



Cabauw for aerosol-cloud-radiation studies

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KNMI

Guide

Cabauw

- CESAR consortium
- scientific goals
- instrumentation
- measured parameters

Satellite data

- AVHRR
- MSG

Intensive measurement campaigns (BBC2)

Research themes

aerosol-cloud-radiation interactions include:

cloud processes

aerosol processes

radiation transport

aerosol-radiation interactions (direct aerosol effect)

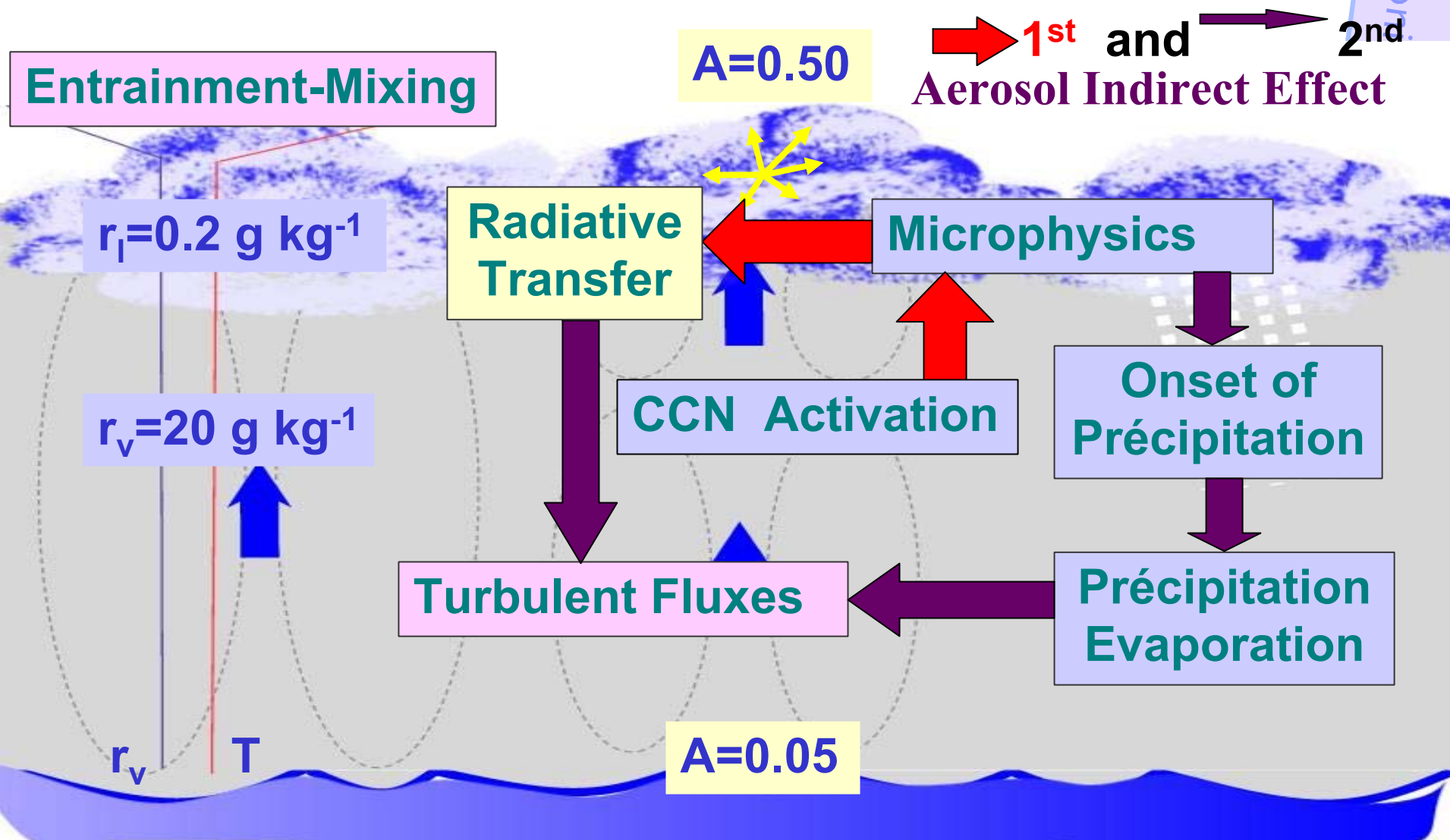
cloud-radiation interactions

aerosol-cloud-radiation interactions (Twomey effect)

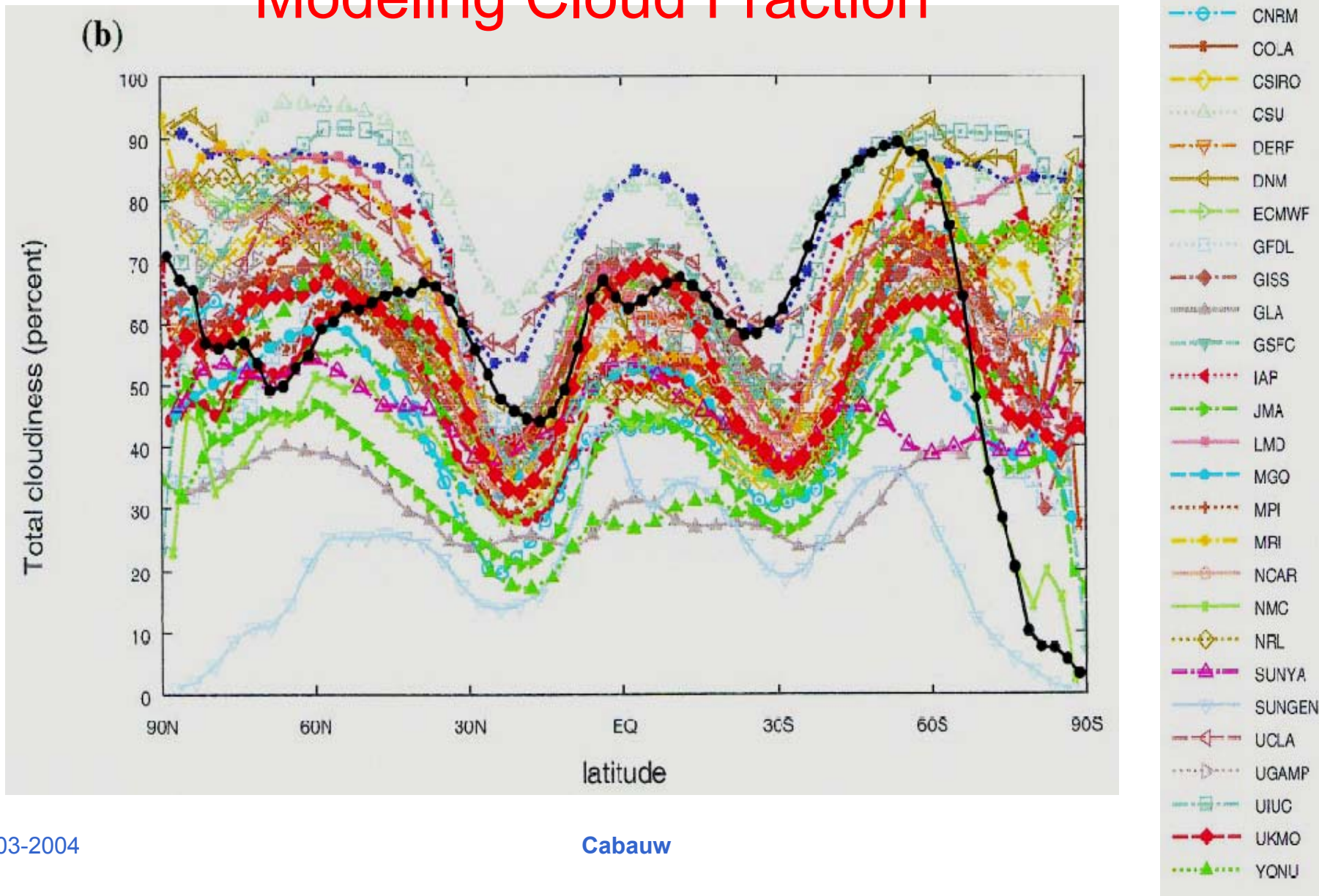
aerosol effects on cloud processes like precipitation

