«CIRAMOSA and beyond »

20/11/2003

1) CIRAMOSA results
2) Ice crystal single scattering properties in VIS and IR
3) Climate models

21/11/2003

3) Cirrus processes
4) Related projects and analyses
5) Satellite missions

-> aerosol – dynamics – cirrus – radiation interactions and impact on climate ?

CIrrus microphysical properties and their effect on RAdiation:

CIRAMOSA

survey and integration into climate MOdels using combined SAtellite observations

http://www.lmd.polytechnique.fr/CIRAMOSA/Welcome.html

CIRAMOSA background

IPCC: Effect of clouds on radiation budget

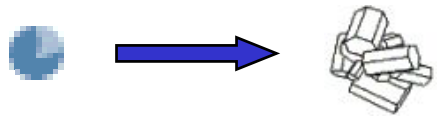
= key uncertainty in climate change

Absorption + scattering by ubiquitous cirrus clouds

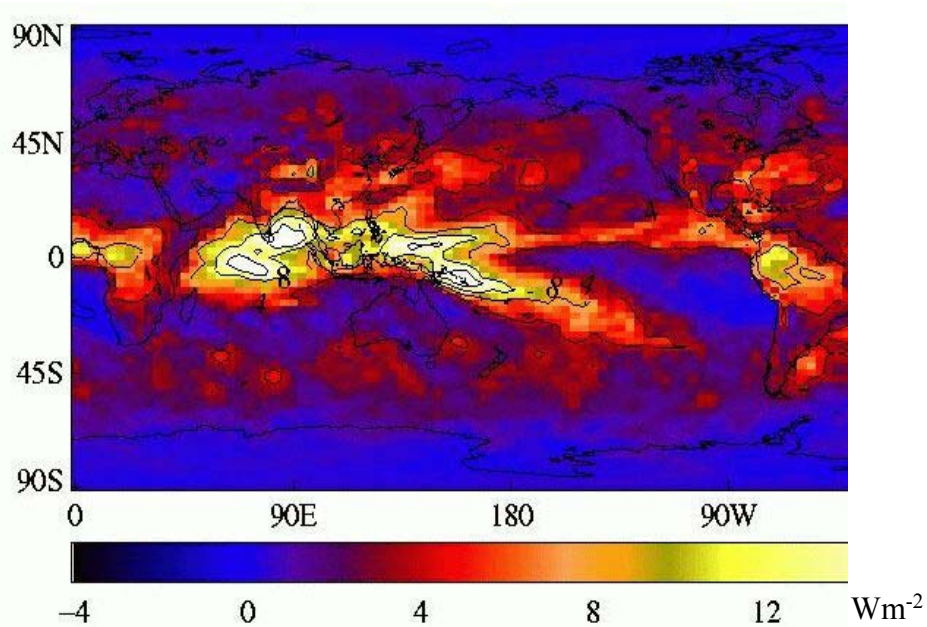
difficult to calculate:

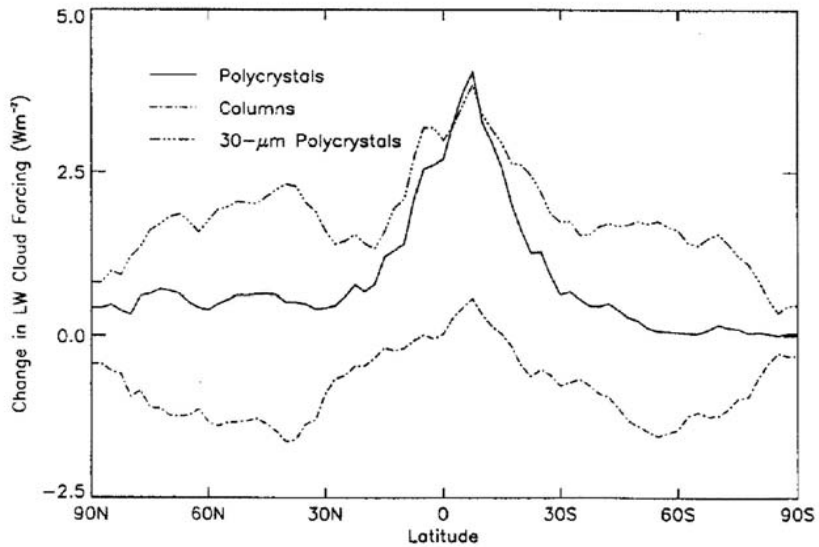
- ice crystals not spherical
- large variability in size and shape

climate simulation

ice clouds: 

changes in reflected solar flux & outgoing thermal flux





J.-E. Kristjansson, J. M. Edwards and D. L. Mitchell, JGR 2000

CIRAMOSA Objectives

- long-term survey of cirrus physical and microphysical properties (1987-1995)
- correlations between cirrus properties and the state of the atmosphere
- study their effect on the reflection and absorption of solar and thermal radiation
- improvement of cirrus radiative transfer in GCMs

Observations (TOVS, ATSR, POLDER, in-situ)

Cirrus properties

P_{cld}, τ, IWP, D_e

⟷

state of atmosphere

(humidity, T, winds)

glob. D_e, reg./seas. D_e

$D_e = f$(IWP, hum, w, uv)

TOVS

atmosphere, cirrus

GCM radiative transfer model

ScaRaB

fluxes

TOA LW, SW fluxes

Observations

- in-situ: CEPEX, EUCREX, FRAMZY, CARL, FIRE2, INTACC
- POLDER: VIS-NIR, polarization, 1996/97 -> ***phase, p, T, τ, crystal shape***
- ATSR-2: dual view, VIS-NIR-IR, selected cases -> ***p, T, τ, crystal shape, D_e***
- TOVS: IR Vertical Sounder, 1987-1995 analyzed -> ***p, T, ε_{IR}, D_e, IWP***
- ScaRaB: radiative fluxes, 1994

CIRAMOSA components

- Compilation of regional cirrus properties *IfMK*
  Andreas Macke
- Angular, spectral behaviour, polarisation of observed & modelled cirrus using ATSR-2/POLDER *MetOffice, LOA*
  Anthony Baran, Gérard Brogniez
- Long-term retrieval of cirrus properties from TOVS *LMD*
  Gaby Rädel
- Sensitivity of radiative fluxes to changes in cirrus microphysics *MetOffice*
  John Edwards
- Effect of parameterizations on radiative fluxes using TOVS-ScaRaB observations *LMD, IfMK*
  Claudia Stubenrauch