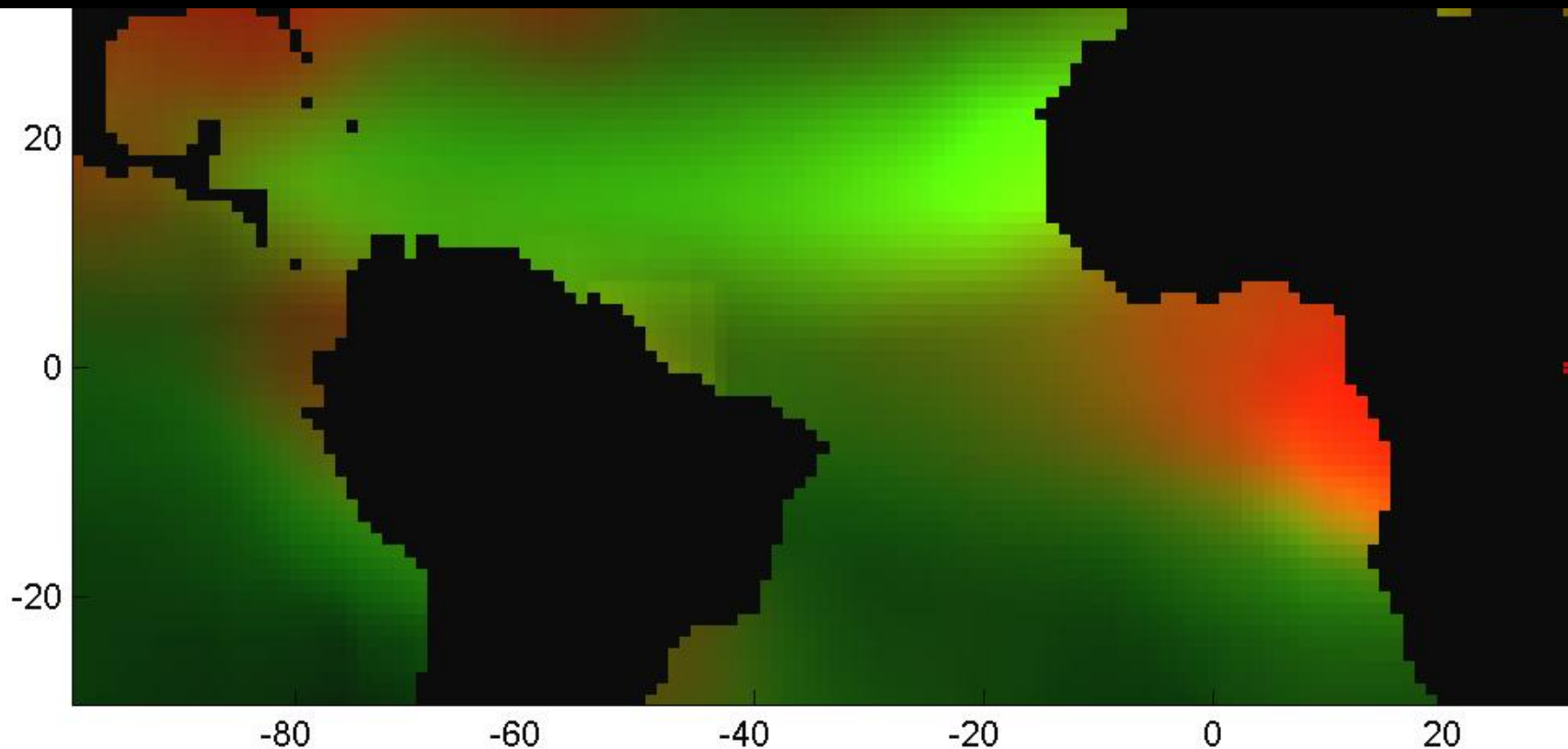


"Can MODIS derive anthropogenic aerosol?"

Kaufman, Boucher, Tanré, Chin, Remer,
Takemura





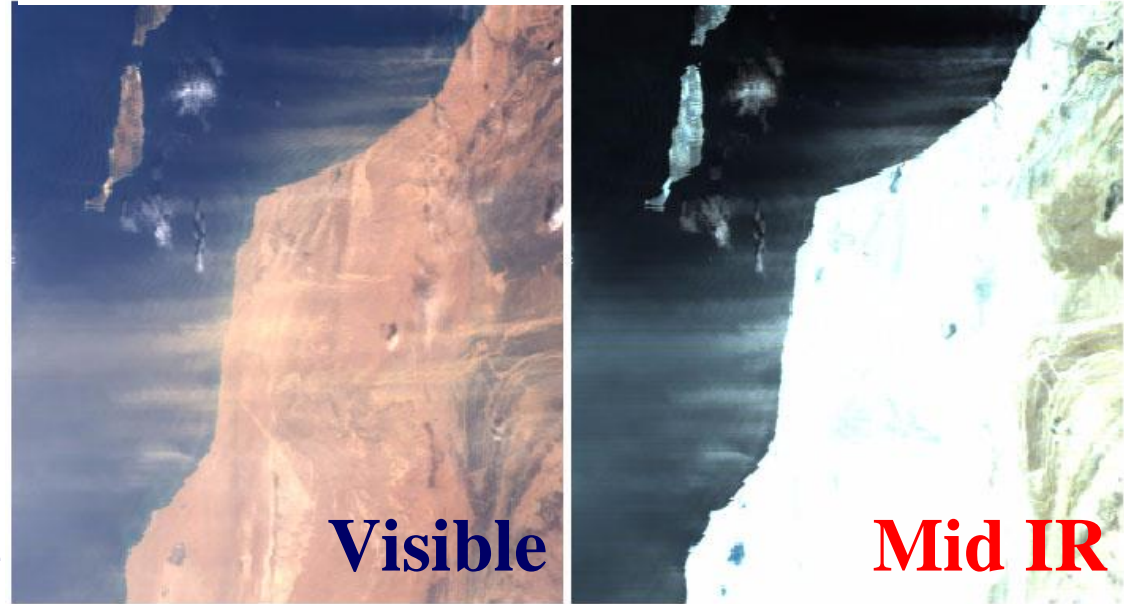
Can MODIS derive anthropogenic aerosol?

