

Virtual Institute Aerosol-Cloud Interactions

VI - ACI

Contributions of ICG 1 cloud group

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Kickoff meeting VI-ACI, May 2007



CONTRIBUTION OF ICG 1 TO VI-ACI

- **H₂O measurements (FISH, OJSTER, SHARC)**

WP L1: AIDA experiments

- freezing thresholds of different aerosol types
- H₂O partitioning in cirrus life cycle

- **H₂O modelling**

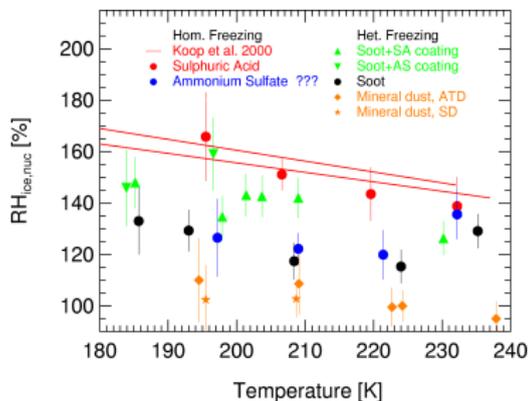
WP M1/2: Process-oriented modelling/Cloud modelling

- Employ cirrus parametrizations from AIDA measurements in models
- Model - field observation closure studies of cirrus life cycles

FREEZING THRESHOLDS

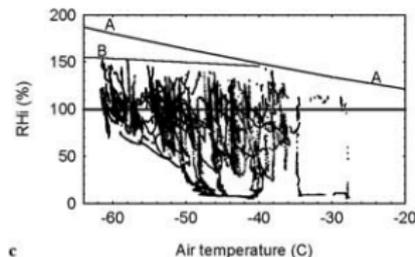
Comparison of lab with field measurements

