

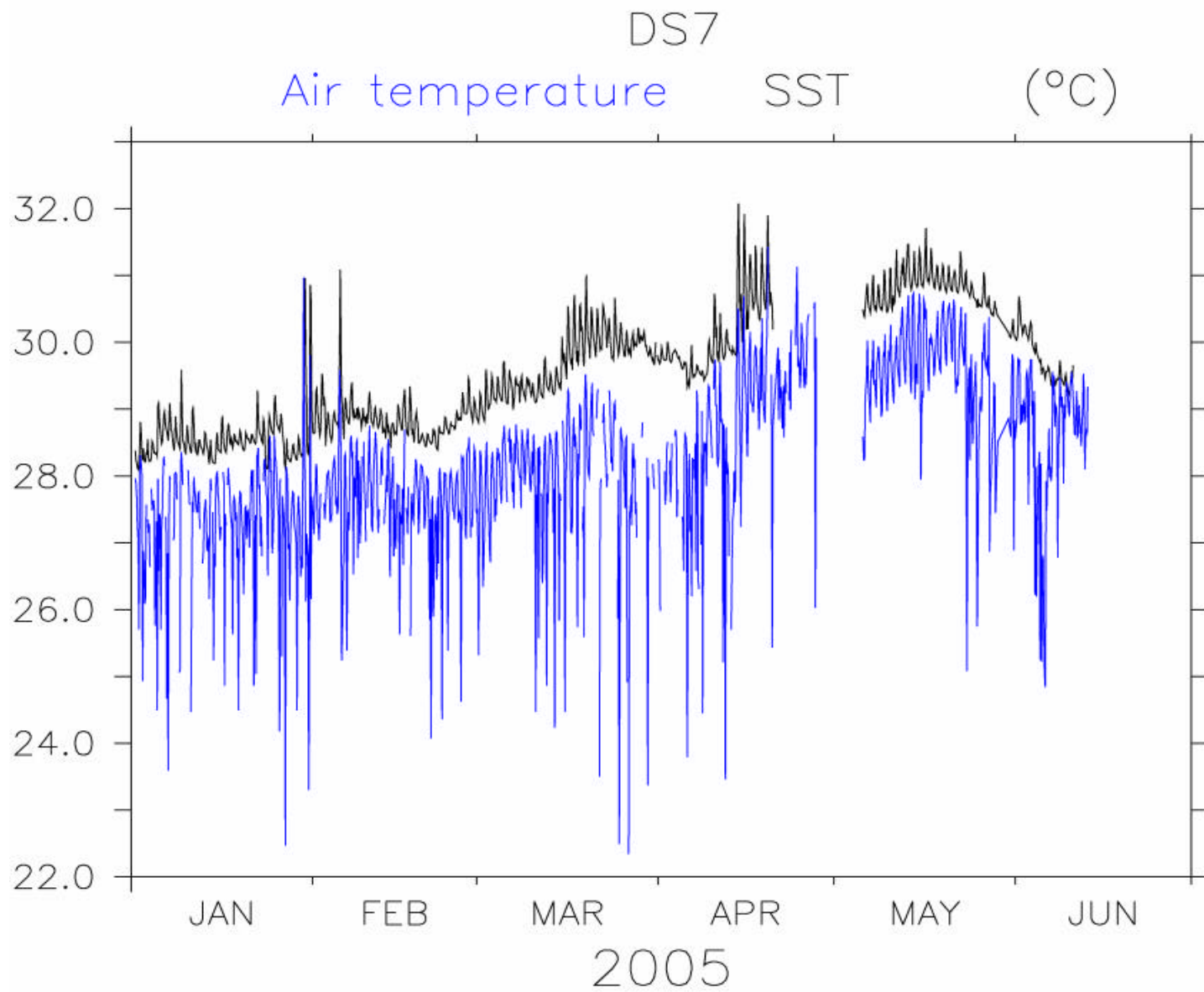
**RADIATION, AEROSOLS AND SST :
PRELIMINARY ESTIMATES FROM ARMEX
OBSERVATIONS**

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ARMEX Workshop

Goa

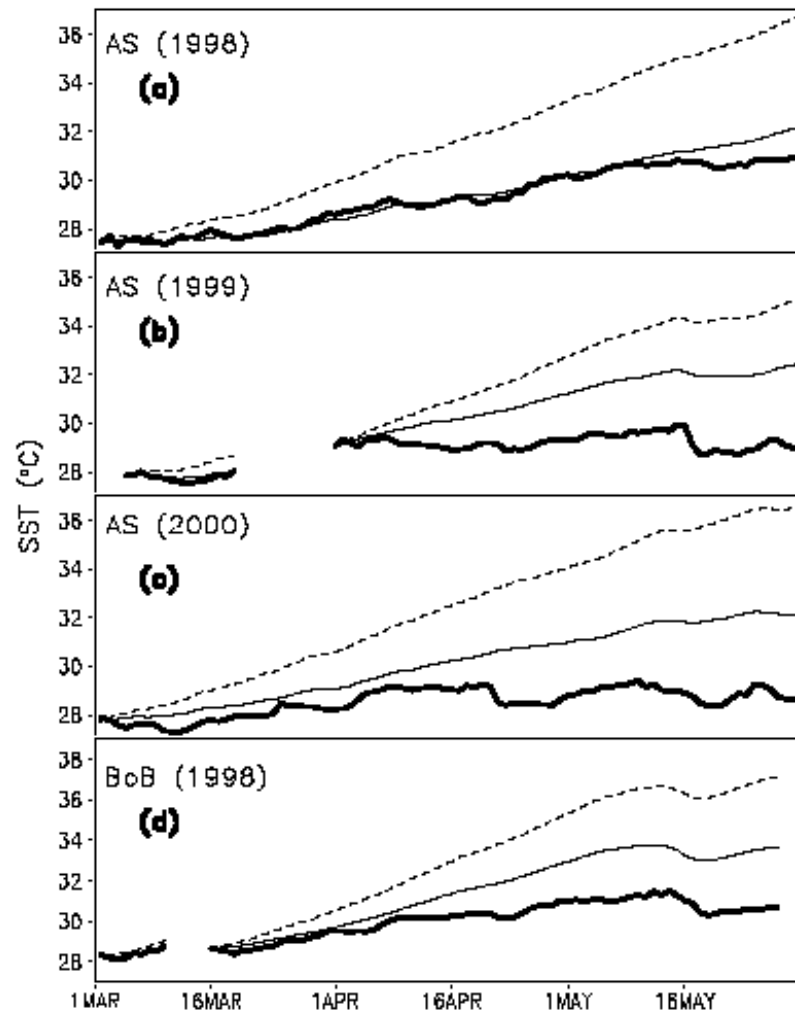
April 2006



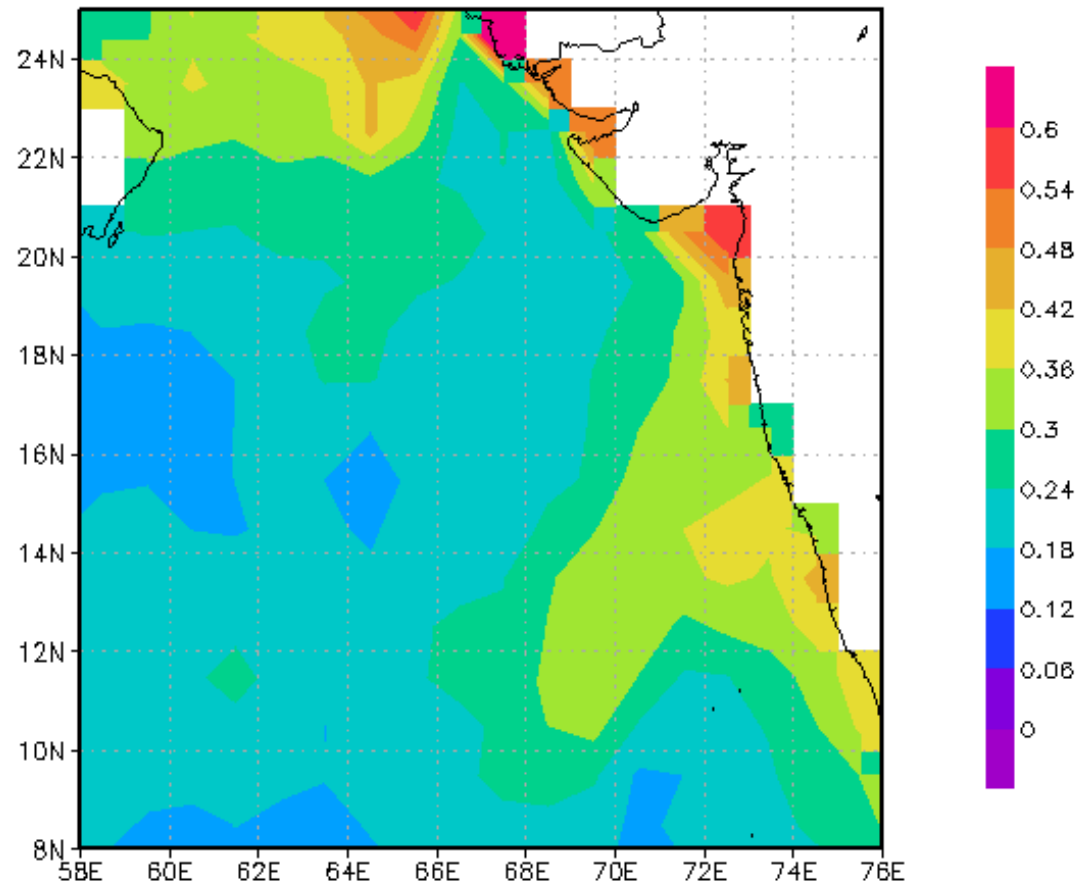


Effective Cooling: 75 Wm⁻²