- How?
- Are the data adequate?
- Application to 2 yrs of data
- Implications to models and IPCC

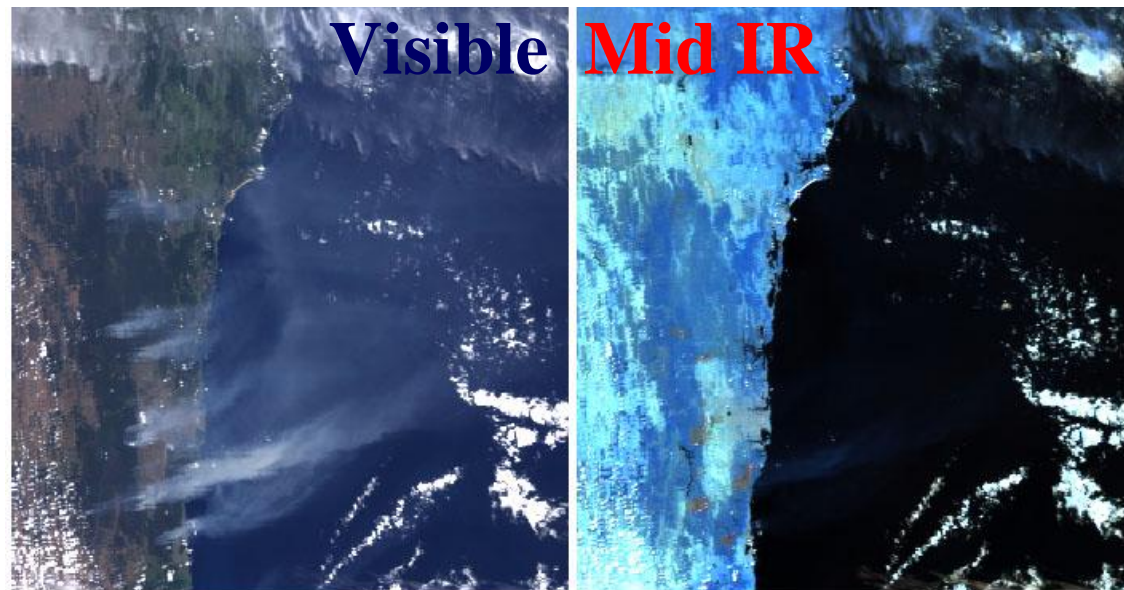
MODIS: Saharan dust, Jan. 2002

How?

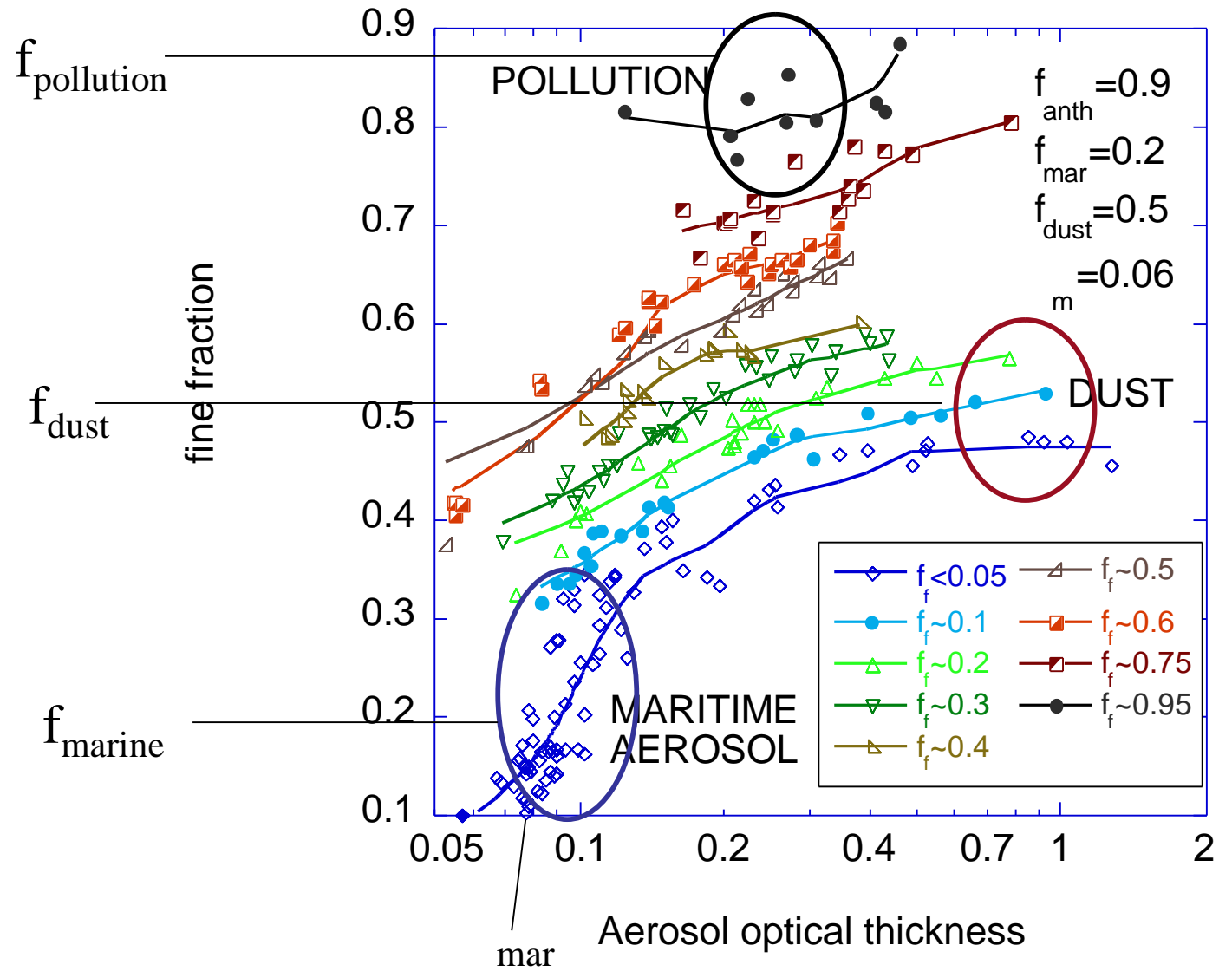
MODIS
distinguishes
fine from coarse
aerosol particles
over the oceans