AIDA ice clouds

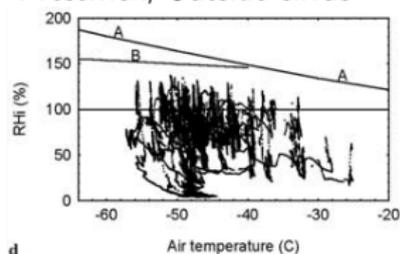


INCA Midlat Cirrus

Punta Arenas, Outside cirrus



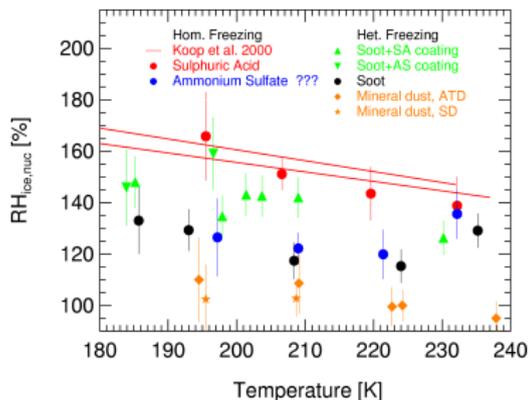
Prestwick, Outside cirrus



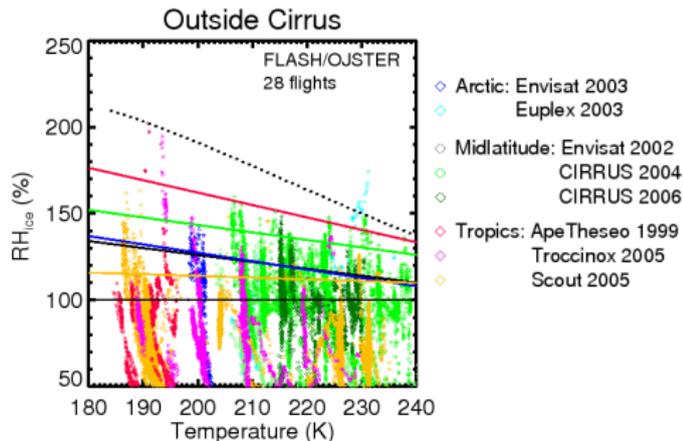
FREEZING THRESHOLDS

Comparison of lab with field measurements

AIDA ice clouds



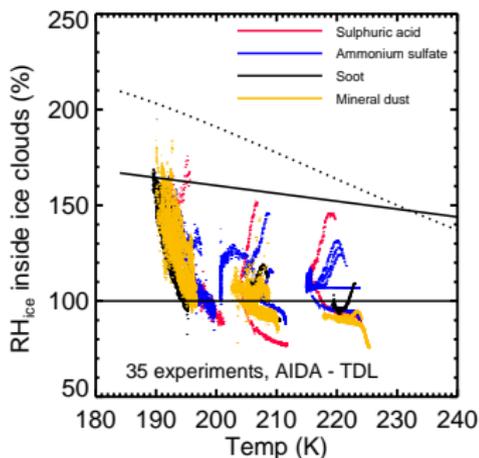
Arctic-Midlat-Tropical Cirrus



SUPERSATURATIONS INSIDE ICE CLOUDS

Comparison of lab with field measurements

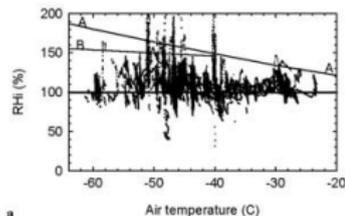
AIDA ice clouds



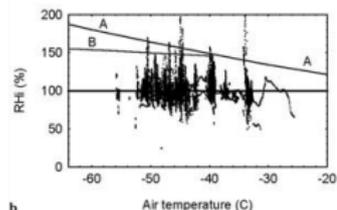
AIDA wall effects?

INCA Midlat Cirrus

Punta Arenas, Inside cirrus



Prestwick, Inside cirrus

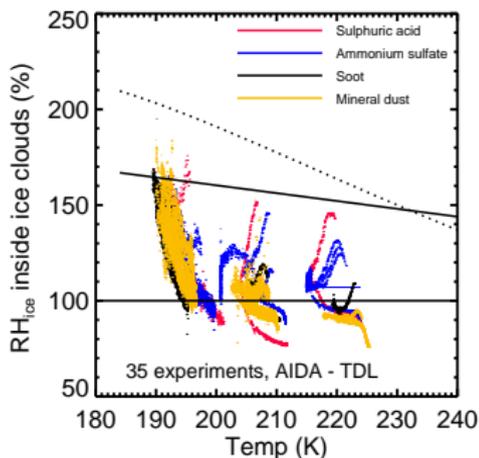


Ovarlez et al. (2002), GRL

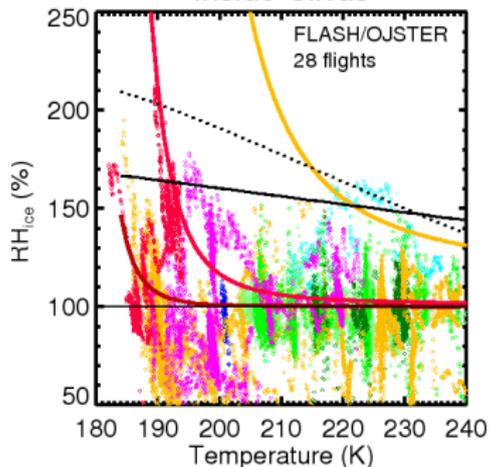
SUPERSATURATIONS INSIDE ICE CLOUDS

Comparison of lab with field measurements

AIDA ice clouds



Arctic-Midlat-Tropical Cirrus Inside Cirrus



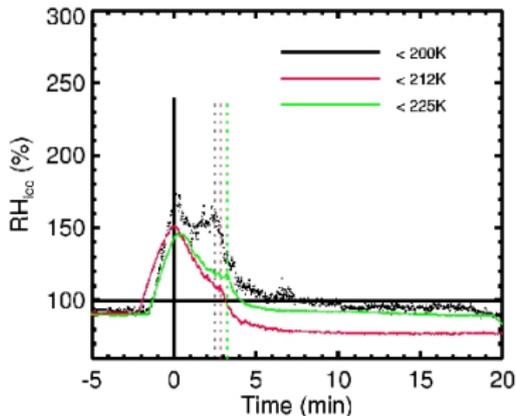
AIDA wall effects?