Boundary Layer Clouds

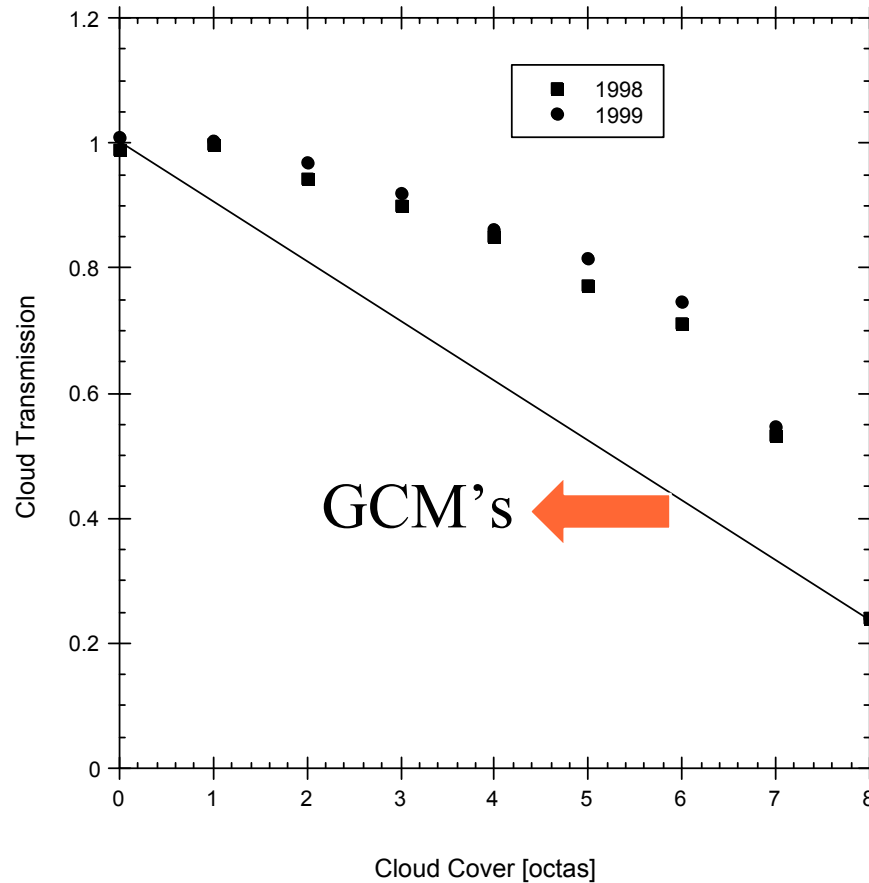
Kor.