Fires in Australia, Dec 2001

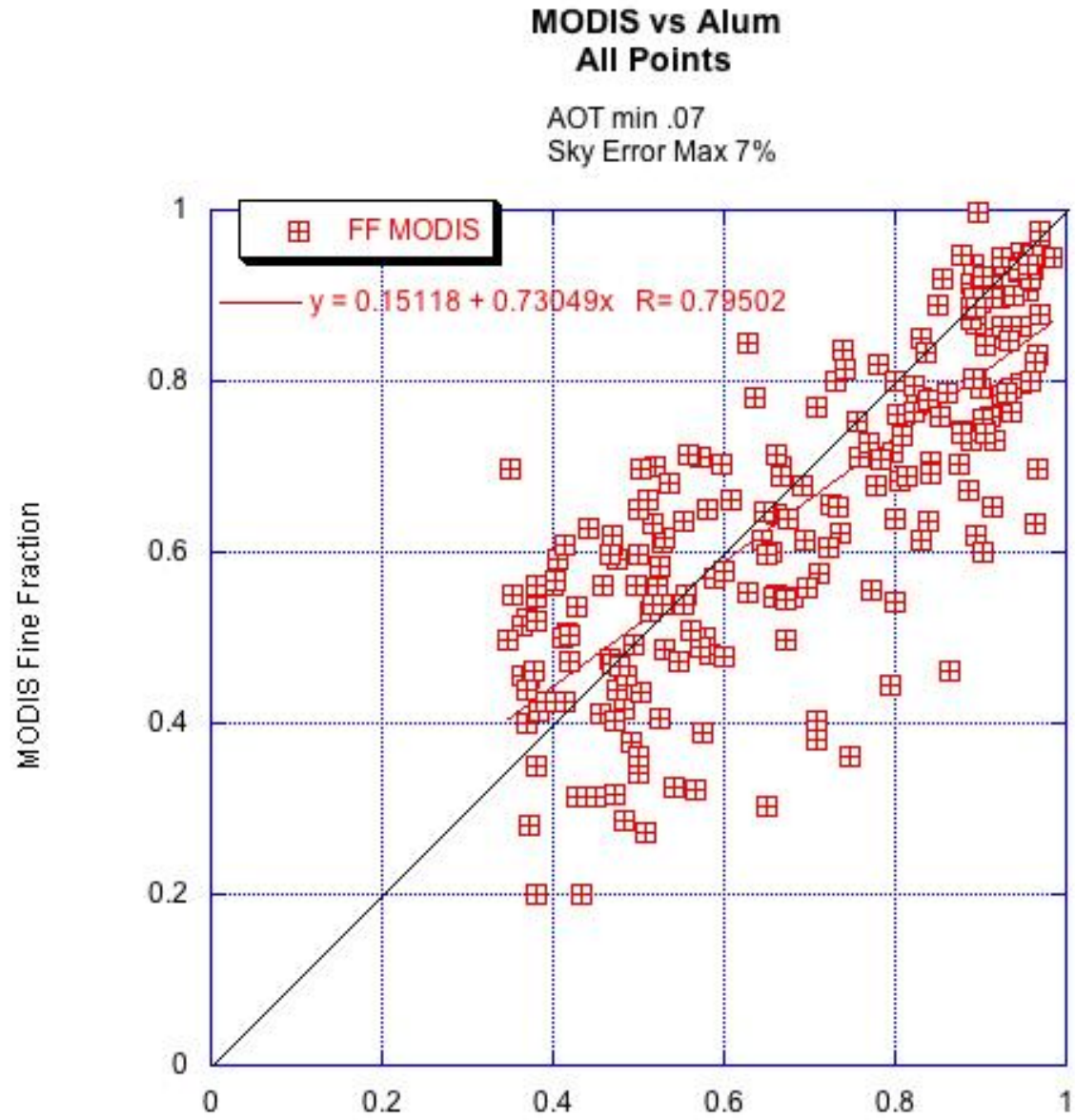


Kaufman, Tanré, Boucher,
Nature 2002



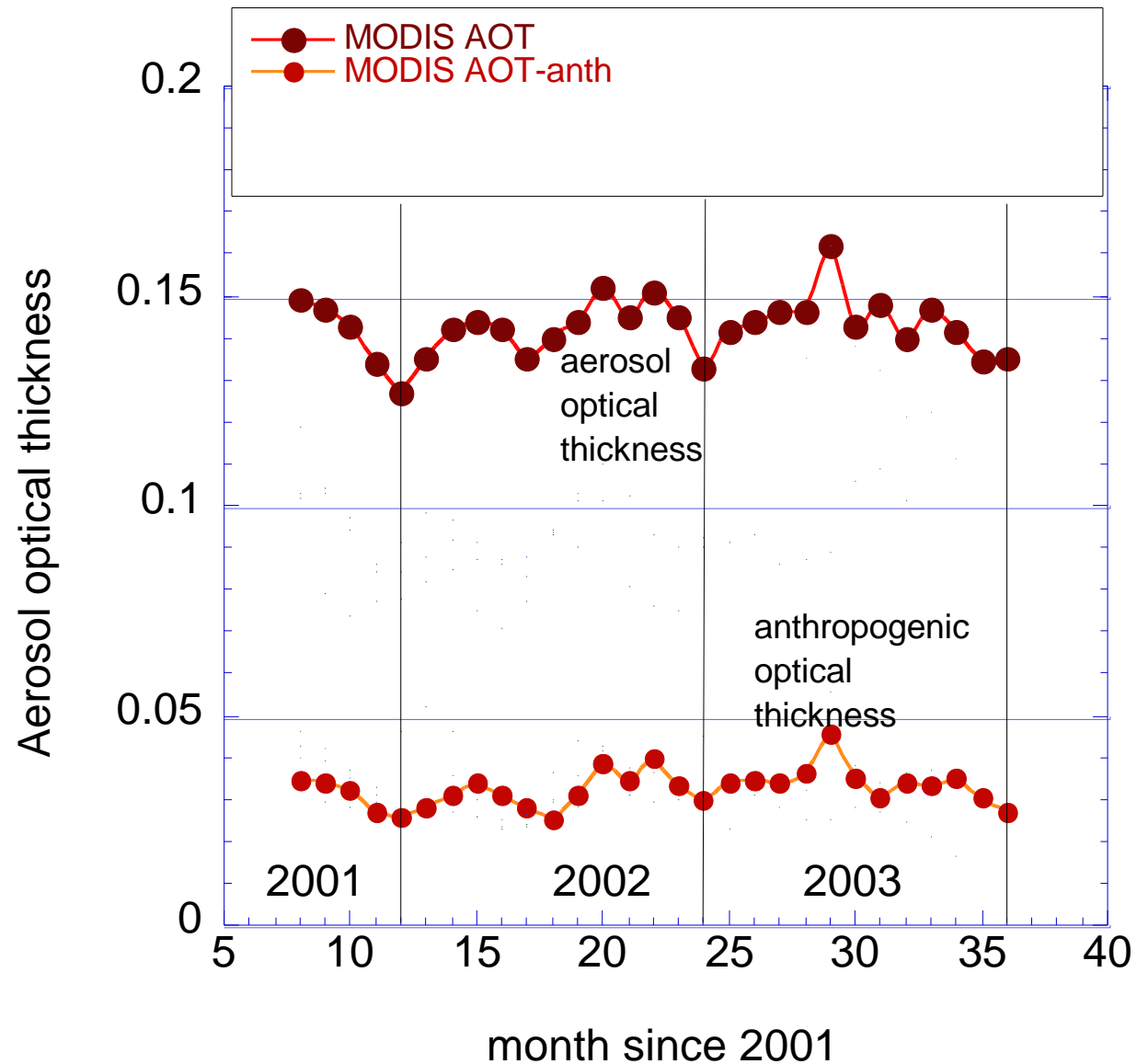
$$\text{anth} = \frac{[(f_{\text{tot}} - f_{\text{dust}})_{\text{tot}} - (f_{\text{mar}} - f_{\text{dust}})_{\text{mar}}]}{(f_{\text{anth}} - f_{\text{dust}})} ; f_f = \frac{\text{anth}}{\text{total}}$$