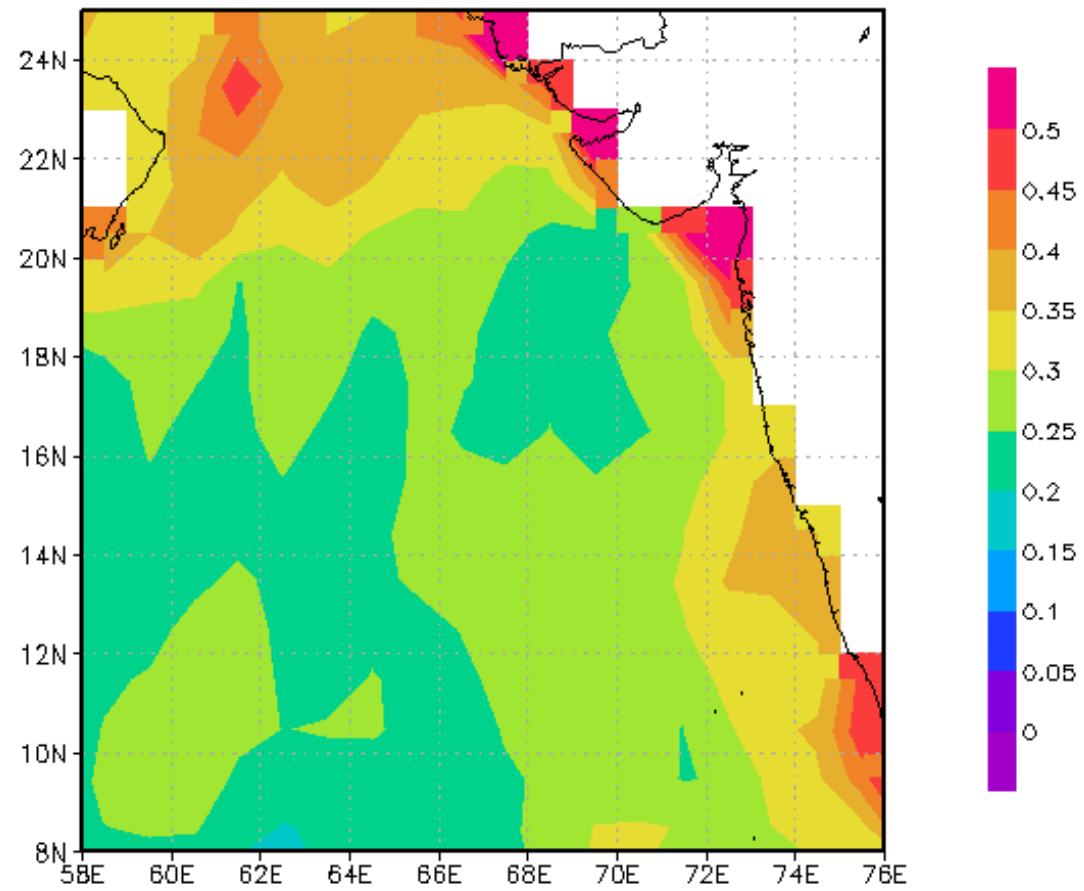
1. Webster : Ocean Advection
2. Our suggestion : Solar Penetration, Advection
3. Ramanathan : Contribution from Black Carbon Aerosol



AOD April 2005 MODIS Estimates



AOD May 2005

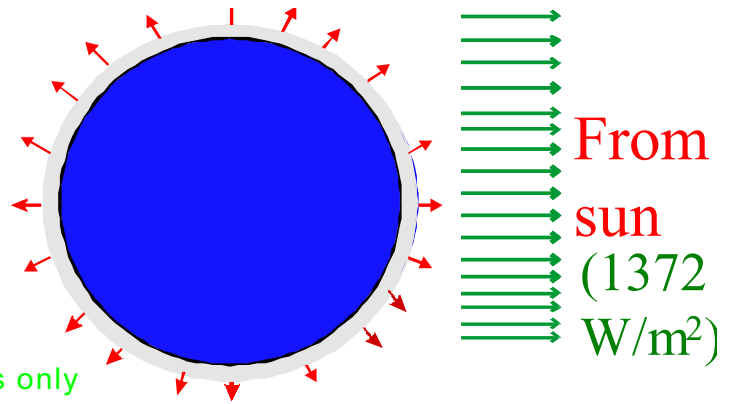


Total Aerosol cooling 2005	- 27 Wm⁻²
Increase in TOA shortwave radiation due to aerosol scattering	- 12 Wm⁻²
Contribution of BC to shortwave cooling	~ 25 %
Increased longwave at surface (based on observed properties i.e., optical depth, size distribution, chemical composition of 2005 aerosols, incorporated into radiation models)	+ 7 Wm⁻²

