CIRAMOSA milestones

Compilation of cirrus properties from 7 field campaigns:

- Ci microphysical properties strongly vary from campaign to campaign due to different measurement and analysis techniques
- even for specific campaign Ci microphysical properties little correlated with surrounding atmospheric conditions

climatological interpretation of in-situ data requires:

- quality improvement of size distribution measurements
- combined measurements of microphysics and atmospheric conditions along trajectory of cirrus parcel

CIRAMOSA milestones

ATSR-2 Analysis of selected Ci ($1<\tau<50$):

- Dominant ice crystal shapes are **aggregates**
- No simple deterministic relationship between D_e and T_{cld}
- D_e, IWP decrease with distance from convective core, following simple exponential scaling laws
- P_{cld}^{ATSR}(parallax) ≈ p_{cld}^{POLDER}(Rayleigh) ≈ p_{cld}^{ATSR} (OE) : within 50 hPa

ATSR-2 / POLDER synergy:

- Radiatively equivalent shape of ice crystals given by IHM model : L/2R = 2.5
- $\tau_{Ci}^{ATSR} \approx \tau_{Ci}^{POLDER}$
- Improvement of accuracy of De retrievals by using nadir and forward viewing directions
- D_e increases with T_B of cirrus ($\langle D_e \rangle$: 50 μm and $\langle T_B \rangle$: 230 K)

CIRAMOSA milestones

Longterm climatology of large-scale semitransparent Ci:

- $p_{cld}^{TOVS} \approx$ p(mid-cloud)
- $\langle D_e \rangle = 55\mu m$, $\langle IWP \rangle = 30\ gm^{-2}$
- 8 years (1987-95) of Ci properties and 4 years (1987-91) of D_e and IWP

- IWP increases with T_{cld}, D_e increases with IWP
- D_e and IWP increase with atmospheric water vapour (H_2O)
- D_e increases less with H_2O in case of strong winds
- IWP increases more with H_2O in case of strong vertical updraft
- Differences in relationships between midlatitudes & tropics linked to different formation processes?
- smallest D_e near the center of convection

CIRAMOSA milestones

radiative flux sensitivity to changes in Ci microphysics:

- Ci SW flux uncertainty up to 30 Wm^{-2}, not knowing crystal size distribution (depending on crystal shape, θ_0 and τ, from MC)
- Ci reflectivity increases from Fu's, Baran's to Mitchell's SSP parametrization
- Ci LW emissivity, from Fu's to Mitchell's SSPs at small IWP (<25gm^{-2}) from Fu/Mitchell to Baran's SSPs at large IWP D_e=40μm

- α_{SW}^{obs} using ScaRaB ADMs closer to model!
- α_{SW}^{mod}(const. D_e, const. Δp) does not increase as much with IWP as α_{SW}^{obs}
- **smaller D_e more plausible at small IWP and larger D_e at large IWP**
- more difference between Fu SSP and Mitchell SSP in LW than SW (for D_e=55μm)
- LW comparison more dependent on quality of atmospheric and surface input