

How do we use EarthCARE to better understand the climate impact of aerosols, including aerosol-cloud interactions?

Robin Hogan (Chair)

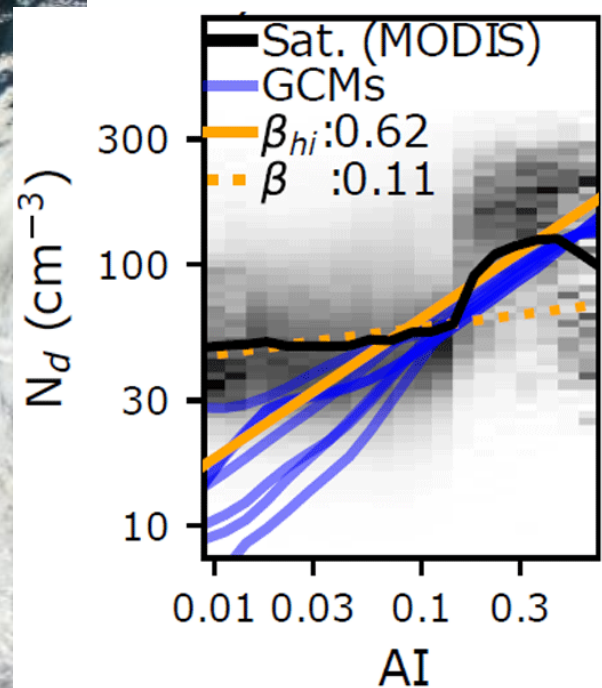