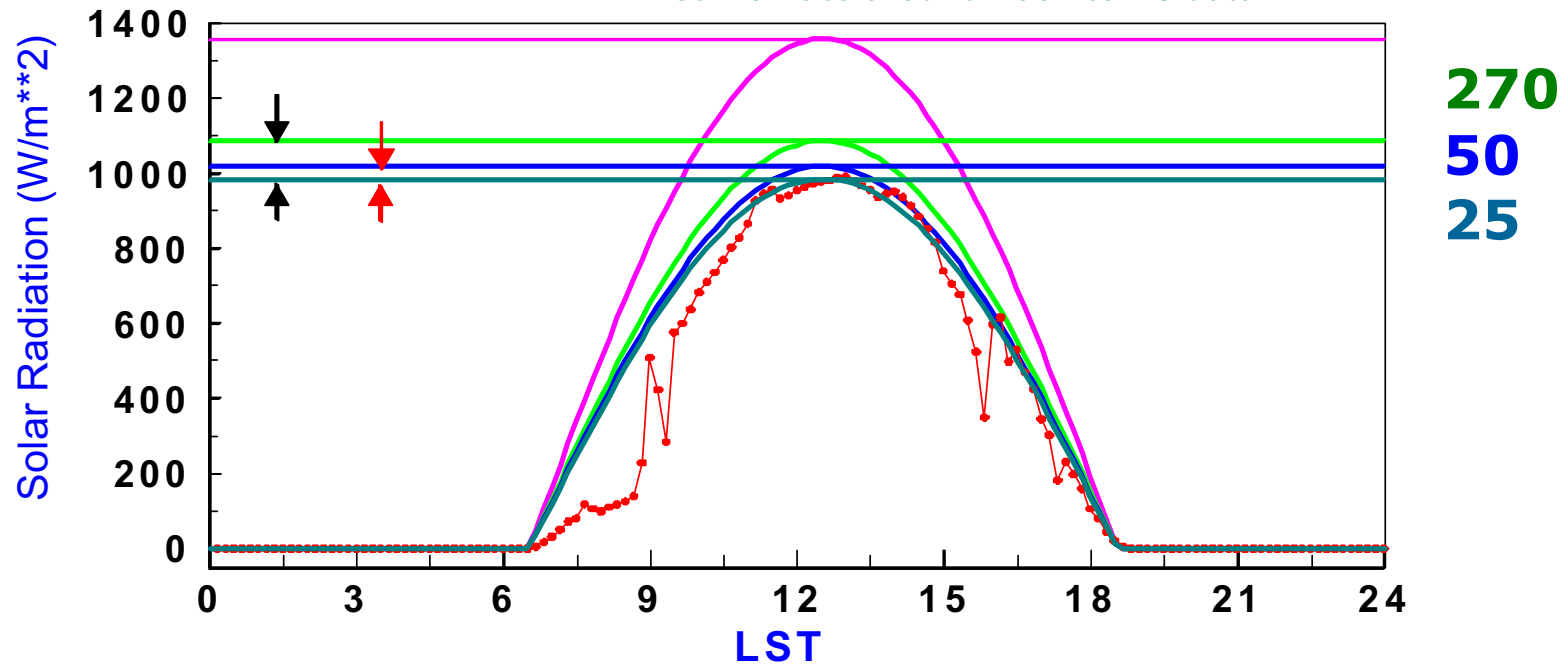
SK219 Apr-May 2005: Aerosol Attenuation: 20 Wm⁻²

(including standard marine aerosol attenuation)

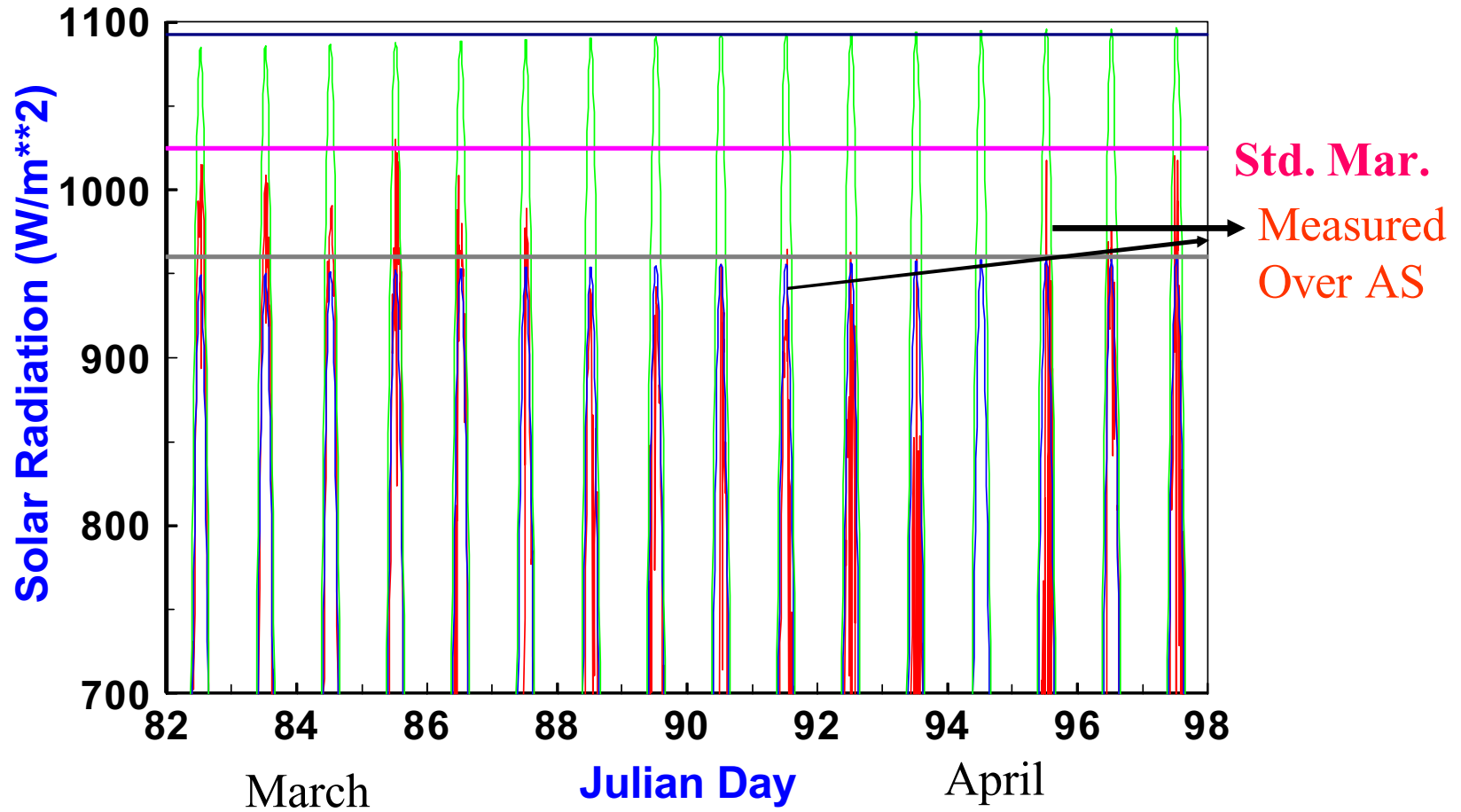
Attenuation of incident radiation due to Black Carbon aerosols: 5 Wm⁻²



