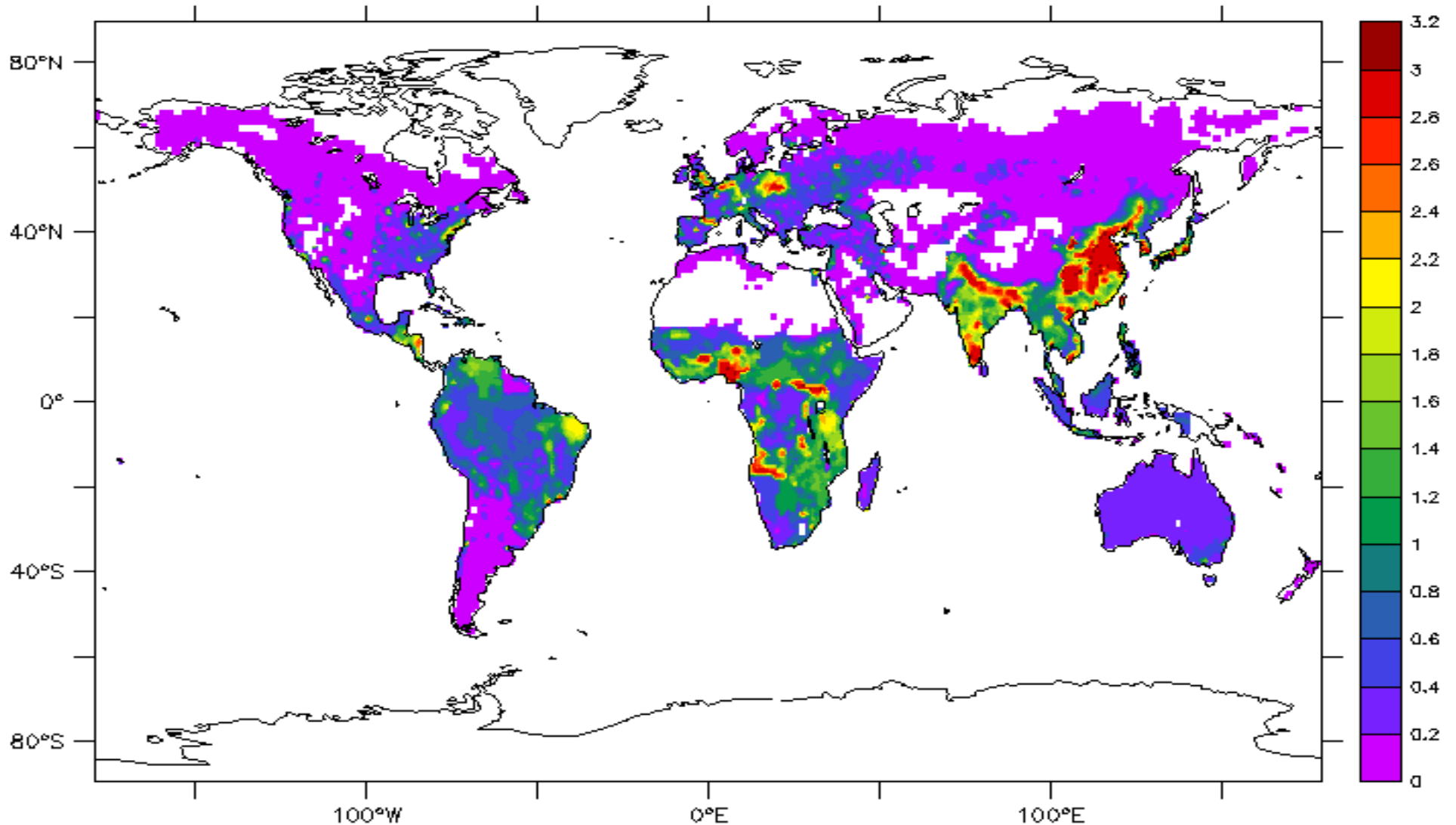


Global BC Emissions

(Tami Bond, 2002)