SUPERSATURATIONS IN AIDA ICE CLOUDS

Temporal evolution

Homogeneous freezing

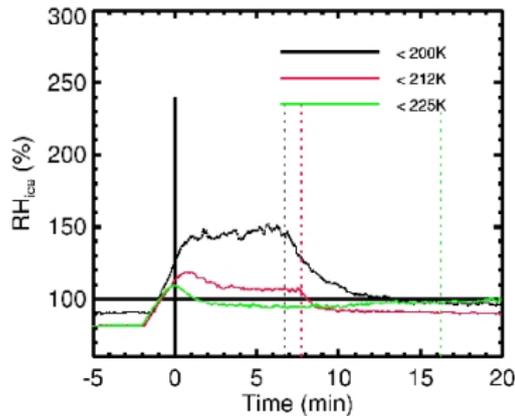
$\text{H}_2\text{SO}_4\text{-H}_2\text{O-particles}$



high $\overline{N_i R_i}$ ($500\text{-}1000 \frac{\mu\text{m}}{\text{cm}^3}$)

Heterogeneous freezing

Soot particles

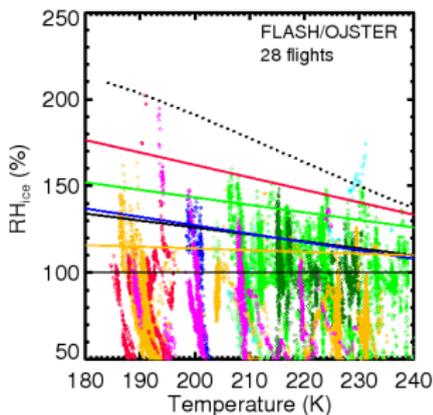


low $\overline{N_i R_i}$ ($50\text{-}500 \frac{\mu\text{m}}{\text{cm}^3}$)

OBSERVATION BASED FIRST CIRRUS PARAMETERIZATIONS FOR USE IN MODELS

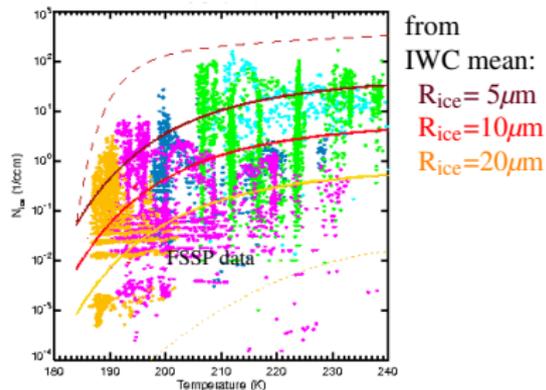
Freezing thresholds

from AIDA ice clouds



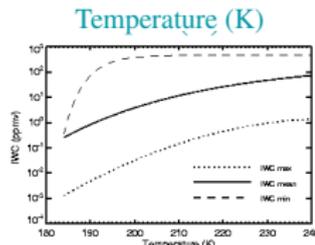
Number of ice crystals:

from IWC climatology



from
IWC mean:
 $R_{ice}=5\mu m$
 $R_{ice}=10\mu m$
 $R_{ice}=20\mu m$

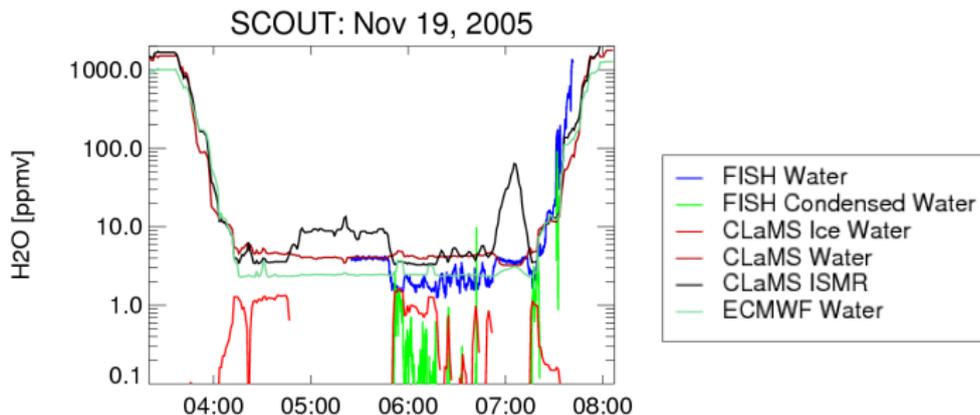
Ice Water Content
climatology from FISH



CIRRUS IN CLAMS @ ICG 1

CHEMICAL LANGRANGIAN MODEL OF THE STRATOSPHERE

CLaMS simulation



Transient run, first cirrus parametrization

Particles: coated soot, mean N_{ice}

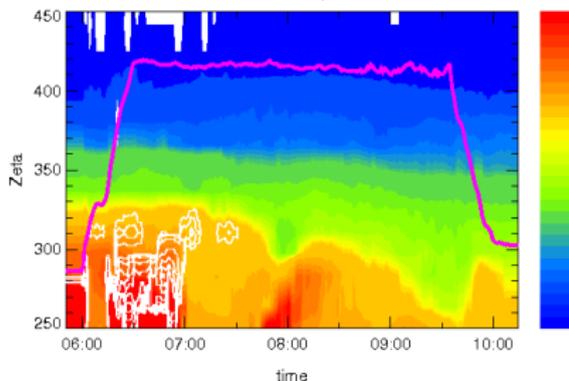
CIRRUS IN CLAMS @ ICG 1

CHEMICAL LANGRANGIAN MODEL OF THE STRATOSPHERE

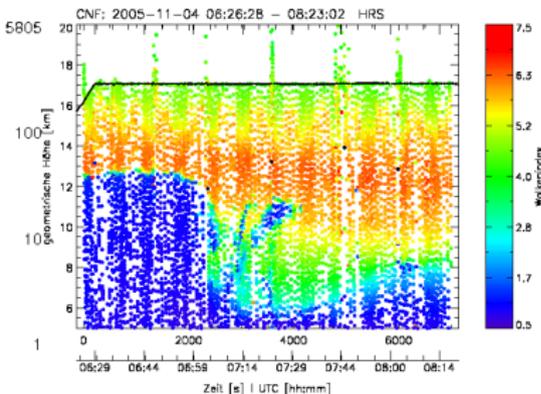
CLaMS simulation

SCOUT : Water Vapour [ppmV]

Date: Nov 4, 2005



CRISTA-NF cloud observations

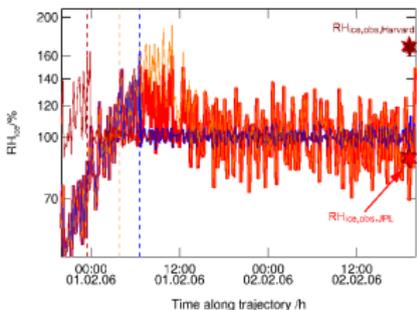


OBSERVATION-MODEL CLOSURE STUDIES

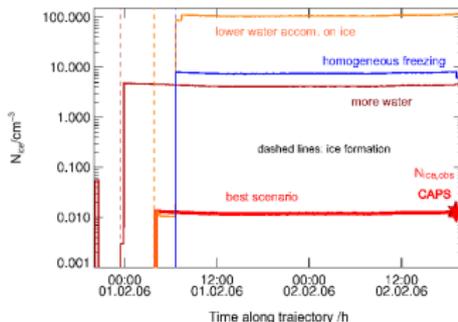
WITH DETAILED PROCESS MODEL (COOP. AIDA MODEL GROUP)