Modeling Cloud Fraction

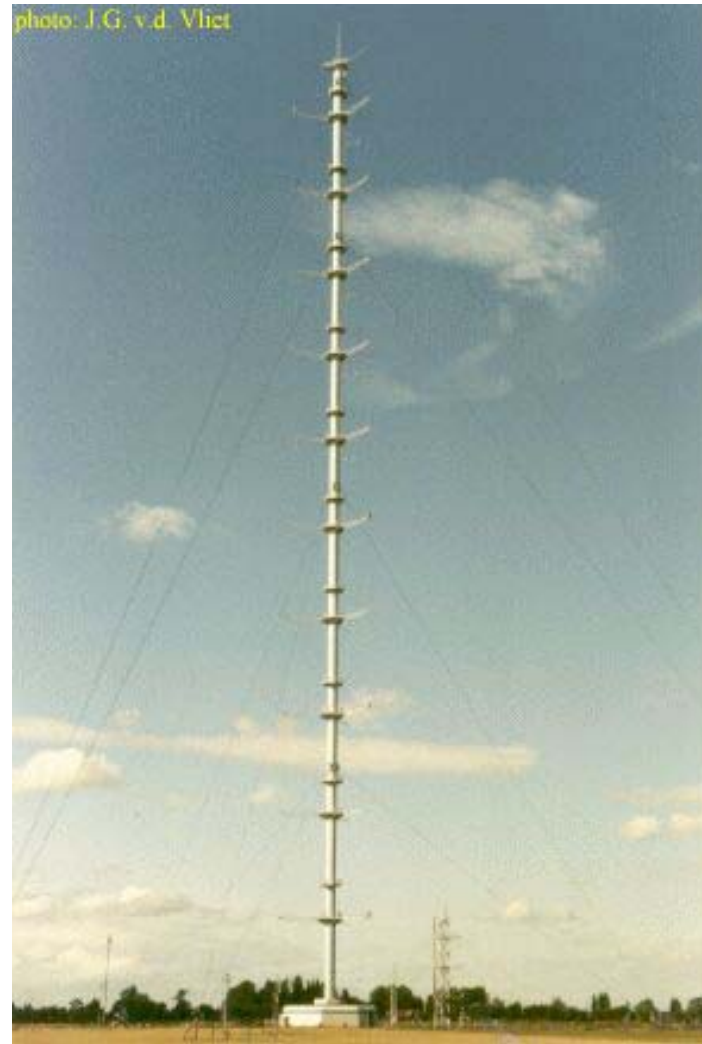
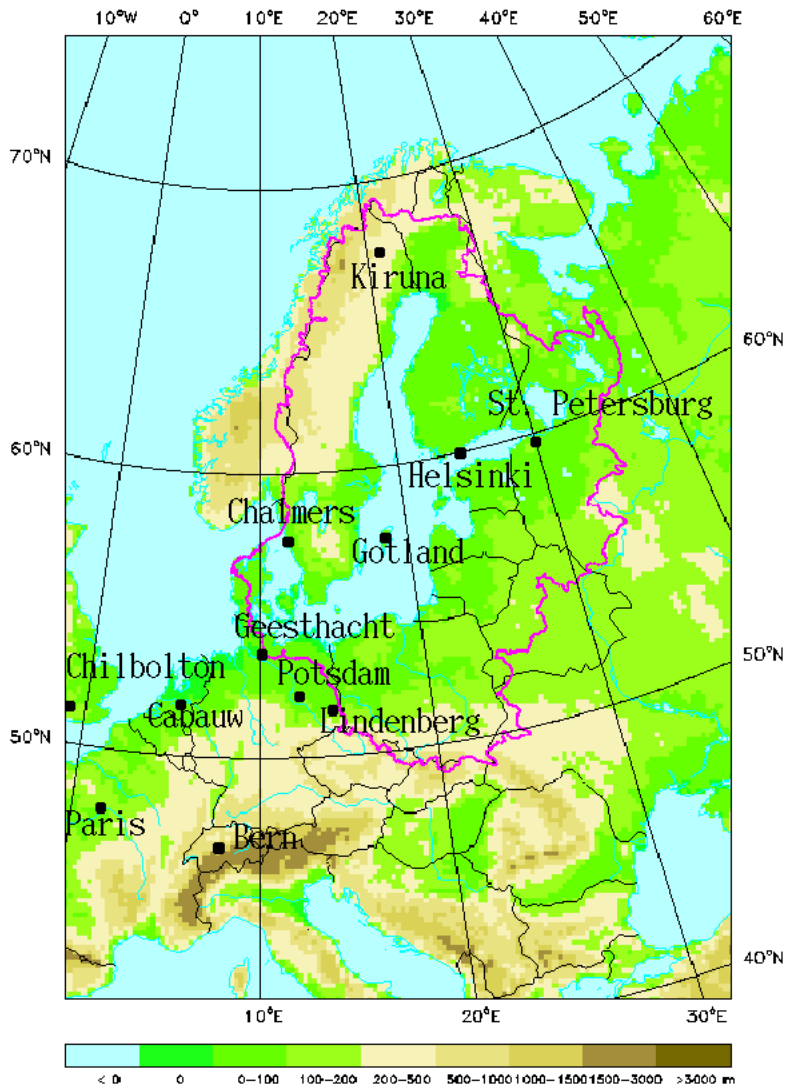


Modeling Radiative Transfer



Transmissivity versus Cloud Cover, Cabauw

Cabauw Tower



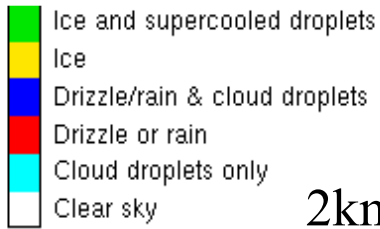
CESAR

- Cabauw Experimental Site for Atmospheric Research
 - KNMI, RIVM, TUD, ECN, TNO/FEL, WU, ESA, TUE
 - 10years project, state-of-the-art instrumentation
 - One of the key sites in Europe
 - European context, projects, importance
- International embedding
 - Participants (Uni.Bonn, Uni Marburg, ..)
 - CEOP, Baltex, BSRN
 - International campaigns (BBC1, BBC2)
 - EU-projects (CLIWANET, CloudNet, Bacc-to-bacc?, MeteoMap, ESA EarthCare, ..)