Previous simulation with aerosol's direct effect

Menon et al., 2002

BC-induced increased summer rainfall in southern China, decreased rainfall in northern China

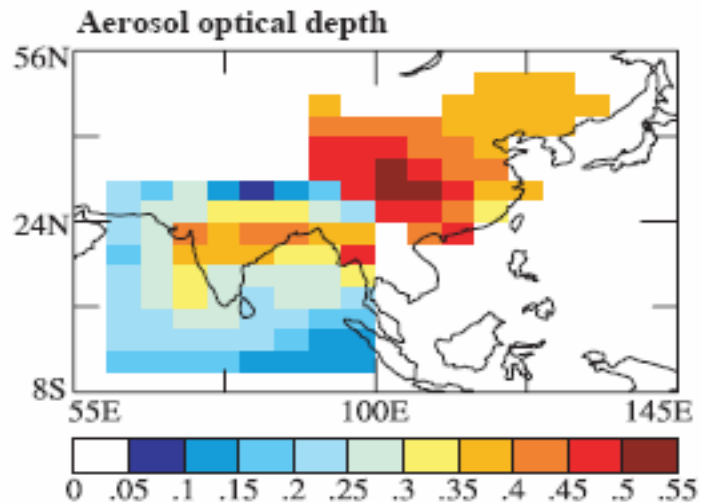
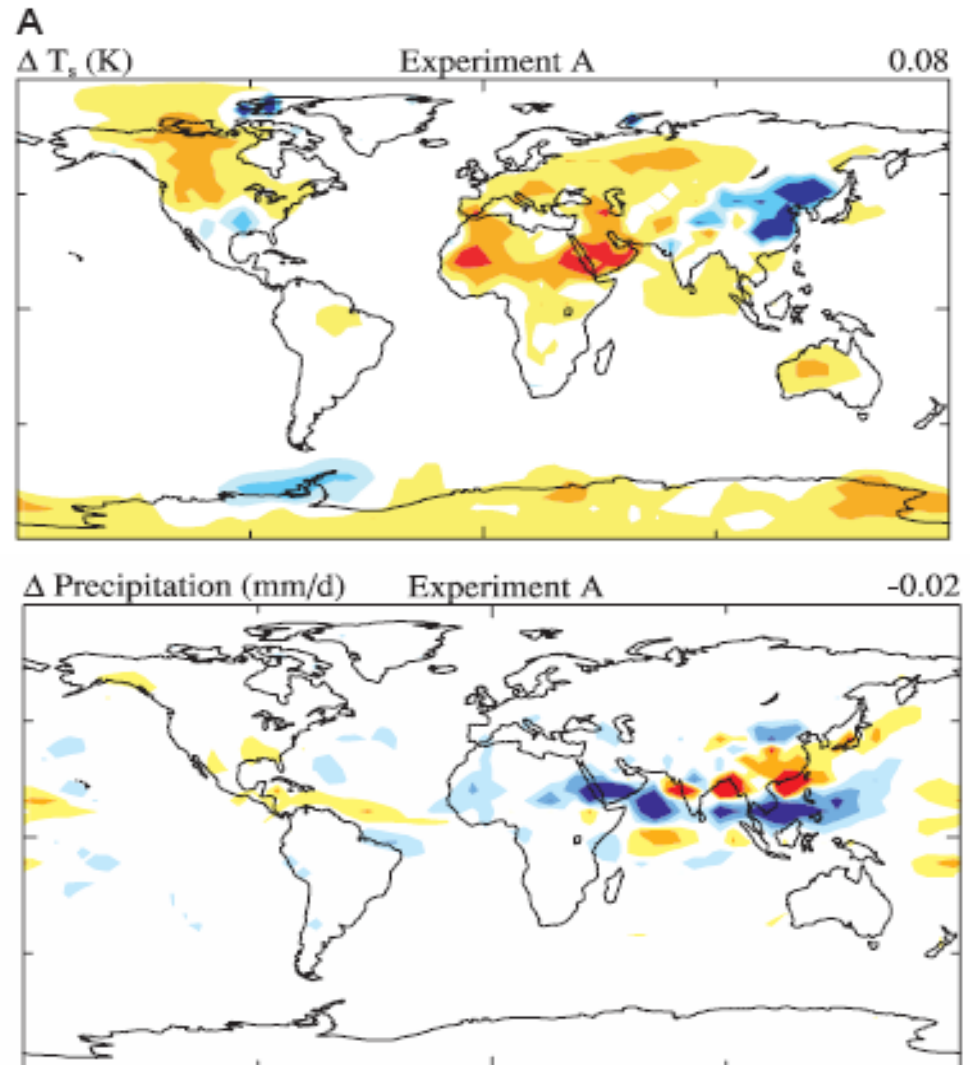