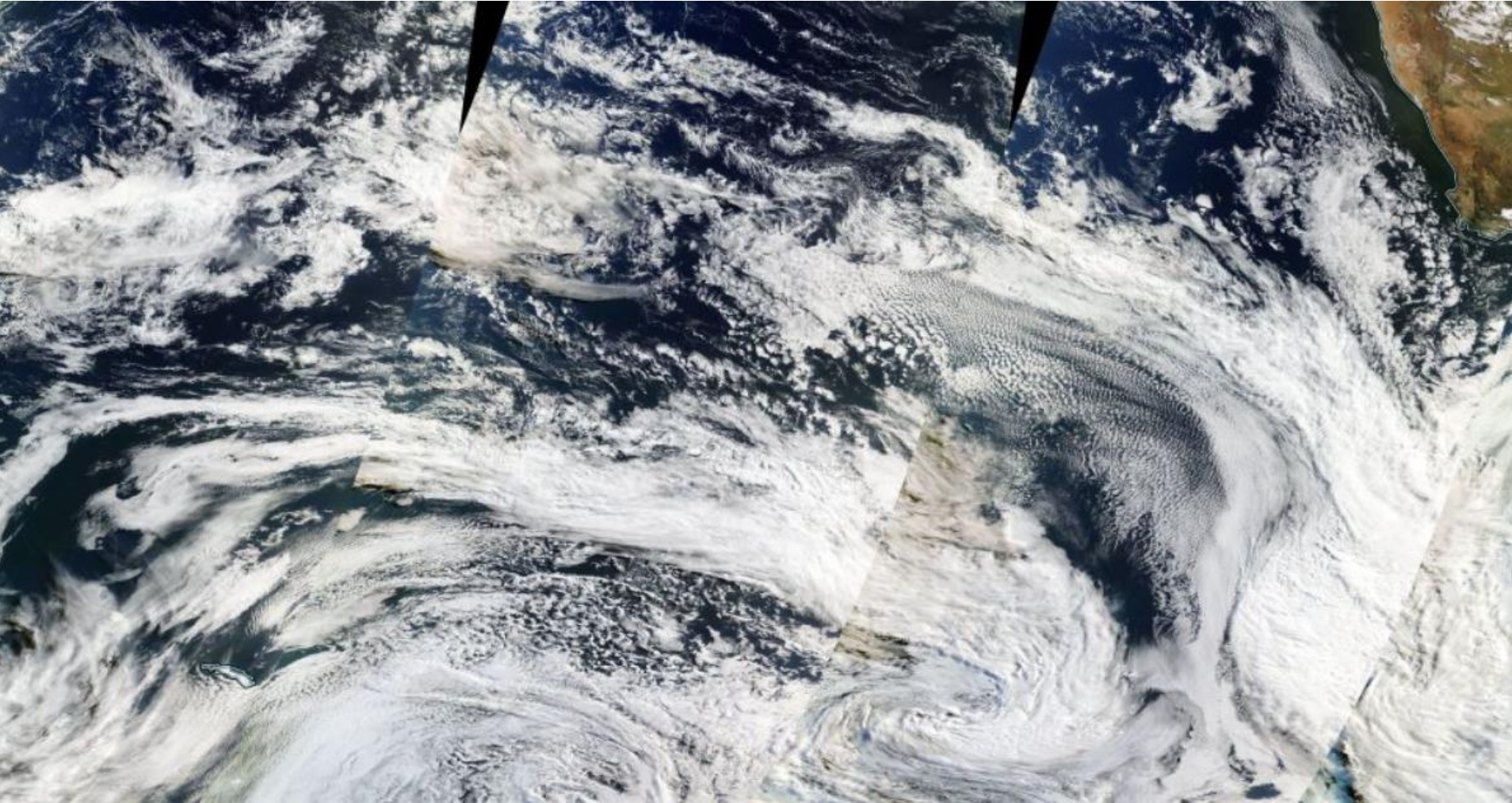
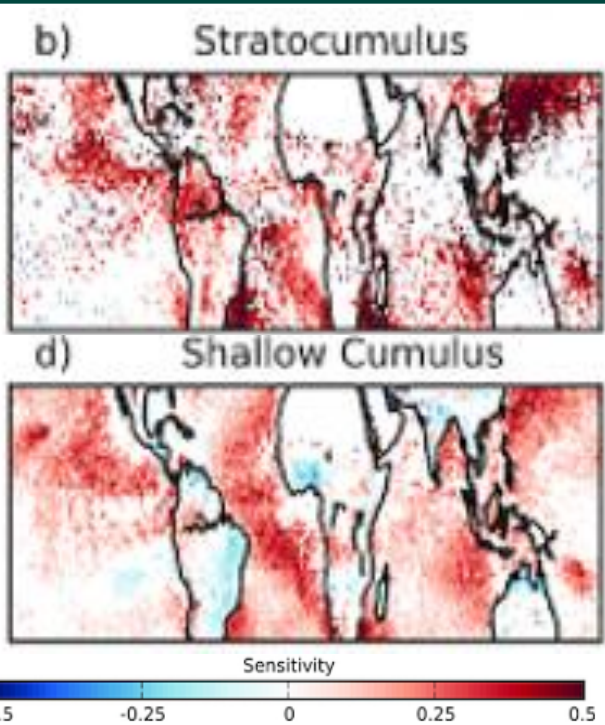
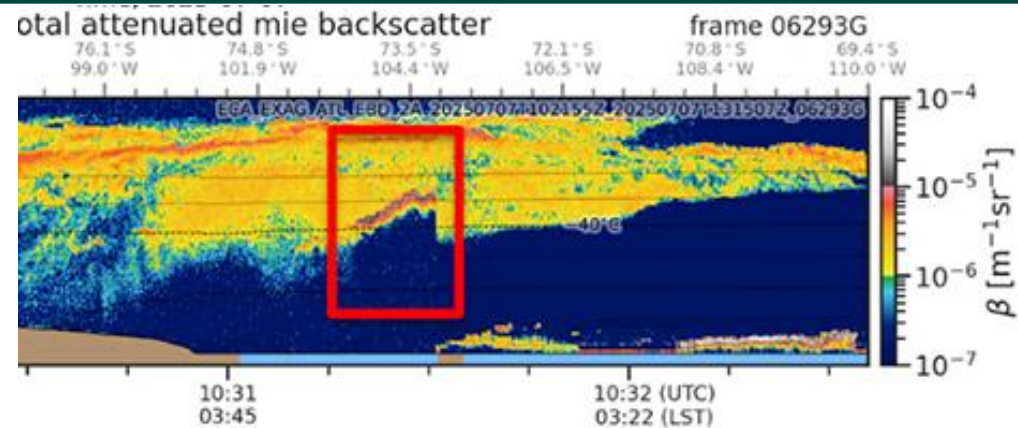
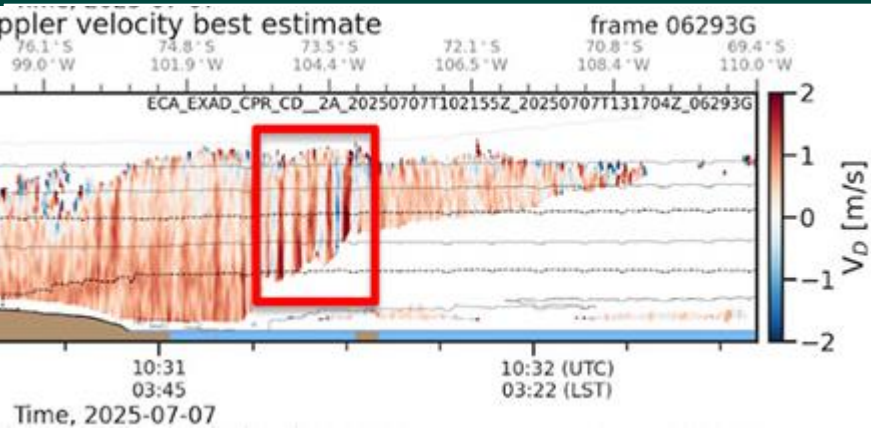
Edward Gryspeerdt