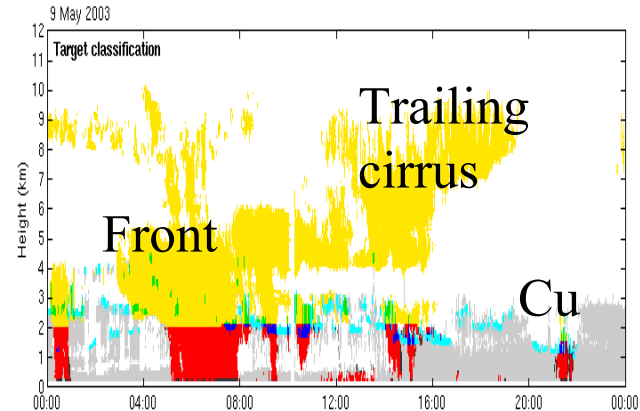
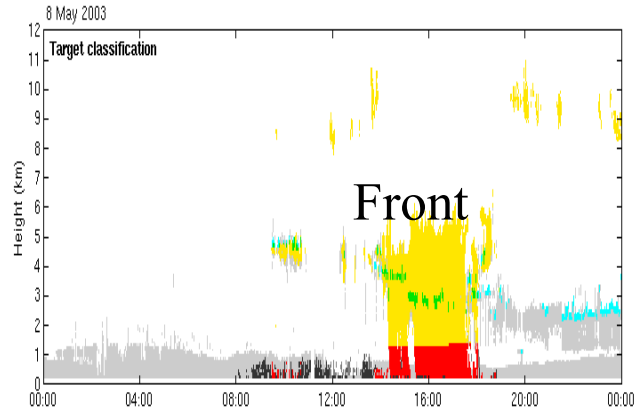
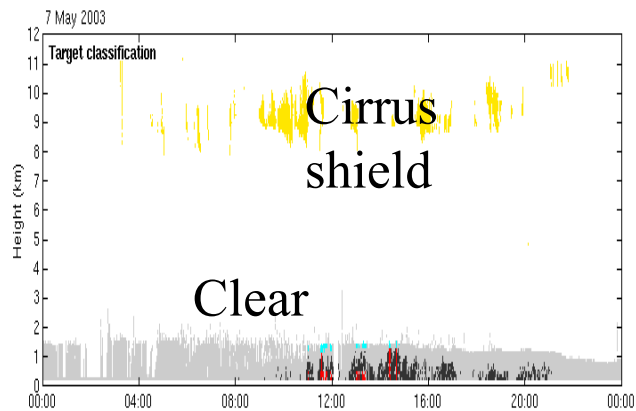
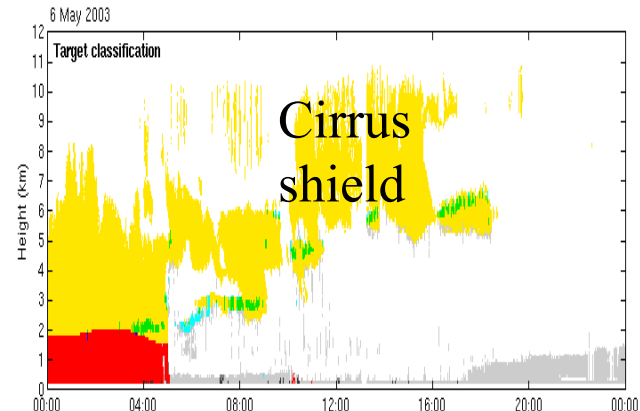
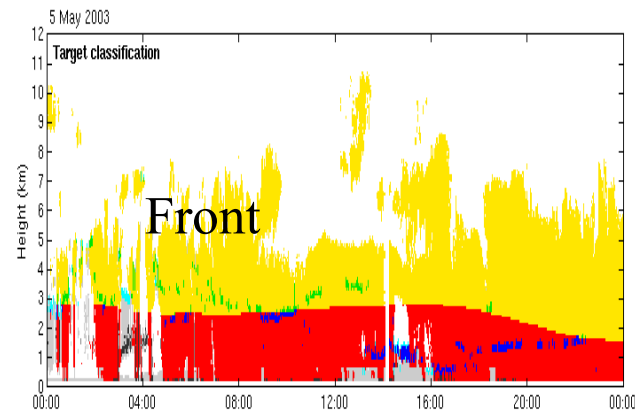
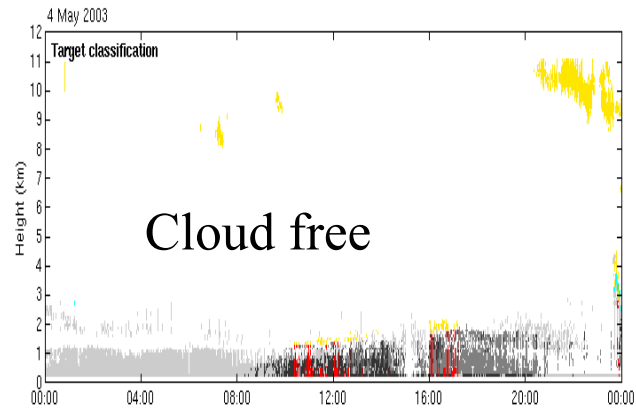
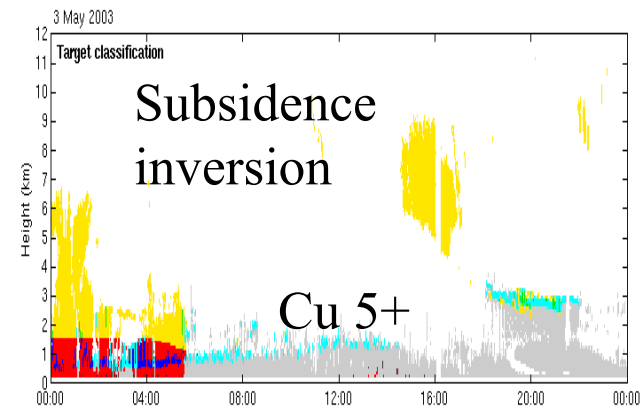
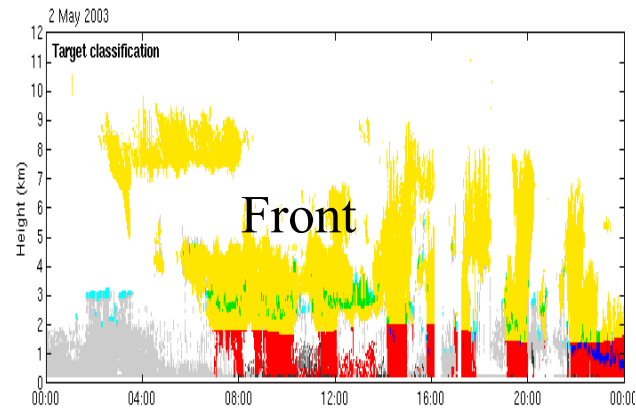
CESAR instruments