Fig. 1. Incremental aerosol optical depth $\Delta\tau_{\text{aer}}$ ($0.55 \mu\text{m}$), which is used to drive the climate change simulations. Latitude and longitude are denoted.



Previous simulation with aerosol's direct effect

Lau, 2006

Enhanced Indian monsoon by the mechanism of “elevated heat pump” of Tibetan Plateau.

East Asia (Mei-yu) rain belt shifted north westward, suppressing rainfall over East Asia and the adjacent oceanic regions.

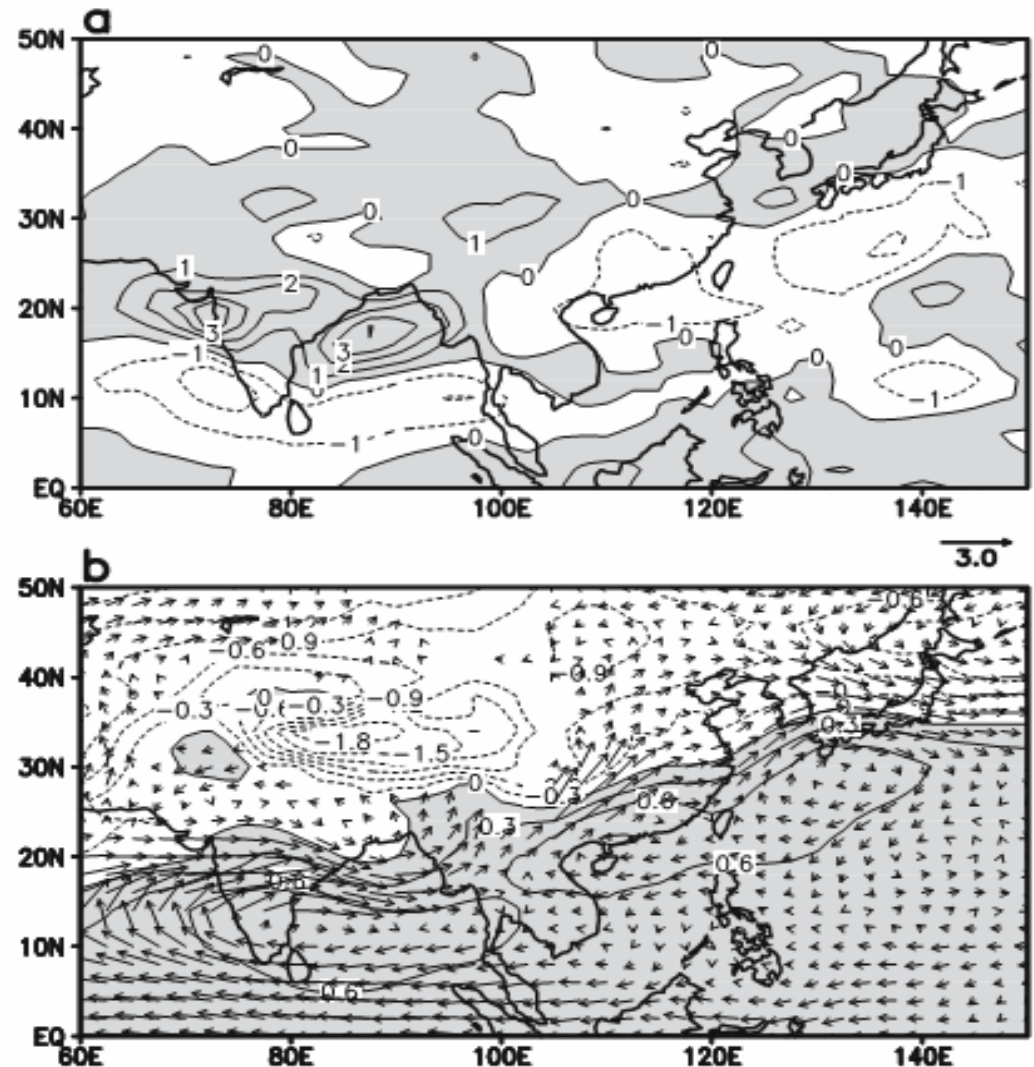


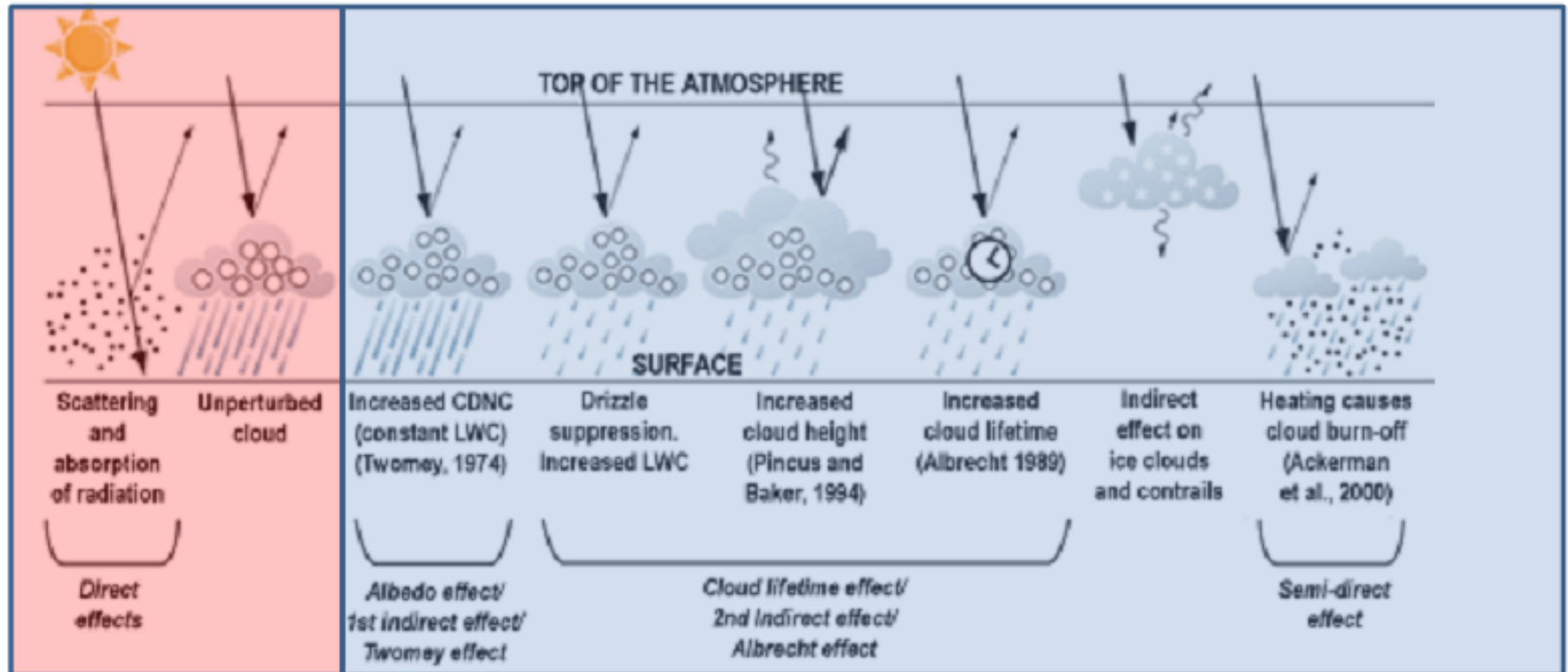
Fig. 6 Spatial distribution of JJA anomalies in the Asian monsoon region due to aerosols for a precipitation (mm day^{-1}), and b sea level pressure (hPa) and 850 hPa winds (ms^{-1})