Tomoaki Nishizawa

Claire Ryder

Philip Stier

Ulla Wandinger



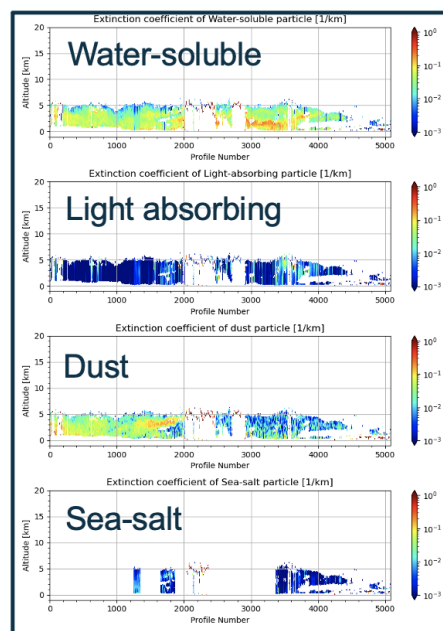
- EarthCARE can provide various physical parameters related to the radiative effects of aerosols and aerosol-cloud interactions.

- ATLID & MSI => Aerosol optical property => Radiative property (SSA, Phase function ...) => Microphysical property (N, R, IN, CCN...)

How do we convert optical property to radiative/microphysical property?

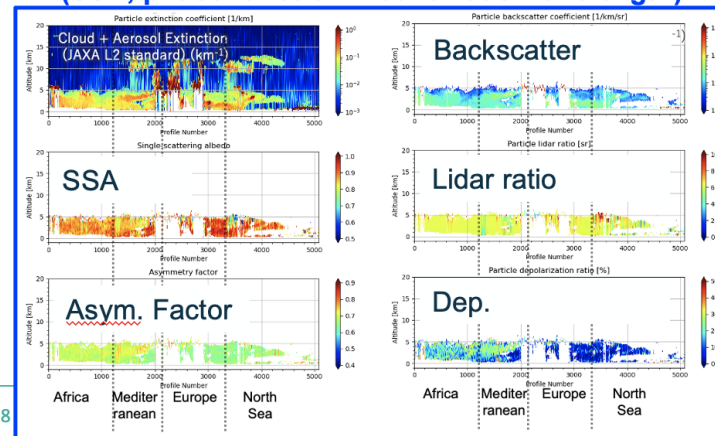
How do we treat mixture of various aerosol types externally and internally ?