Rich Kleidman: validation of MODIS fine fraction

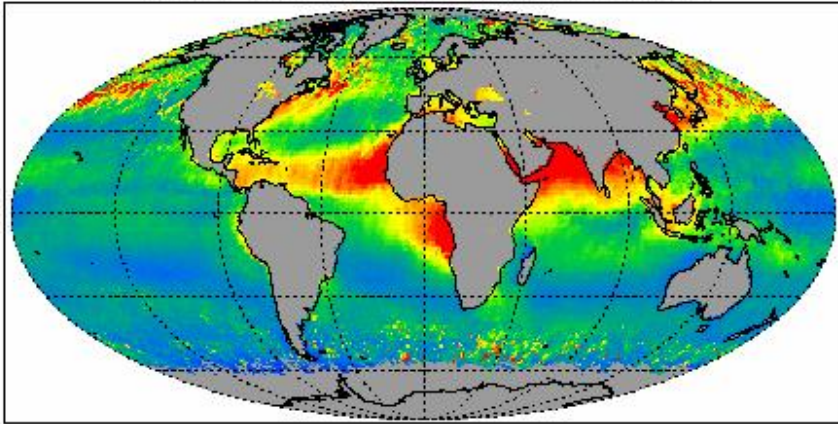


Aeronet almucantar fine fraction

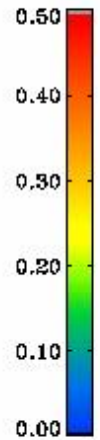
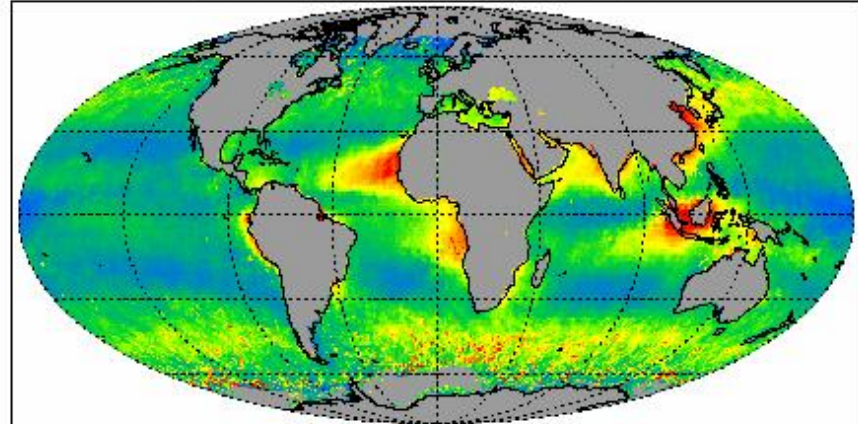
Application to 2 years of MODIS data?



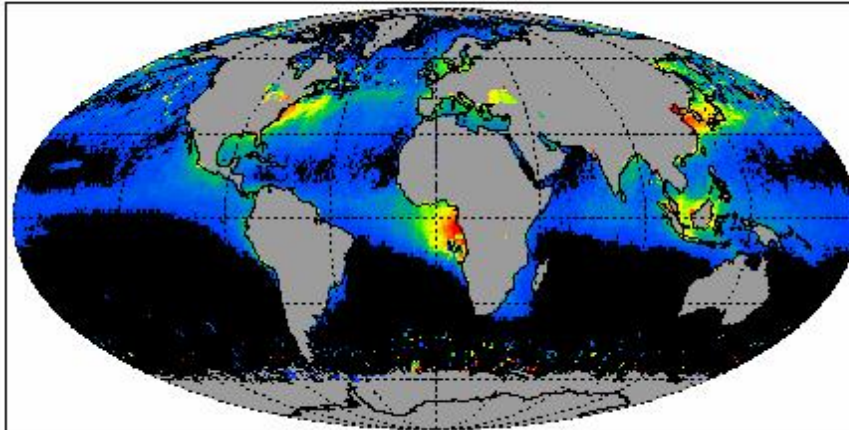
MOD08 2002 JJA (Total AOT at $0.55\mu\text{m}$)



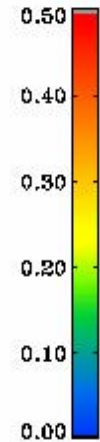
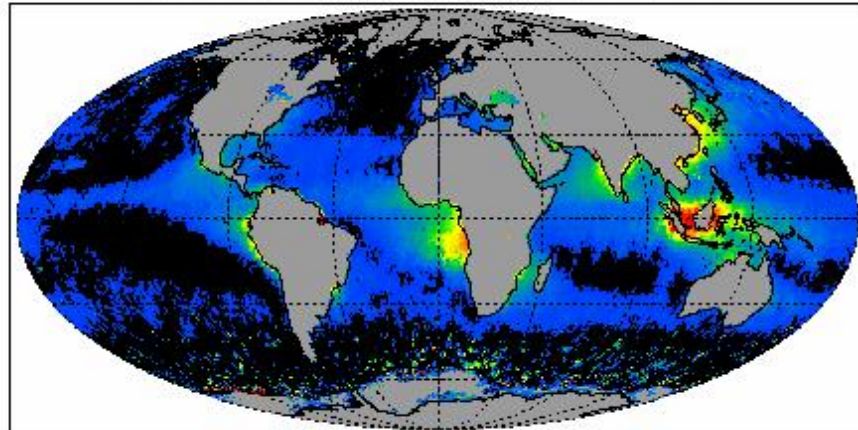
MOD08 2002 SON (Total AOT at $0.55\mu\text{m}$)



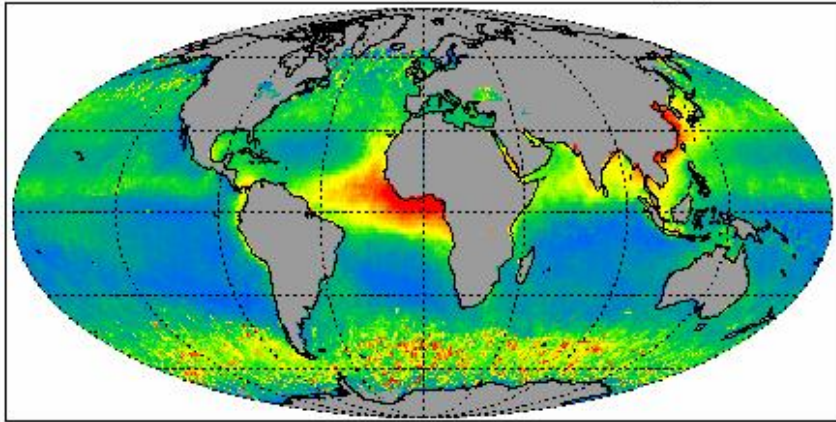
MOD08 2002 JJA (Anthropogenic AOT)