Current simulation with aerosol's direct and indirect effects

Microphysics and modal aerosols permit the study of aerosol indirect effects

CAM4

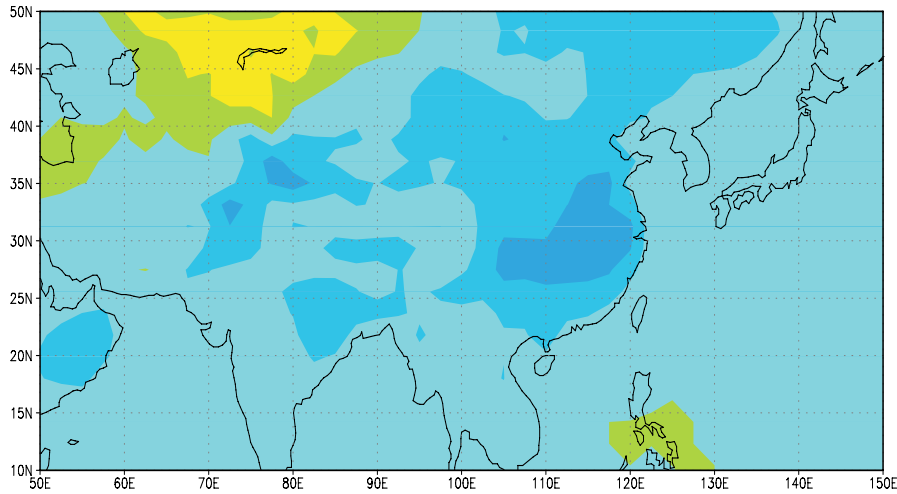
CAM5



Changes in Asian summer monsoon