CR-AVE 2006, Costa Rica

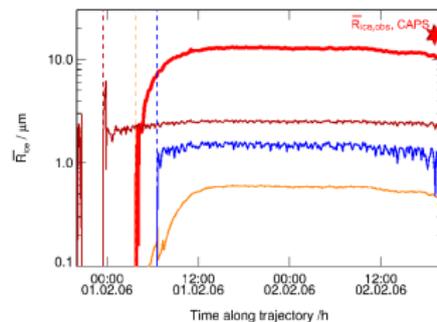
Supersaturation



N_{ice}



R_{ice}

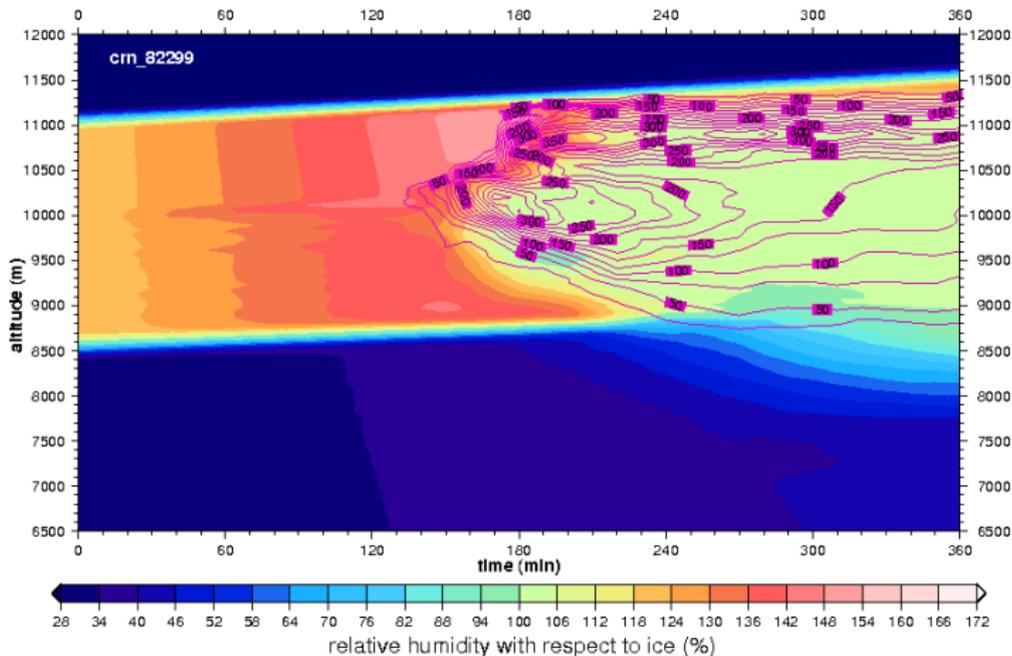


Best scenario: heterogeneous freezing (coated soot), etc.

OBSERVATION-MODEL CLOSURE STUDIES

WITH BULK MICROPHYSICS MODEL, ETHZ

CIRRUS-II 2004, Northern Germany



SUMMARY + OUTLOOK

- H₂O measurements during AIDA lab campaigns
- Relative humidities in AIDA ice clouds
- Freezing thresholds and ice nucleation rates
→ new cirrus parametrizations
- Employ + test parametrizations by
model - field observation closure studies