- Jump to CESAR workplan 2004

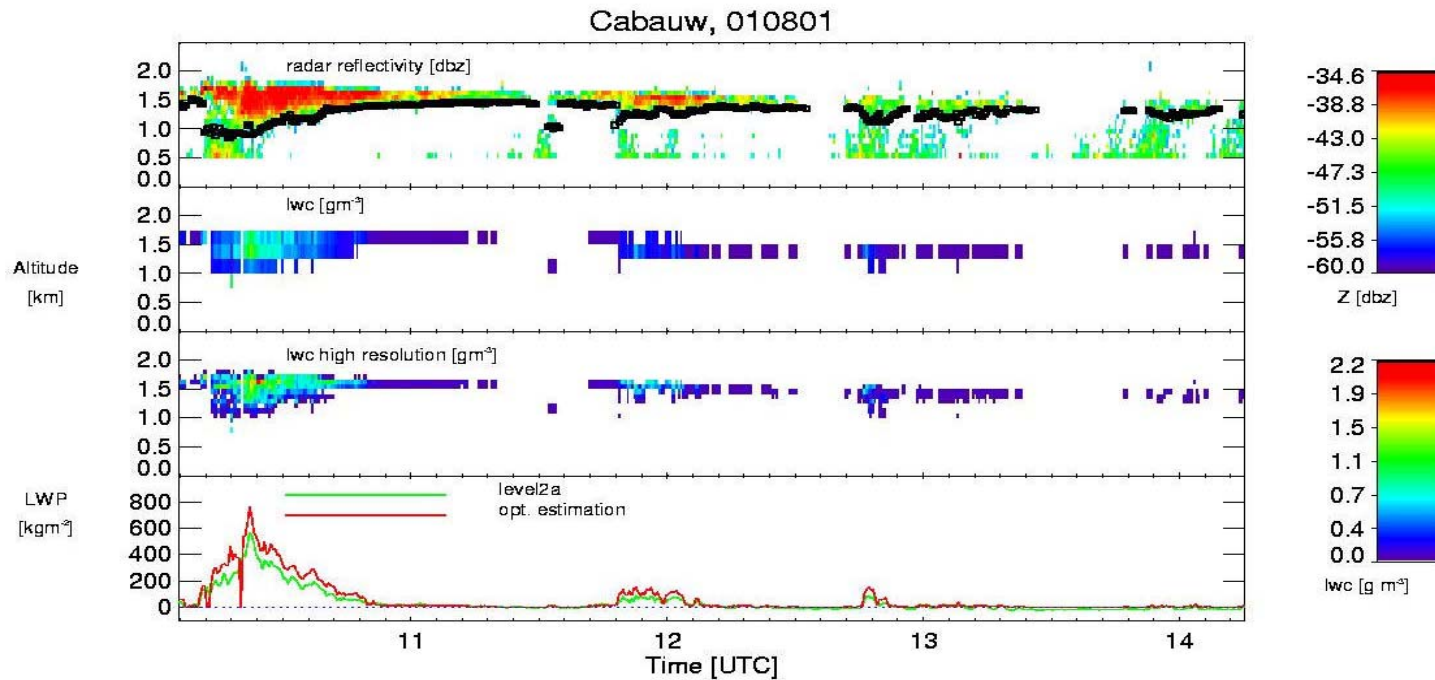
Cloud types at Cabauw during BBC2



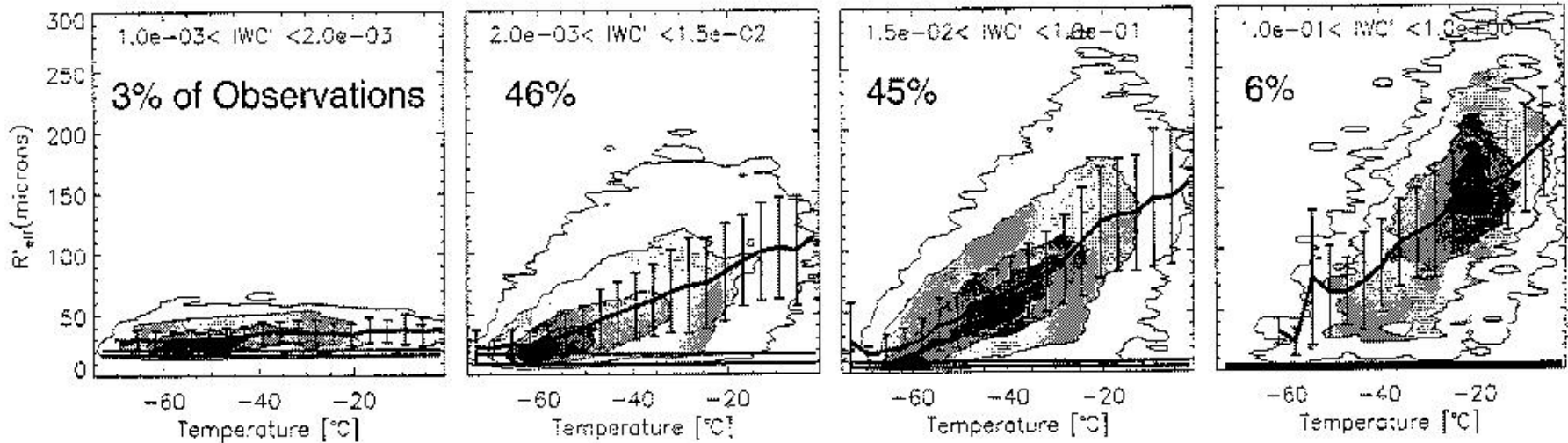
2km = 0°C



Synergetic products



Observations of ice clouds

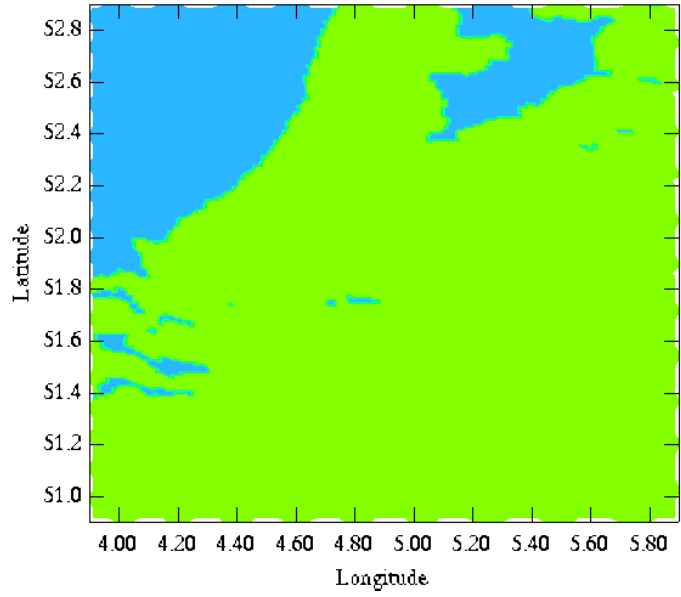


Ice crystal size versus temperature for various values of Ice Water Path as derived from lidar and radar