- measured
- top of Atmos
- surface with gas only
- surface, gas+std. marine aerosols
- curve fit to around noon to AS data

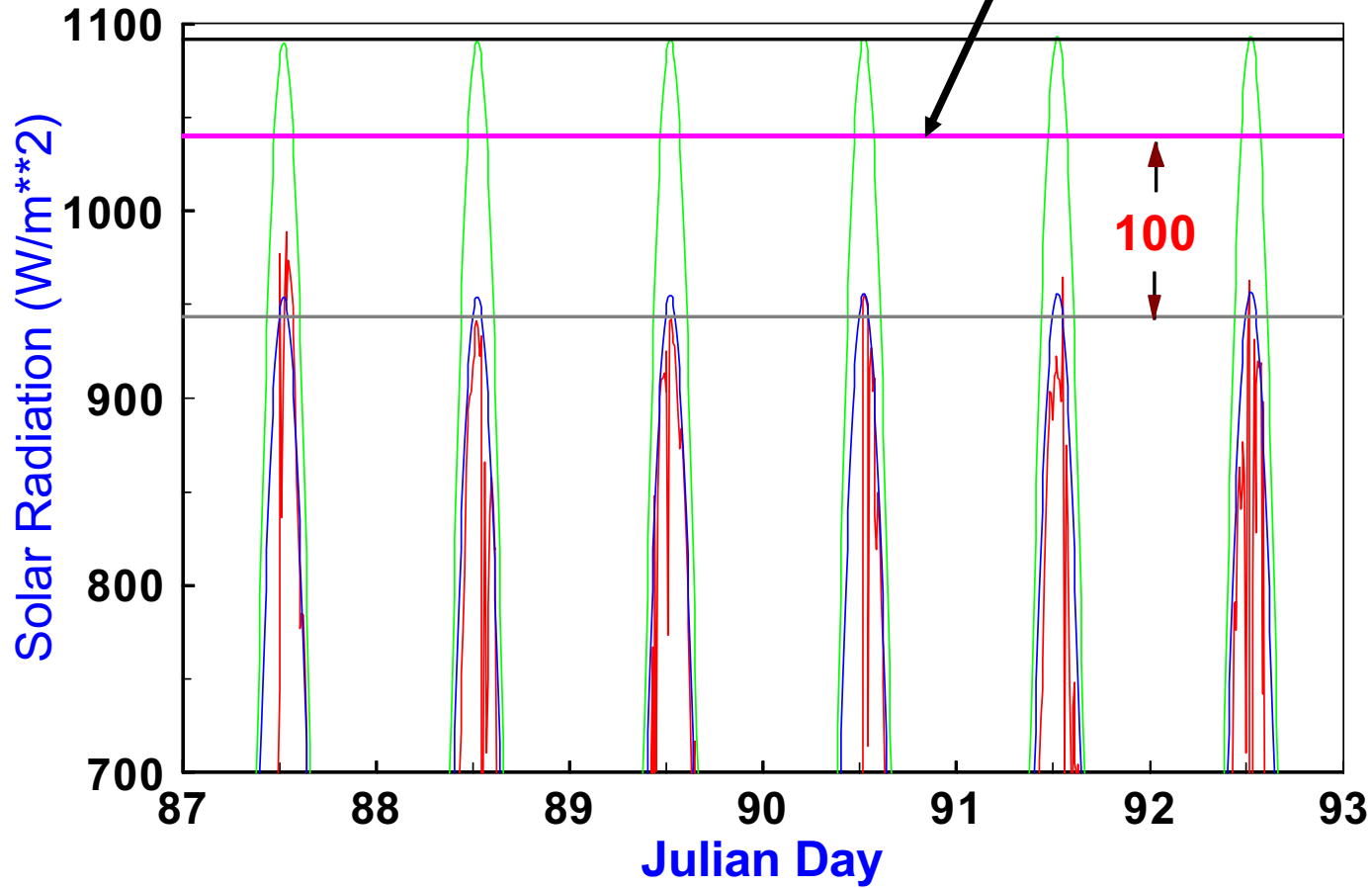


SK190 : March-April 2003



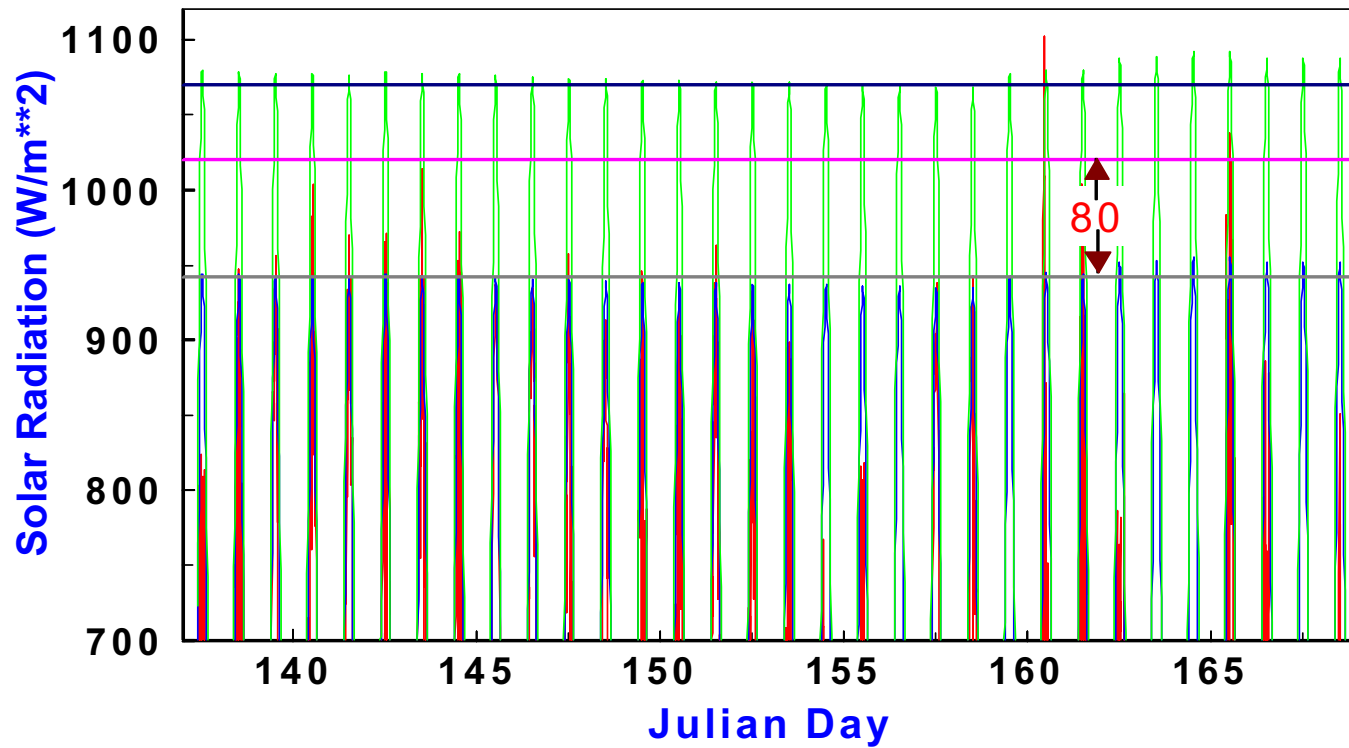
SK190: Mar 27- Apr 3 2003

Pure marine Aerosol.