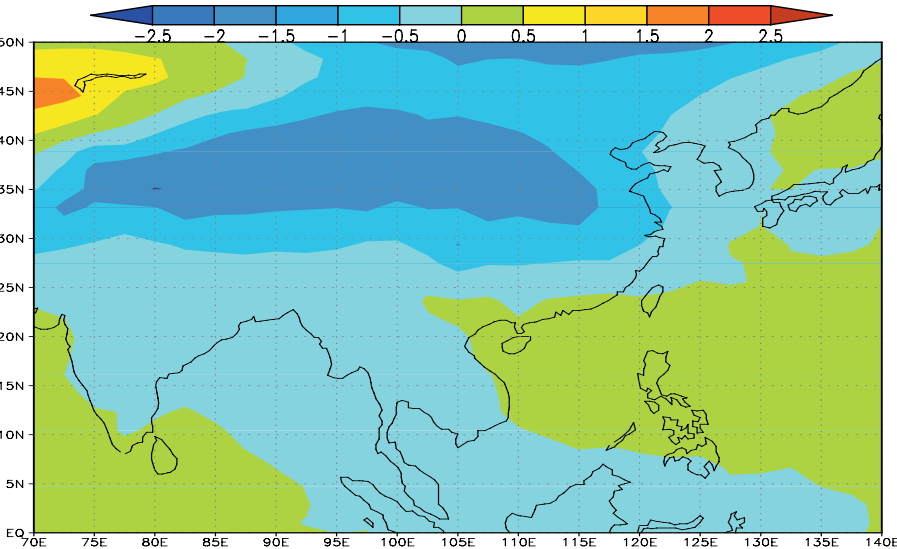
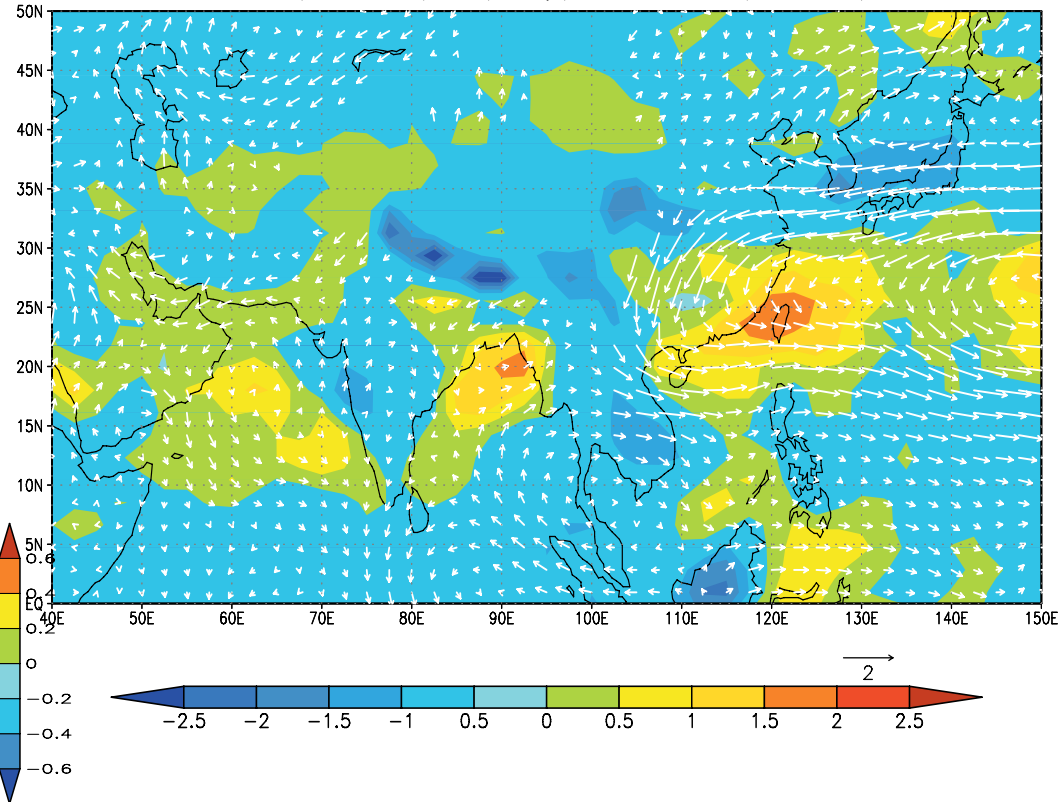
Surface temperature

PD - P1ts



850hPa wind & Precipitation

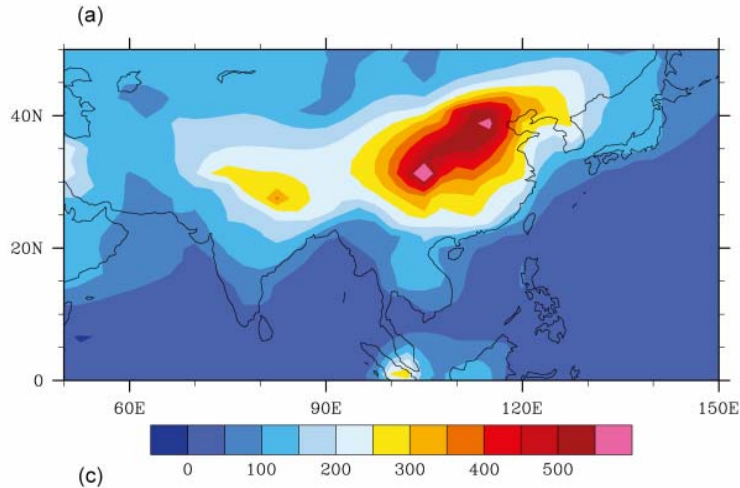
Precipitation(mm/day) and Wind(850mb)