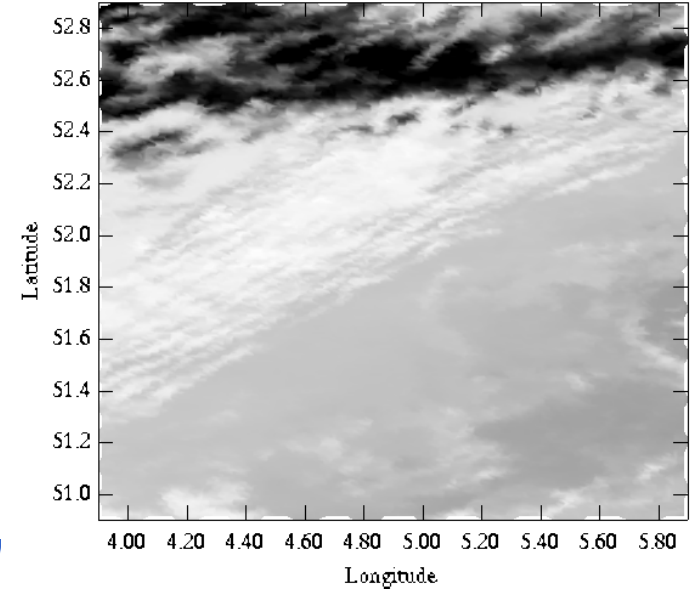
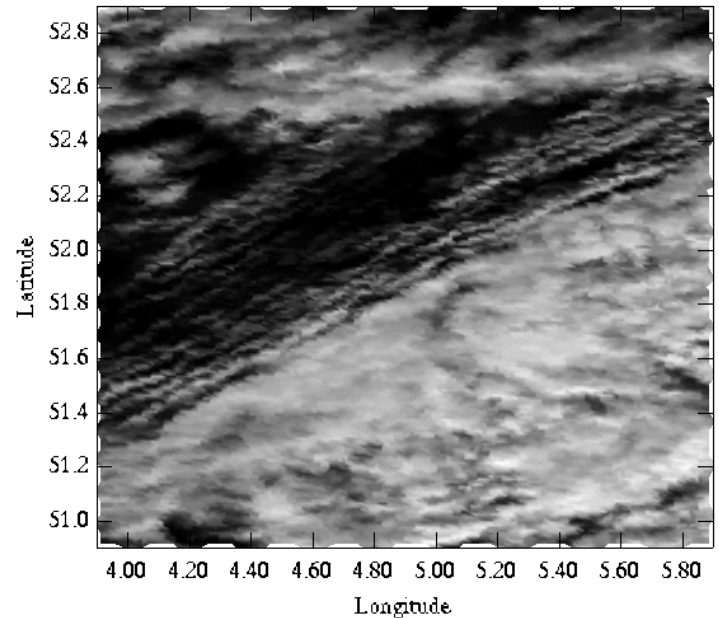
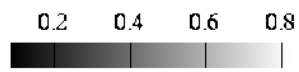
Satellite Observations

- MSG/AVHRR analysis
 - Quantitative cloud analysis
 - Cover fraction, optical thickness, phase, temperature
- GOME/SCIAMACHY/OMI analysis
 - Aerosol and cloud parameters (global)
- EarthCare/Cloudsat/Calipso

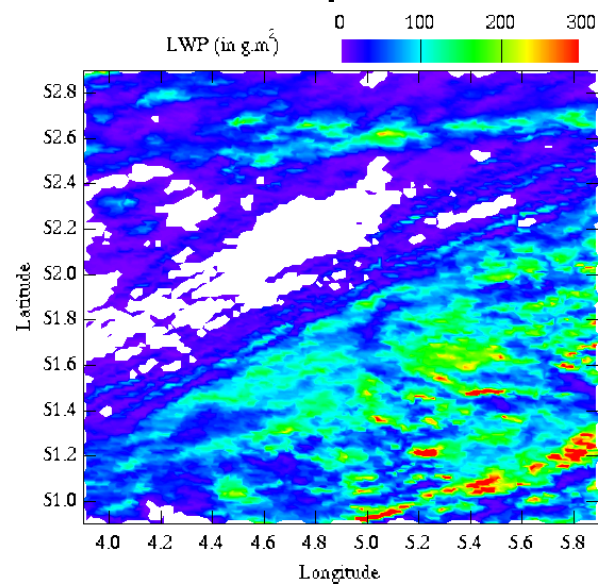
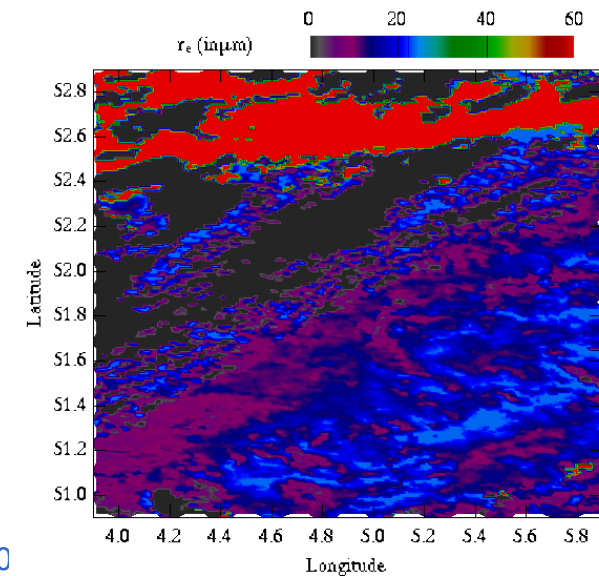
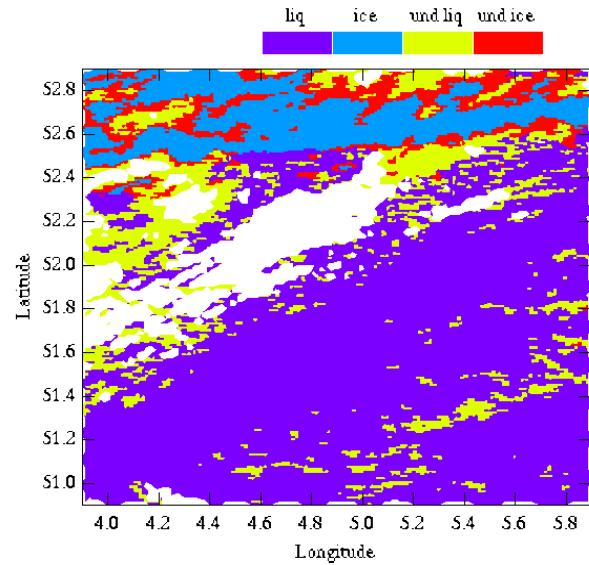
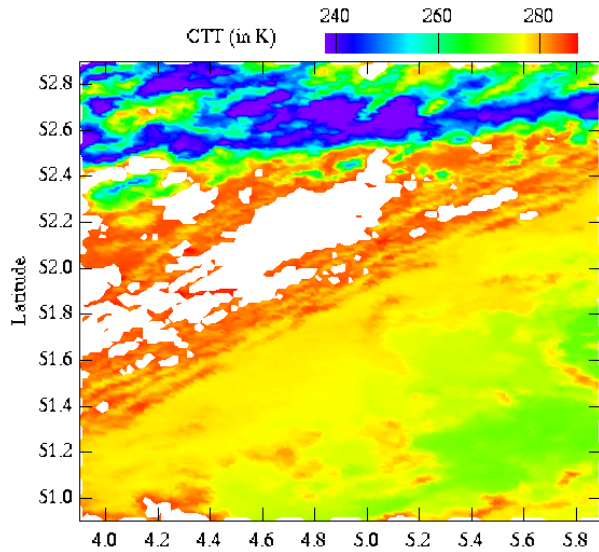
Land - sea mask



