Easy Aerosols

A proposal for advancing understanding of the the effect of aerosols on climate as part of a WCRP grand challenge problem.

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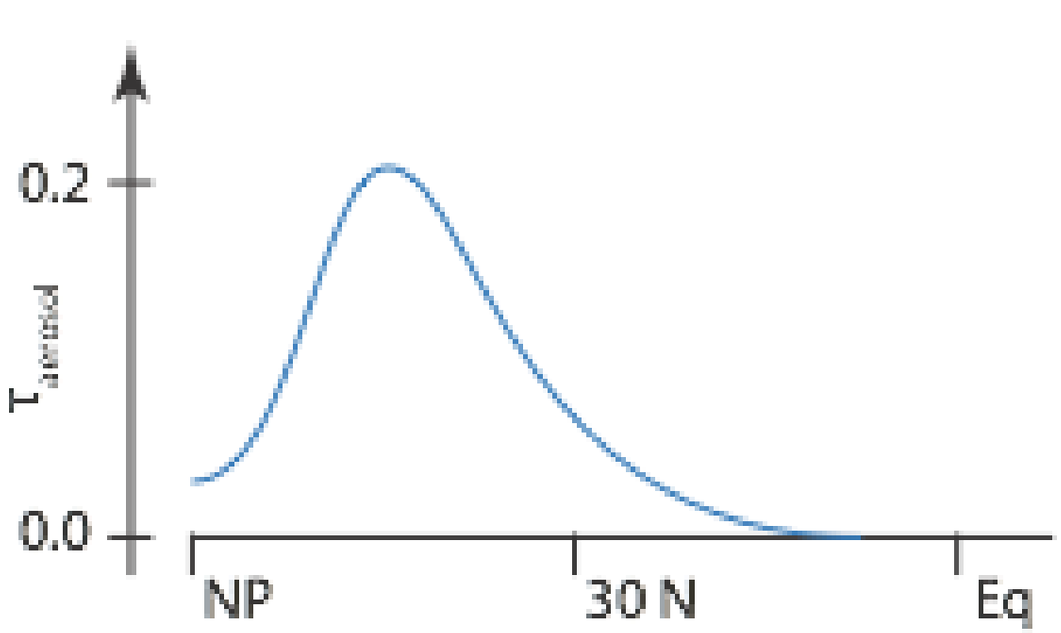
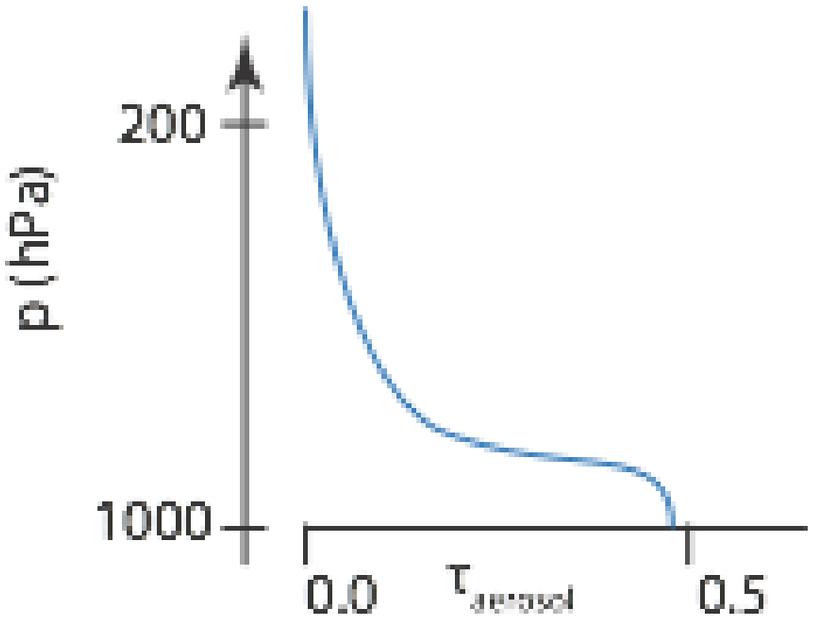
The idea (in a nutshell)

- An important, and perhaps dominant component of the anthropogenic aerosol is confined to the Northern Hemisphere extra tropics.
- Hence the gravest mode of aerosol forcing associated with industrial activity can be represented by zonally symmetric forcing, centered in the northern hemisphere extra tropics.
- Do models forced by a simple and idealized prescription of aerosol optical properties, one designed to capture the gravest mode of aerosol forcing, respond similarly?
  - do they produce a similar RFari?
  - do they produce a similar ARari?
- If so can this response be understood in ways that help us understand or uncover robust behavior in much more complex models?