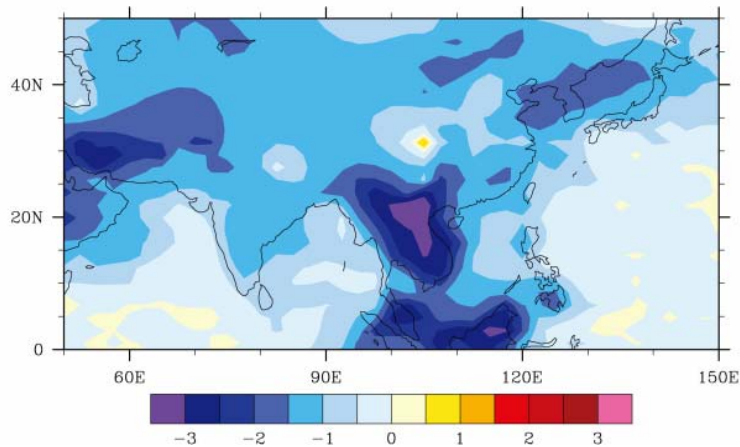
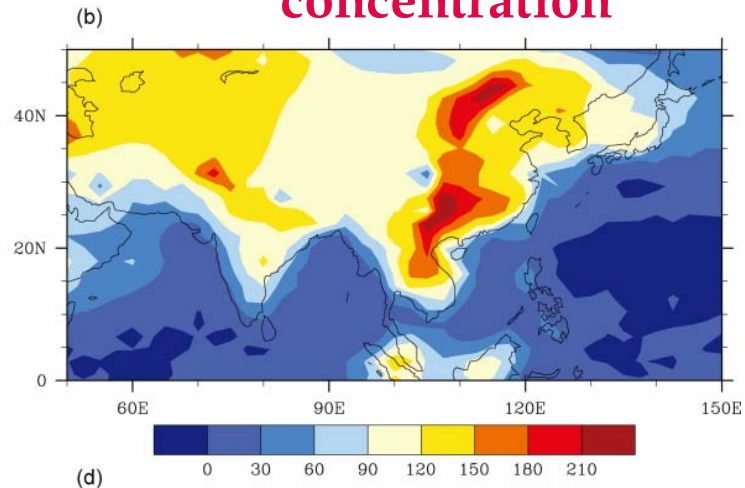
Vertically-integrated temperature

Aerosol's cloud-microphysical effect

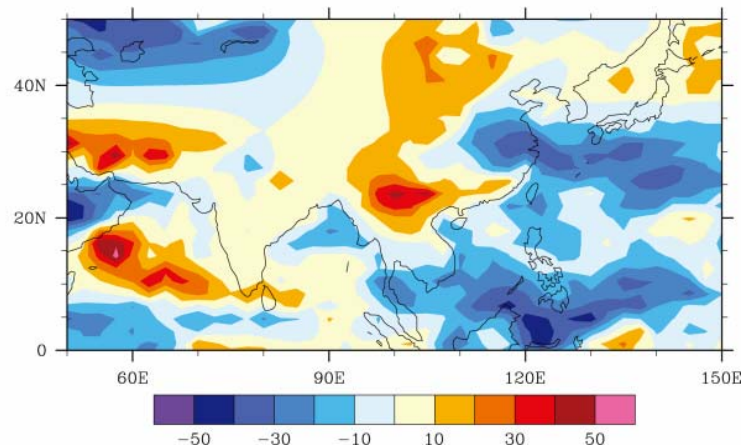
CCN at $S=0.1\%$



Cloud droplet number concentration



Cloud droplet effective radius



In-cloud liquid water content

Issues

- ◆ What is the observed decadal change in East Asian monsoon climate system ?
- ◆ Can such a decadal change be considered as natural variability (say, the PDO's impact)?
- ◆ What is the role of increased CO₂ and aerosols?
- ◆ **Summary**