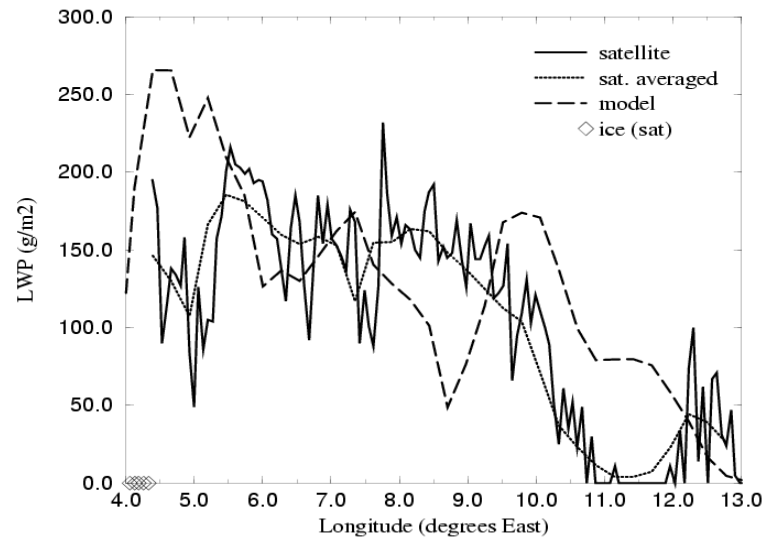
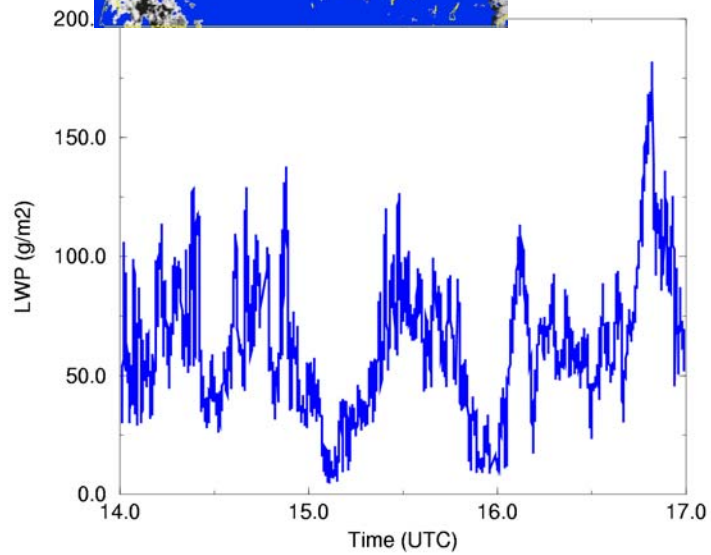
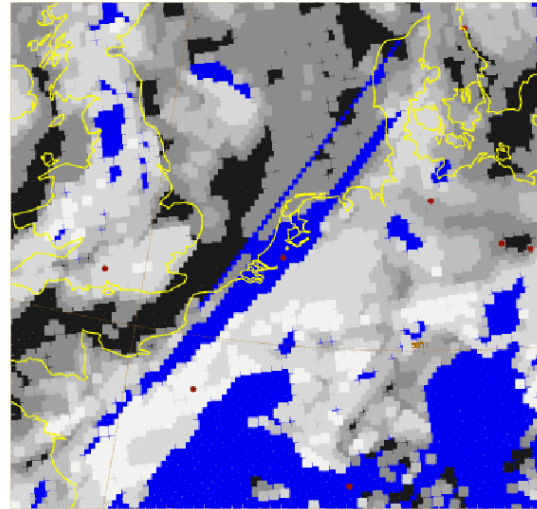
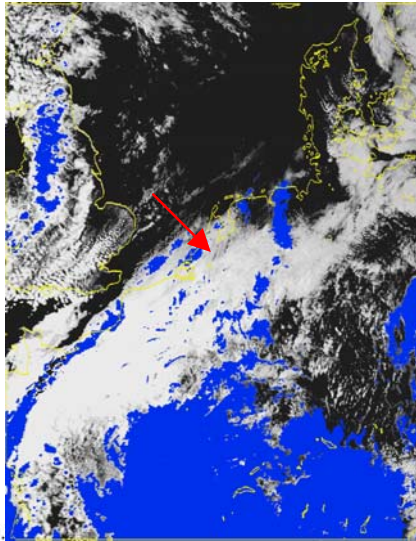
**AVHRR overpass:
23/09/01 at 11:57 UTC**



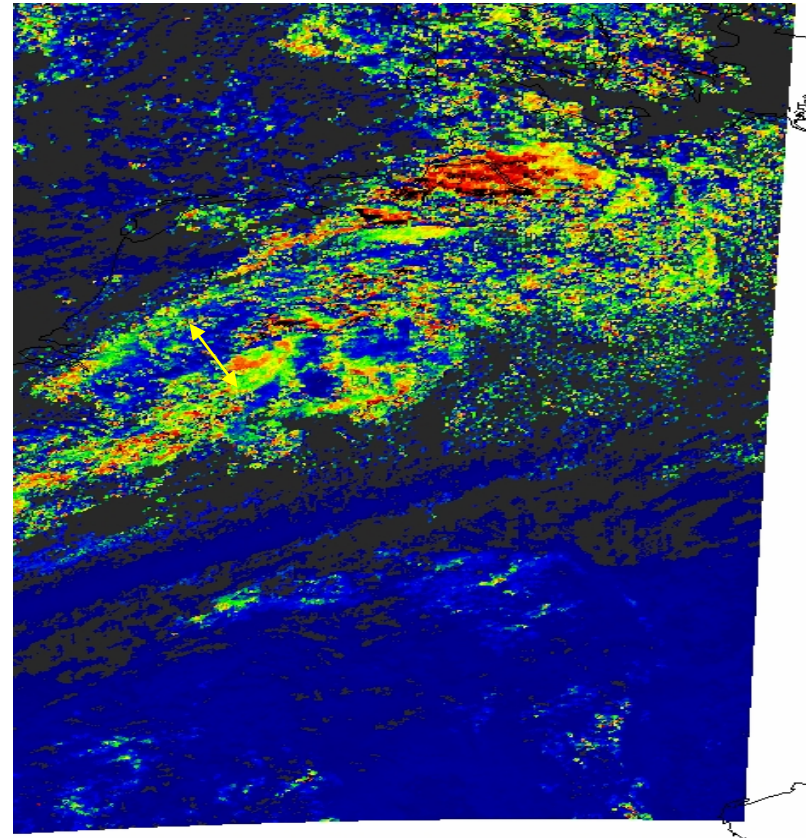
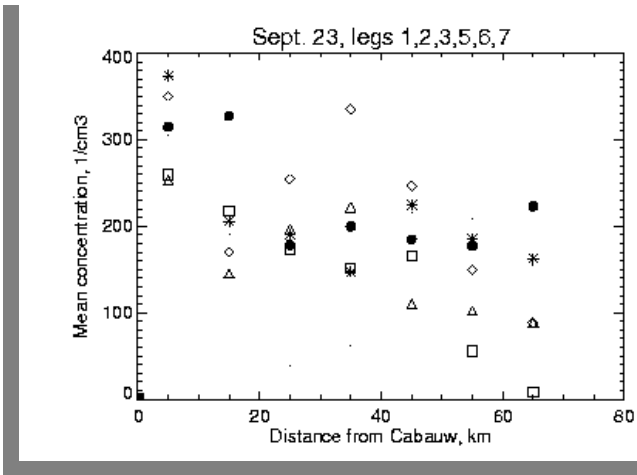
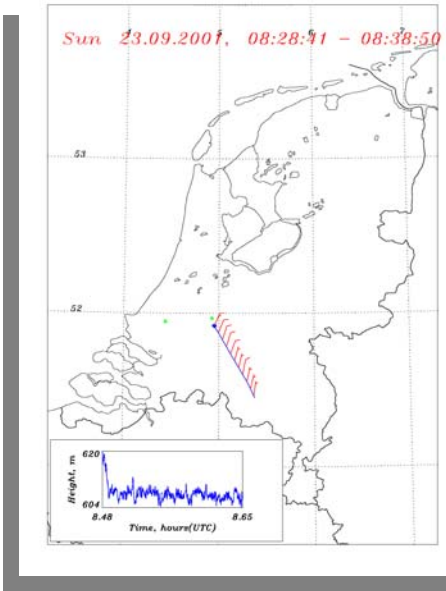
Consistent quantitative cloud analysis from AVHRR