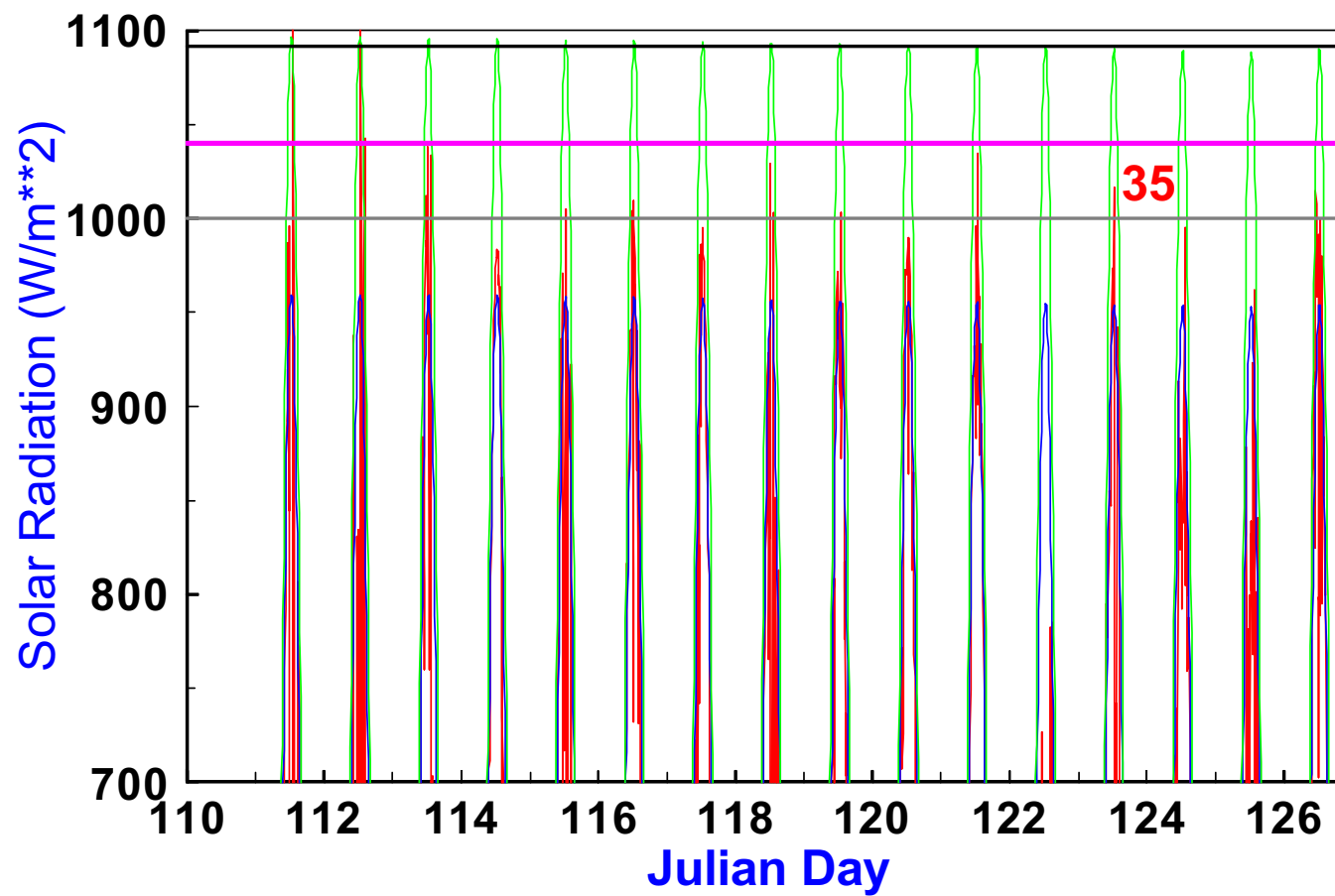


Daily value ~ 1/3 value @ noon

SK193: May 17 -June 17 2003



SK219: April-May 2005



Aerosol Absorption over the Arabian Sea

1. Amount of SW radiation attenuated by aerosols varies with time & at times, it is large ($\sim 30 \text{ W/m}^2$)
2. Pre-Monsoon season, Episodes of
 - a. pure marine
 - b. strongly absorbing ($\sim 30 \text{ W/m}^2$)
 - c. intermediate between a & b.
3. SK 219 Mean estimated attenuation due to Black Carbon: ($\sim 7 \text{ W/m}^2$)
4. Suggestion:
Explore feasibility of continuous monitoring of global SW radiation over AS

Do Black Carbon Aerosols warm the lower atmosphere ?

BC mass fraction in 2005	~ 6 %
Contribution of BC to Optical depth	~ 11 %
Contribution of BC to lower atmosphere warming	~ 85 %
Atmospheric warming (~lowest 3 km, based on Trivandrum LIDAR data)	+ 15 Wm ⁻²
Mean 2005 campaign Optical depth	~0.35
which gives 0.6°C/day warming rate of surface air (~ 2°C/day at local noon)	

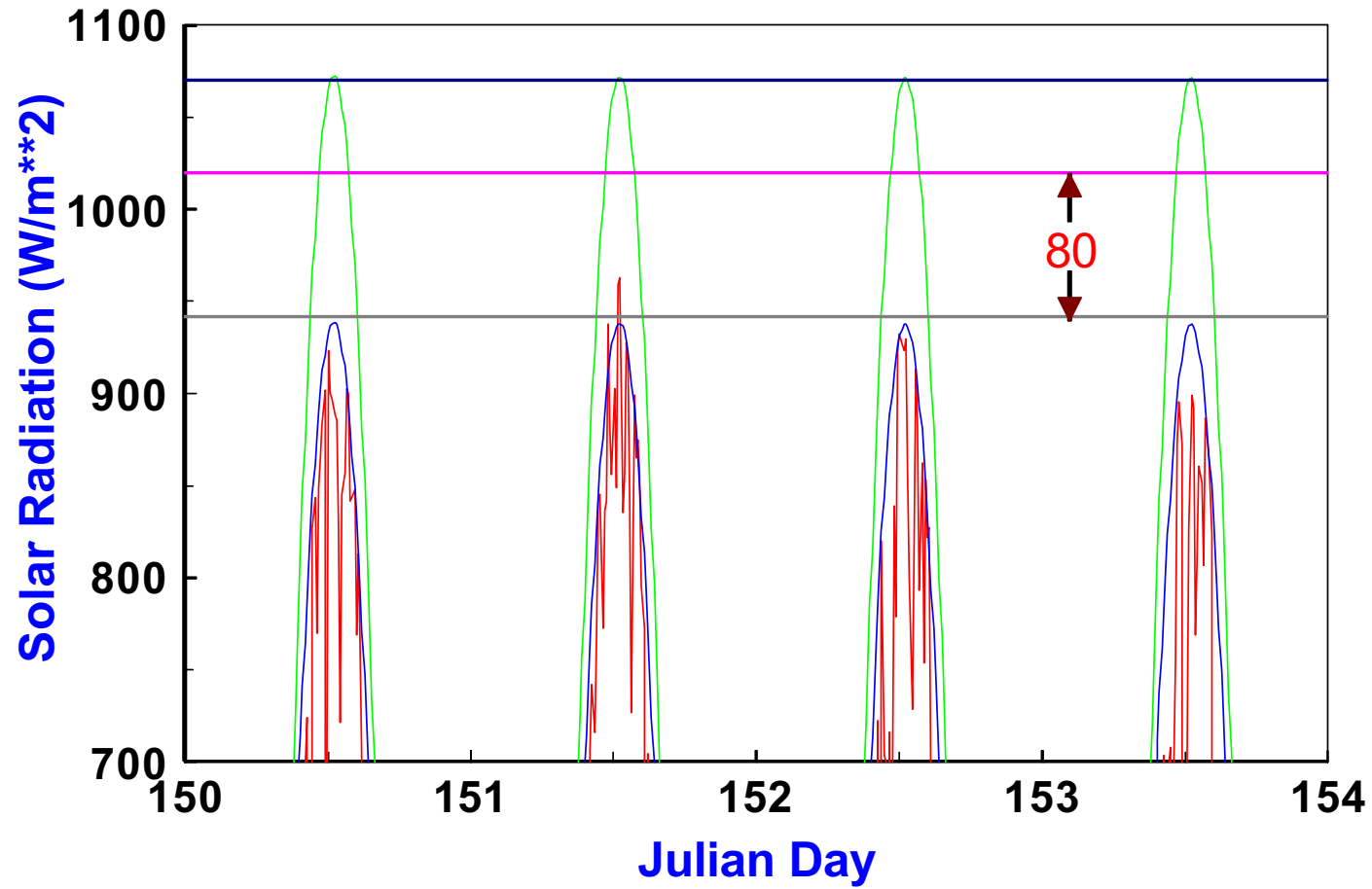
Do Black Carbon Aerosols contribute to SST cooling ?