Aerosol component (Extinction)

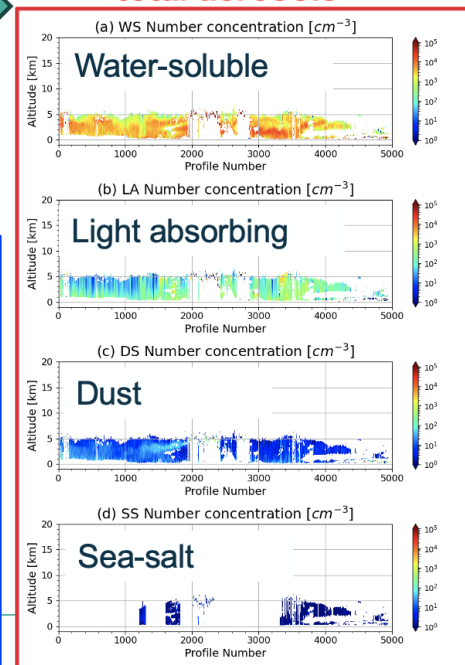


Calculation

**Radiative properties
for each component & total aerosols
(SSA, phase function... at various wavelength)**

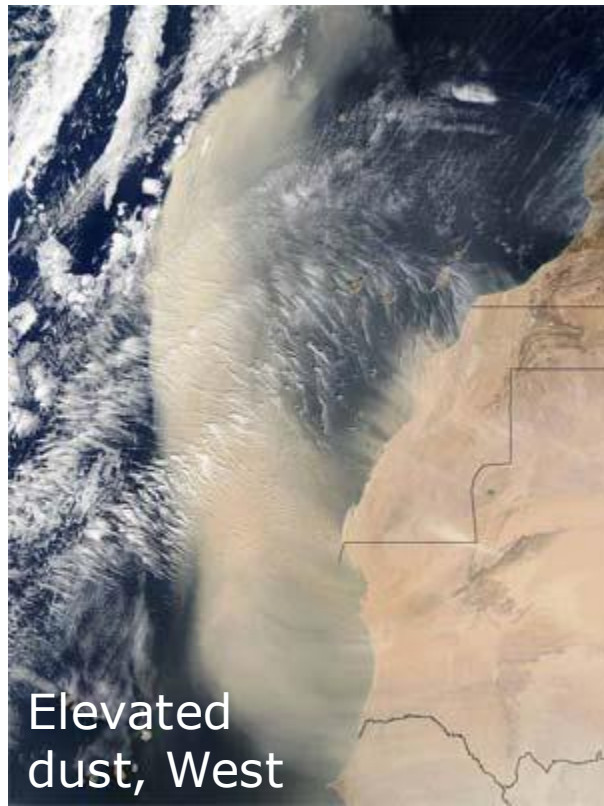


**Number concentrations
for each aerosol component &