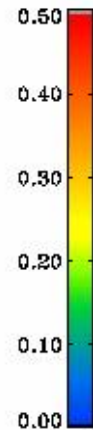
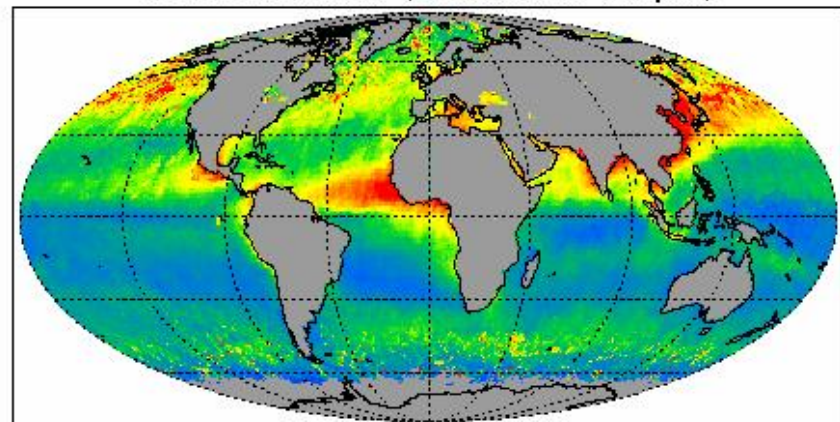
MOD08 2002 SON (Anthropogenic AOT)



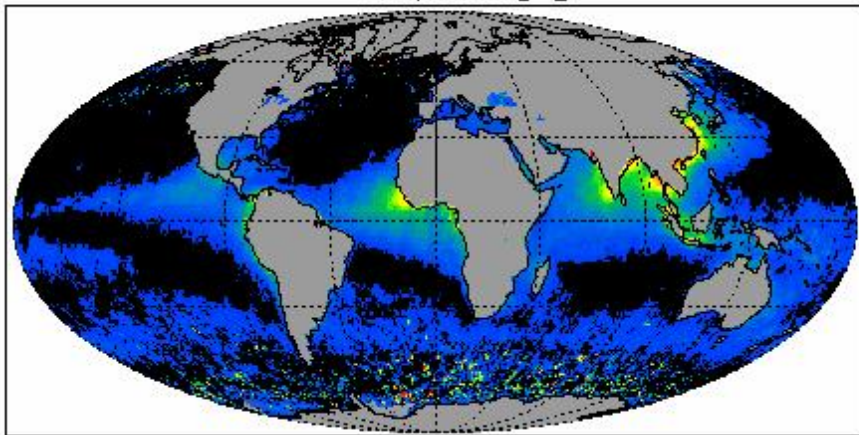
MOD08 2002 DJF (Total AOT at $0.55\mu\text{m}$)



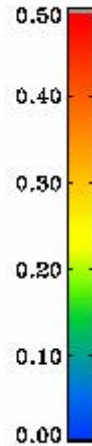
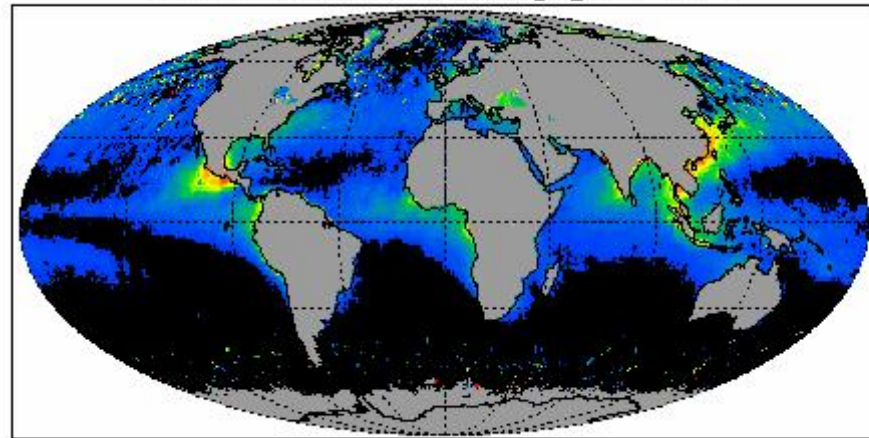
MOD08 2002 MAM (Total AOT at $0.55\mu\text{m}$)



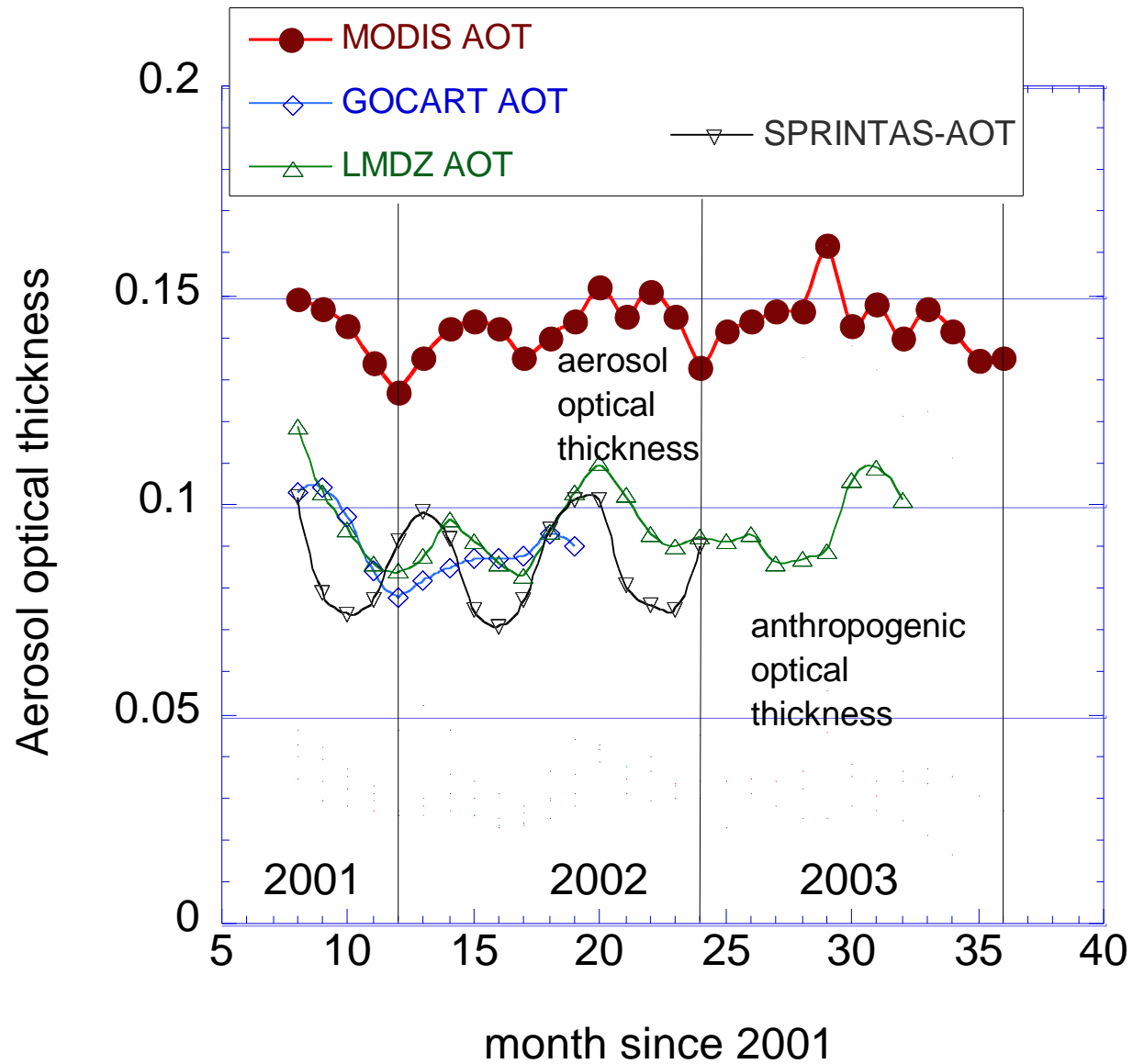
MOD08 2002 DJF (Anthropogenic AOT)