***IPCC Speak: RFari and AFari describe the radiative forcing from aerosol radiation interactions and adjusted forcing from aerosol radiation interactions … i.e., what some people call the direct and seim-diret effect respectively*

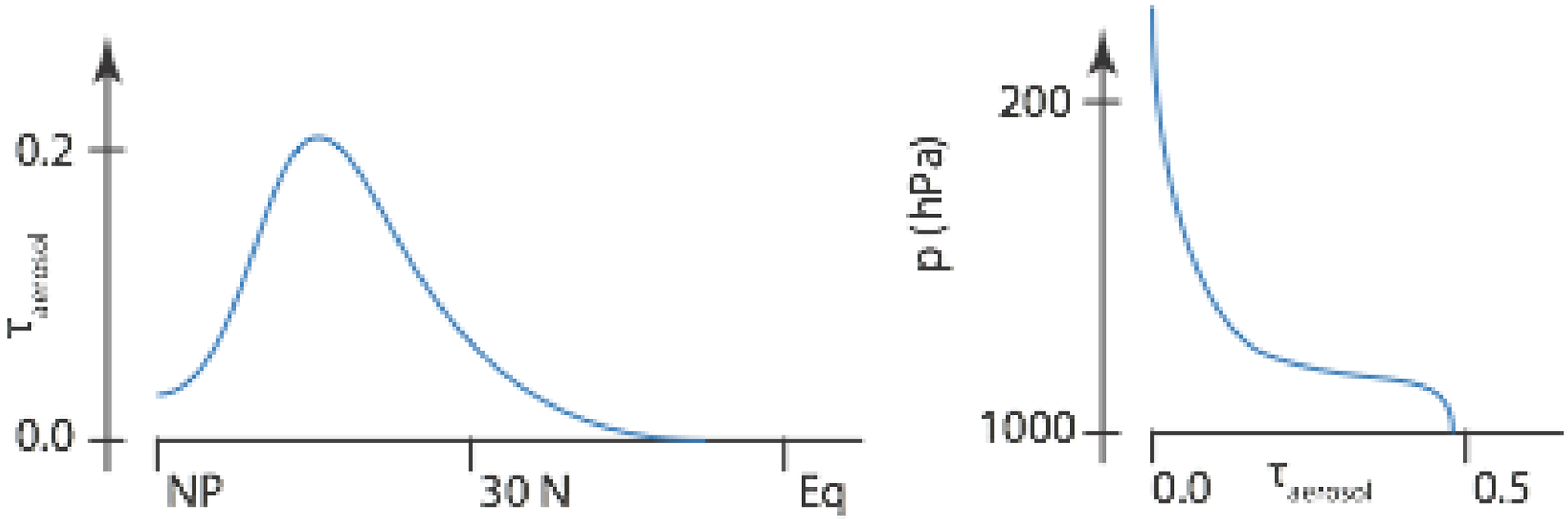
The idea in pictures





- prescribe (τ,ω,g) as a function of latitude, φ, and pressure p.
- prescribed distributions should be based on estimates of zonally averaged anthropogenic forcing.
- simple analytic forms, with intuitive parameters such as a scale height, or central latitude, should be chosen so as to ease implementation and modification.
- study the effects for a hierarchy of models (aqua-planet, amip, slab ocean)

Extend & Repeat



- extend the prescription to simple descriptions of cloud activity (CCN/IN).
- extend to include zonal asymmetries to forcing (for instance a wave number three perturbation) to capture activity centers in Europe, Asia and North America.
- repeat for a tropical source (e.g., Southern Hemisphere tropics biomass burning).
- repeat with simple emissions, rather than simple aerosols, to allow studies of aerosol processes and hence involve complex aerosol models or even CTMs.

The main question

Is AEROCOM interested in organizing and supporting such conceptual activities in the framework of a WCRP grand challenge?

Proposed schedule

12.2012: Release of Case

06.2013: Simulation submission (at lest for first easy round of simulations)

09.2013: Presentation of first results