total aerosols**





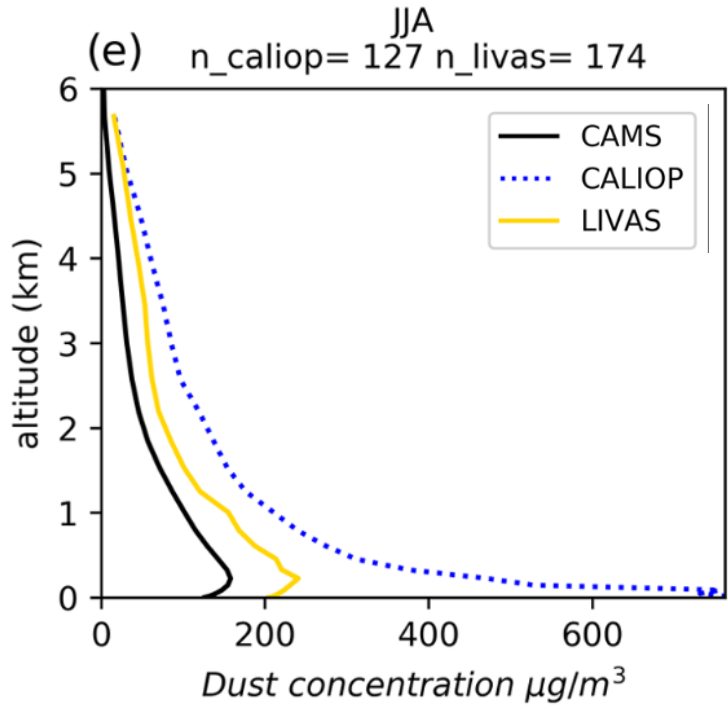
Haboob over Moomba,



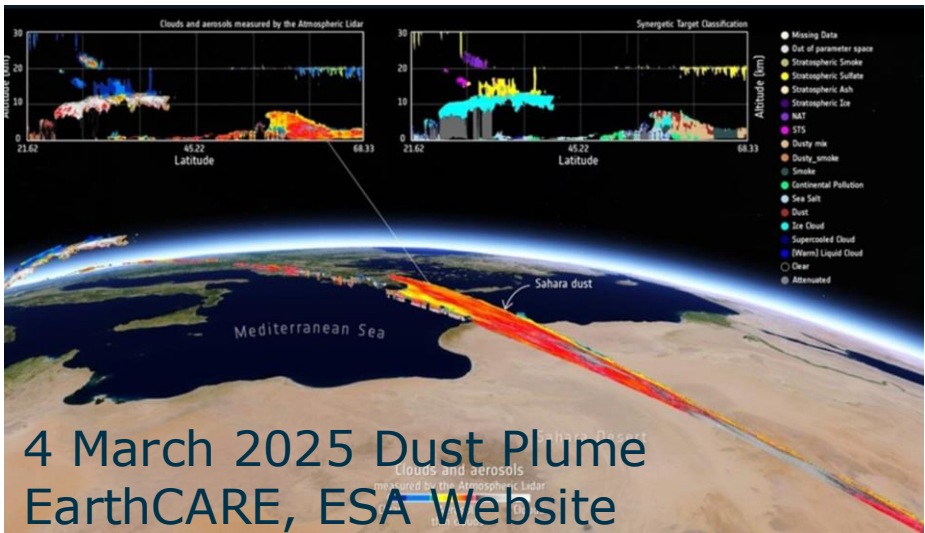
Elevated dust, West



Abu Dhabi, National Exhibition Centre by Victor Besa, The National
Dust-pollution mixture