MOD08 2002 MAM (Anthropogenic AOT)

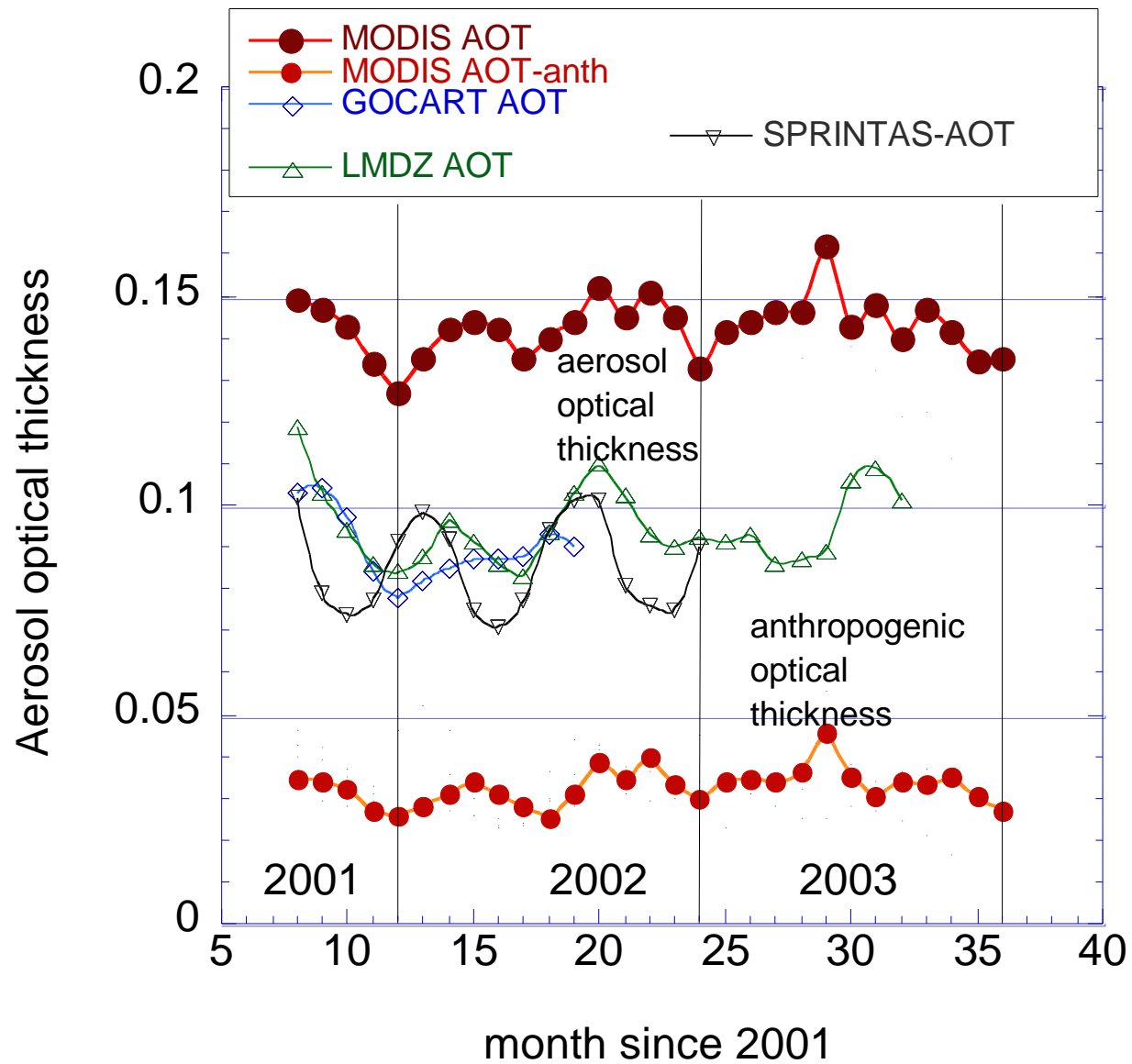


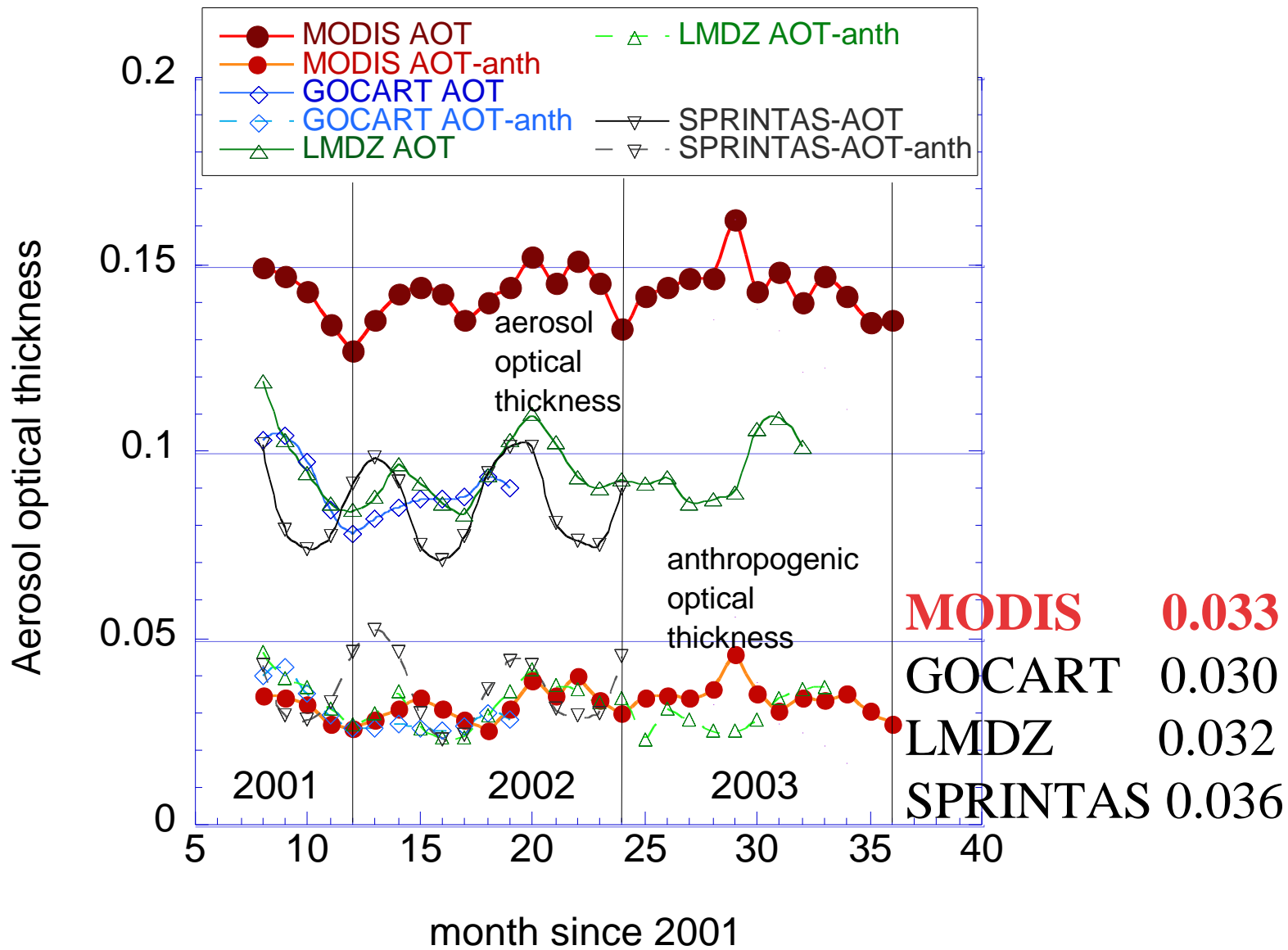
Comparison of MODIS AOT to MODELS

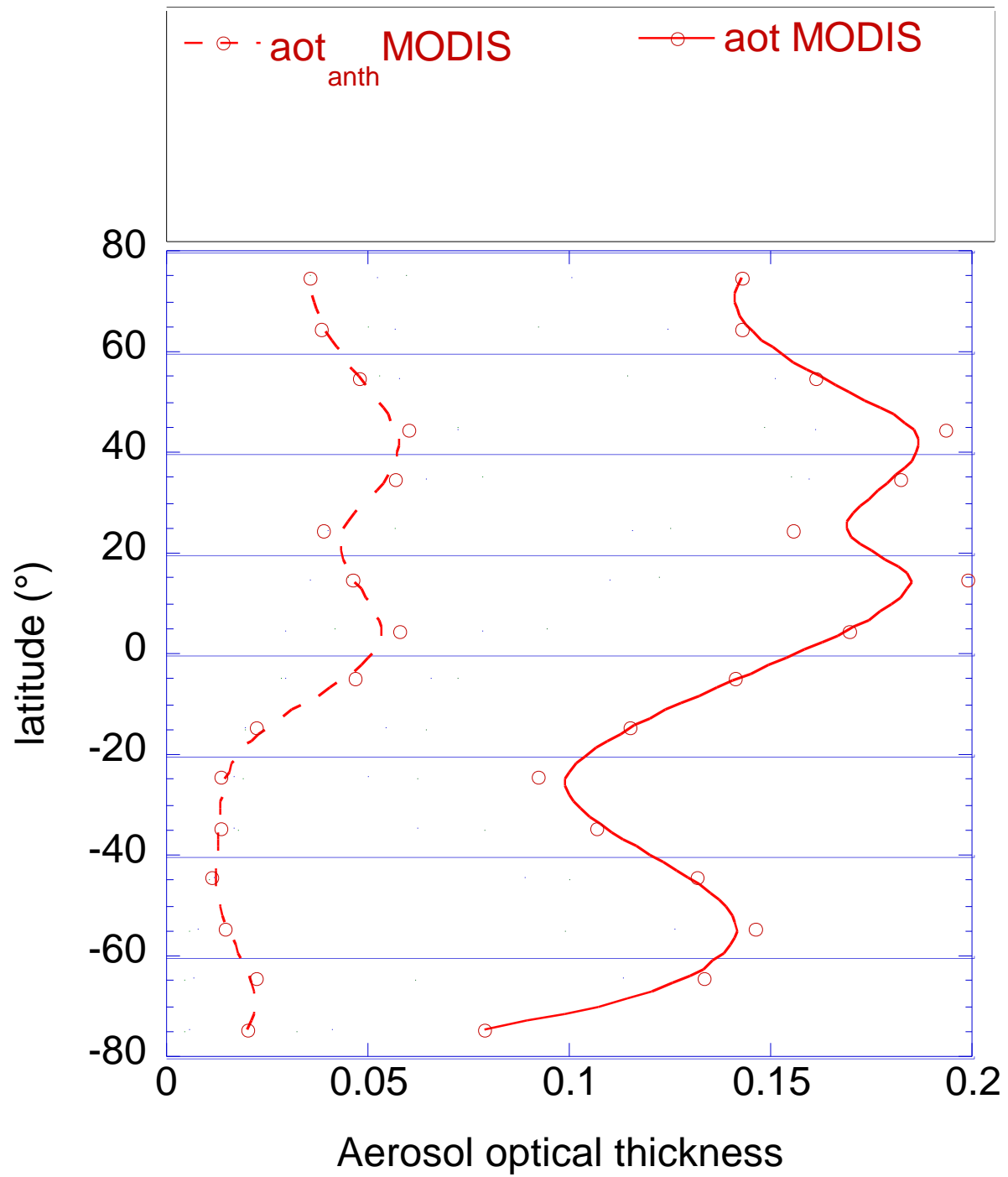


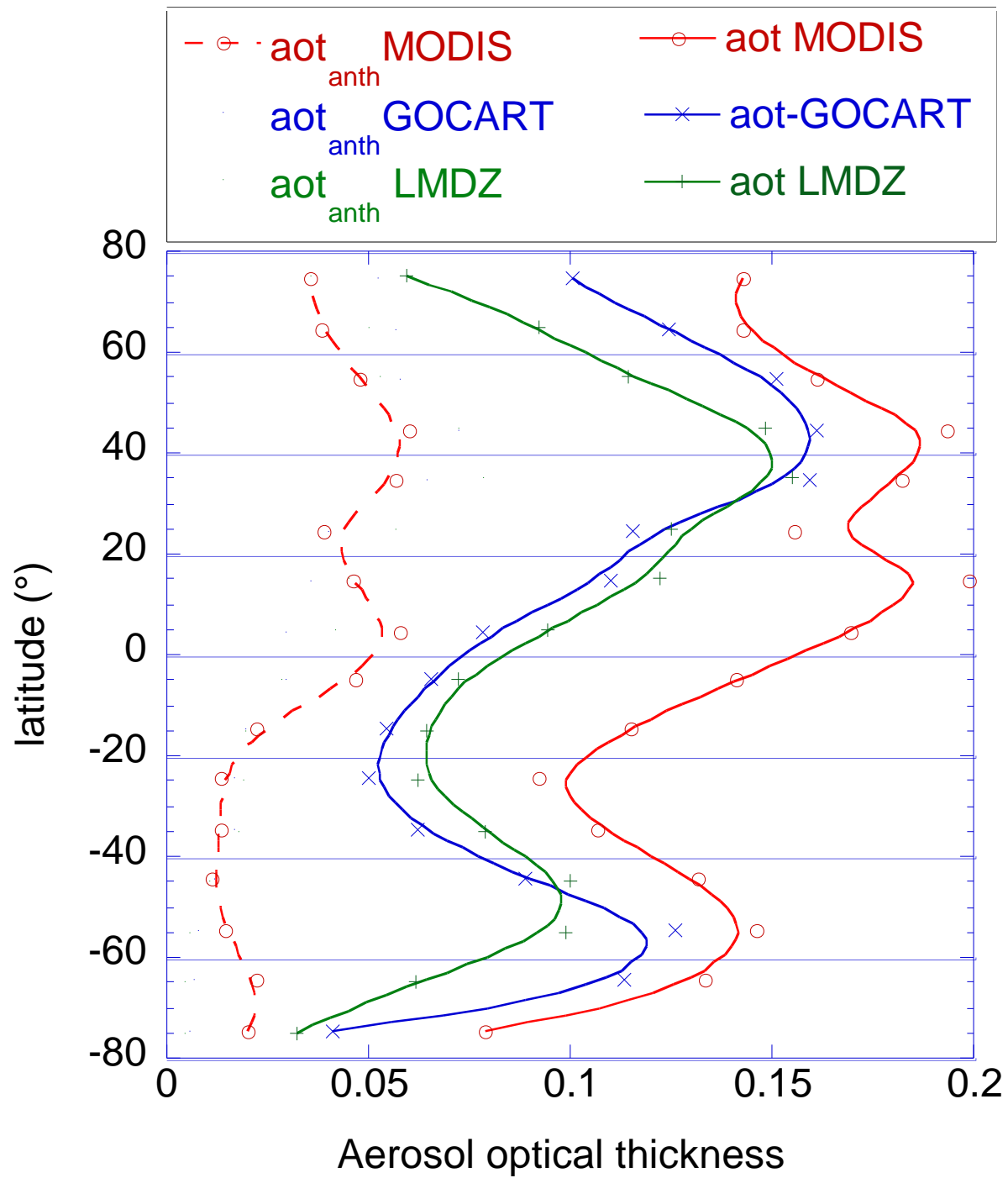
--> hypothesis:

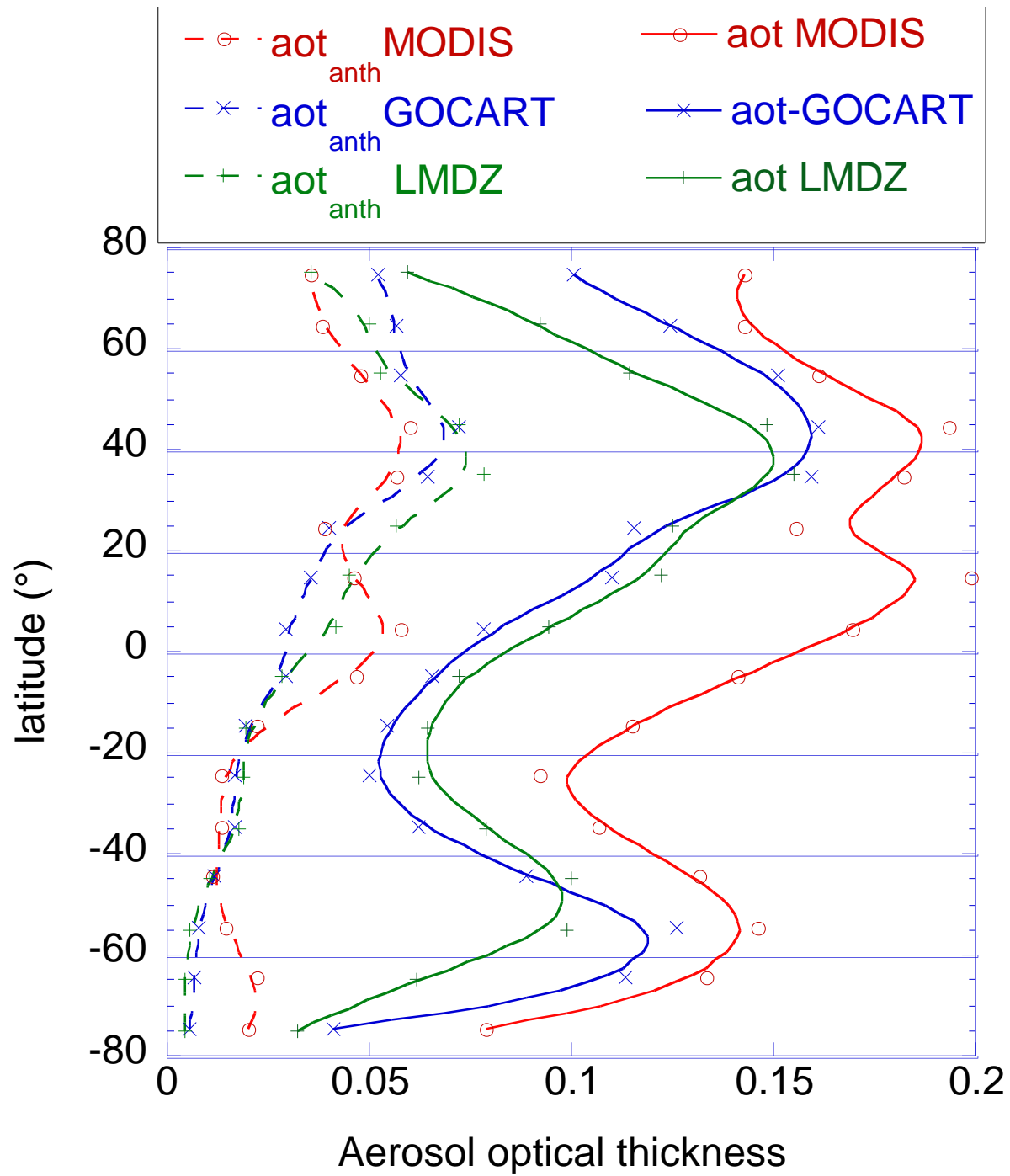
Satellites and models have larger problems with natural (mainly coarse aerosol) than with anthropogenic (mainly fine)











Conclusions:

- Satellites - MODIS agree BETTER with models regarding the anthropogenic AOT than total AOT
- Application to 2 years of global MODIS data shows that 0.21 ± 0.06 of the aerosol optical thickness has anthropogenic origin.
- Good agreements with the MODELS average anthropogenic AOT increases the confidence in their assessment of direct aerosol forcing of climate at the TOA.
- Measured direct forcing in clouds free is $-1.3 \pm 0.4 \text{ W/m}^2$.