Attenuation (reduction in surface net radiative flux)
due to Black Carbon aerosols: **$\sim 5 \text{ Wm}^{-2}$**

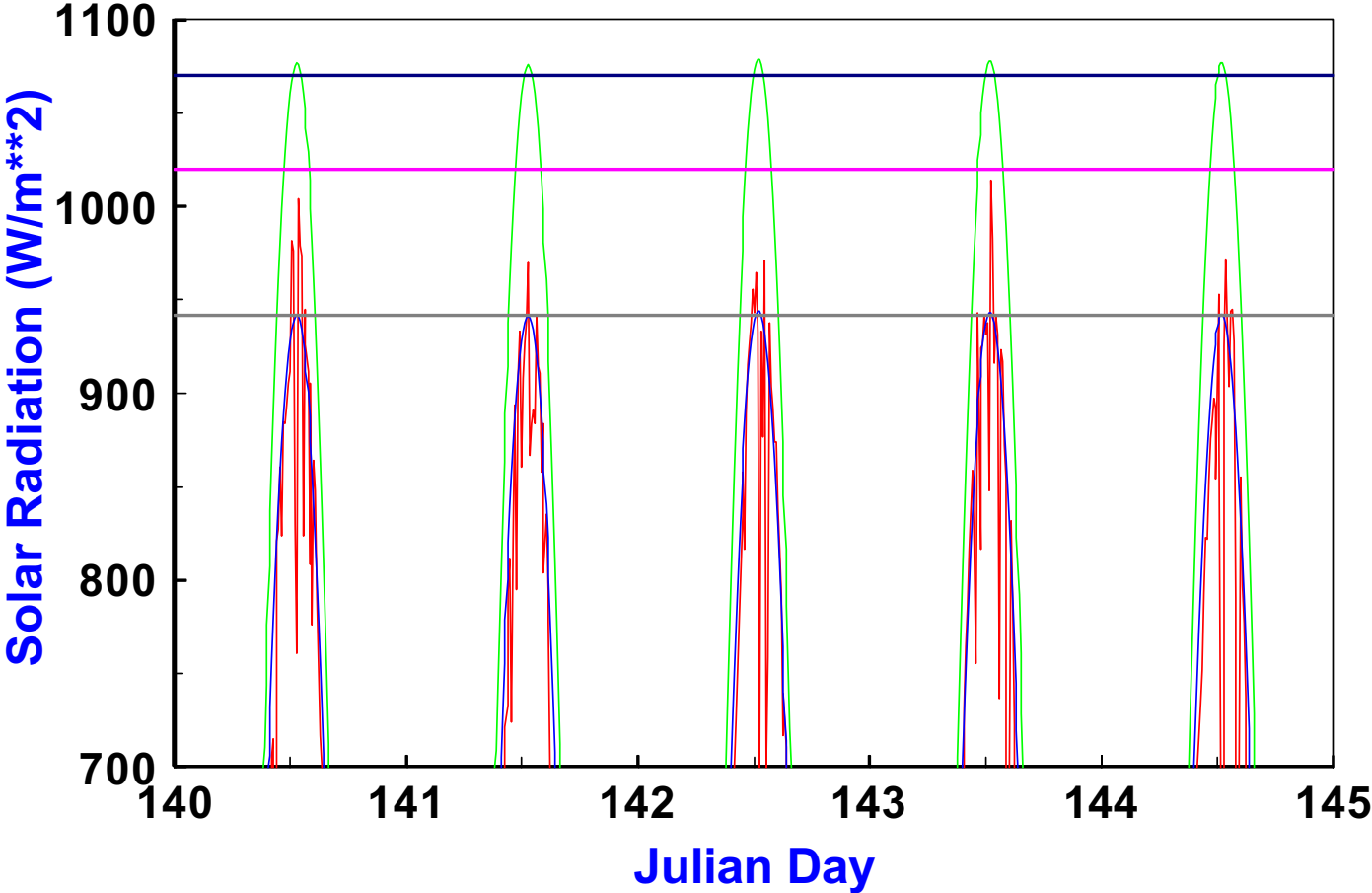
If Black Carbon warms the surface air, it would lead
to reduction in evaporative cooling (if SST, rh, winds
were unchanged) **$? \text{ Wm}^{-2}$**

?

SK193: May 30 -June 2



SK193: May 20-25



FMF May 2005