Ryder et al. (2024, NHESS):
Dubai dust profiles

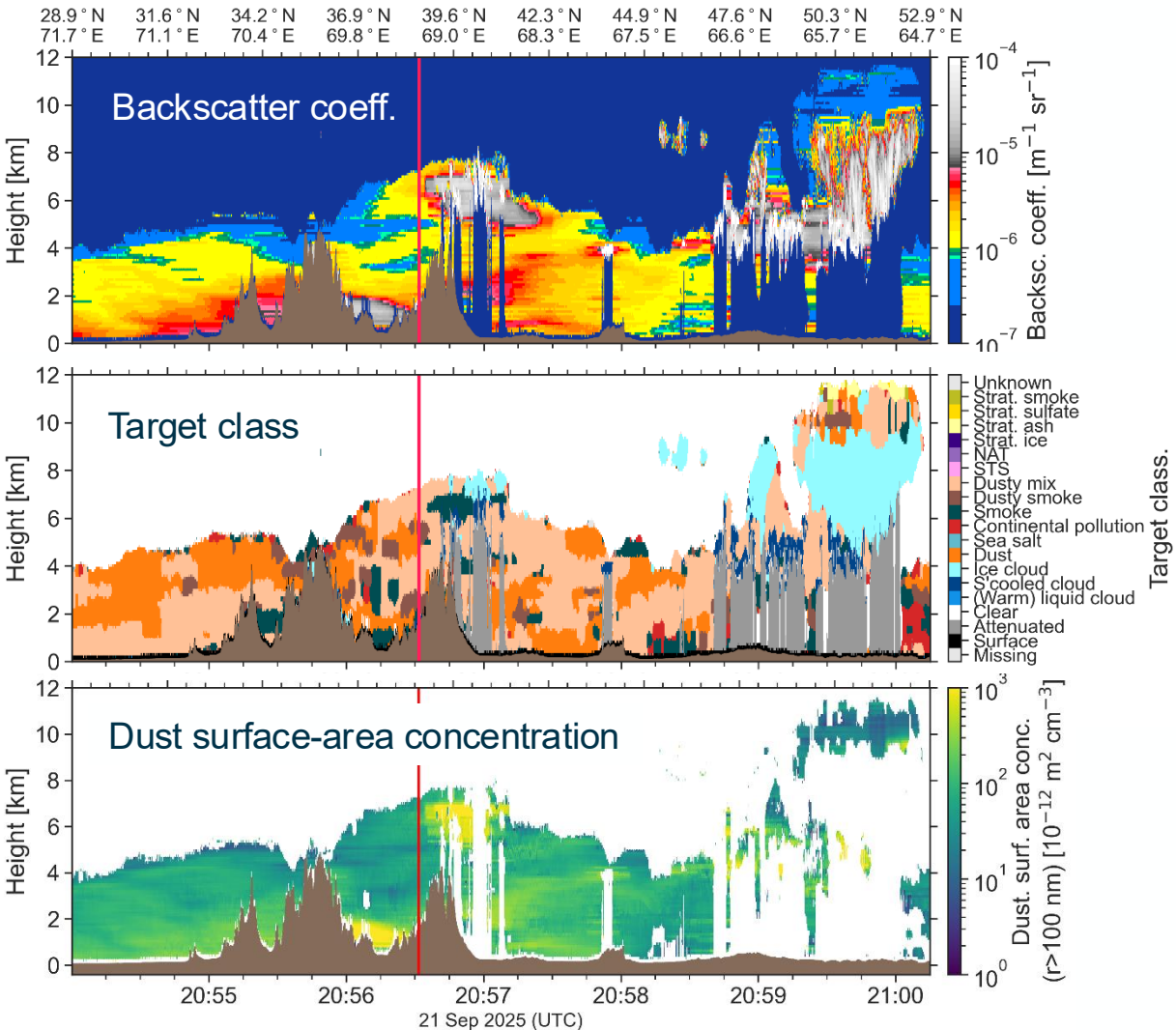


Dust filter sample collected on FAA during AER-D, Cape Verde, 2015

Cloud-relevant aerosol properties from EarthCARE



Poster P051: POLIPHON implementation in the earthcarekit software tool: microphysical and cloud-relevant aerosol properties from EarthCARE/ATLID (König et al.)



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Direct effects of aerosol

- Improving aerosol properties and climatologies: extinction, type, mass, CCN, single-scattering albedo...
- What processes need testing in models: deposition rates, haboobs, stratospheric transport, fire injection heights?
- What are the impacts on weather systems (e.g. monsoons) and climate (e.g. cooling effects of wildfires)?

Aerosol-cloud interactions (ACI)

- First indirect effect on low clouds, ship tracks, susceptibility etc.
- Second indirect effects on low clouds: precipitation, cloud cover etc.
- What about effects on ice clouds and convection?
- Analyse also CloudSat/CALIPSO to quantify effect of large reductions in East Asian aerosol?
- How can we provide tighter constraints on models, particularly trade-off of ACI and cloud feedbacks?

Other topics, e.g. improving aerosol forecasts for health, solar energy, weather prediction etc.

Actions? Data analysis, extra data needed, model experiments & intercomparisons, collaborations?

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