Model vs satellite LWP



CCN from passive imager



Cloud Droplet Concentration

23 September 2003, 11:57 UTC.

International measurement campaign

- BBC2
 - 100 scientists from 27 institutes and 7 countries
 - Cabauw extra instrumentation, 2 tethered balloons,
 - 3 aircraft
 - Embedding in CLIWANET, 4D-wolken, CloudNet
- April - May 2003
- Topic: aerosols . clouds . radiation and their interactions

BBC2-Cabauw-extra

- Radars 94 GHz radar MIRACLE (GKSS)
24 GHz Micro rain radars (WU, Uni. Bonn)
- Lidars Raman-lidar, ARAS (GKSS)
- Microwave MICCY (Uni. Bonn)
20, 30, 50GHZ radiometer (ESA/ESTEC)
13GHZ Radiometer (ESA/ESTEC)
Low cast microwave radiometer
Sodar/RASS Ift Leipzig
- Camera Infra-red cameras (France)
- Tethered balloons: IMAU, Leipzig (microphysics)
- Radiosondes 4 per day (Army)

BBC2-Cabauw-extra

Radiation

Fluxes (BSRN upgrade, KNMI)

Oxygen-A band spectrometers (Uni. Heidelberg)

Albedometer (IfT Leipzig)

Sunphotometer (KNMI, IfT Leipzig)

SunPhotometer CIMEL (TNO/FEL)

Narrow beam spectrometer (FUB)

UV Spectrometer (RIVM)

Impression Remote sensing instrumentation



11-03-2004

Impressions

Building-up



11-03-2004

Cabauw

Impressions

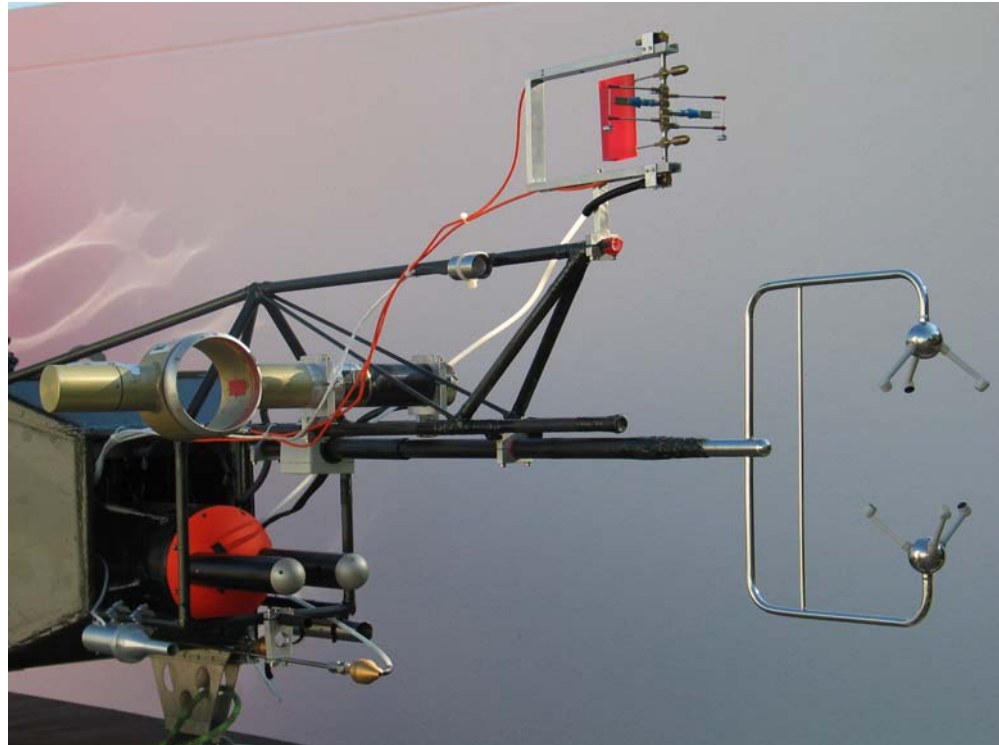
Building-up



Impressions: Clouds



Impression: MAPSY Balloon Uni. Leipzig



- Length: 21.2 m; Diameter: 6.54m; Volume: 450m³
- Max. Height: 1500m; Max. Payload: 150kg



Outlook

The CESAR consortium is growing
Especially more instrumentation for aerosol and precipitation

Considerable effort in opening up the data stream.
Increasing number of parameters in near-real-time on internet

Co-sponsored initiatives

Bacc-to-bacc

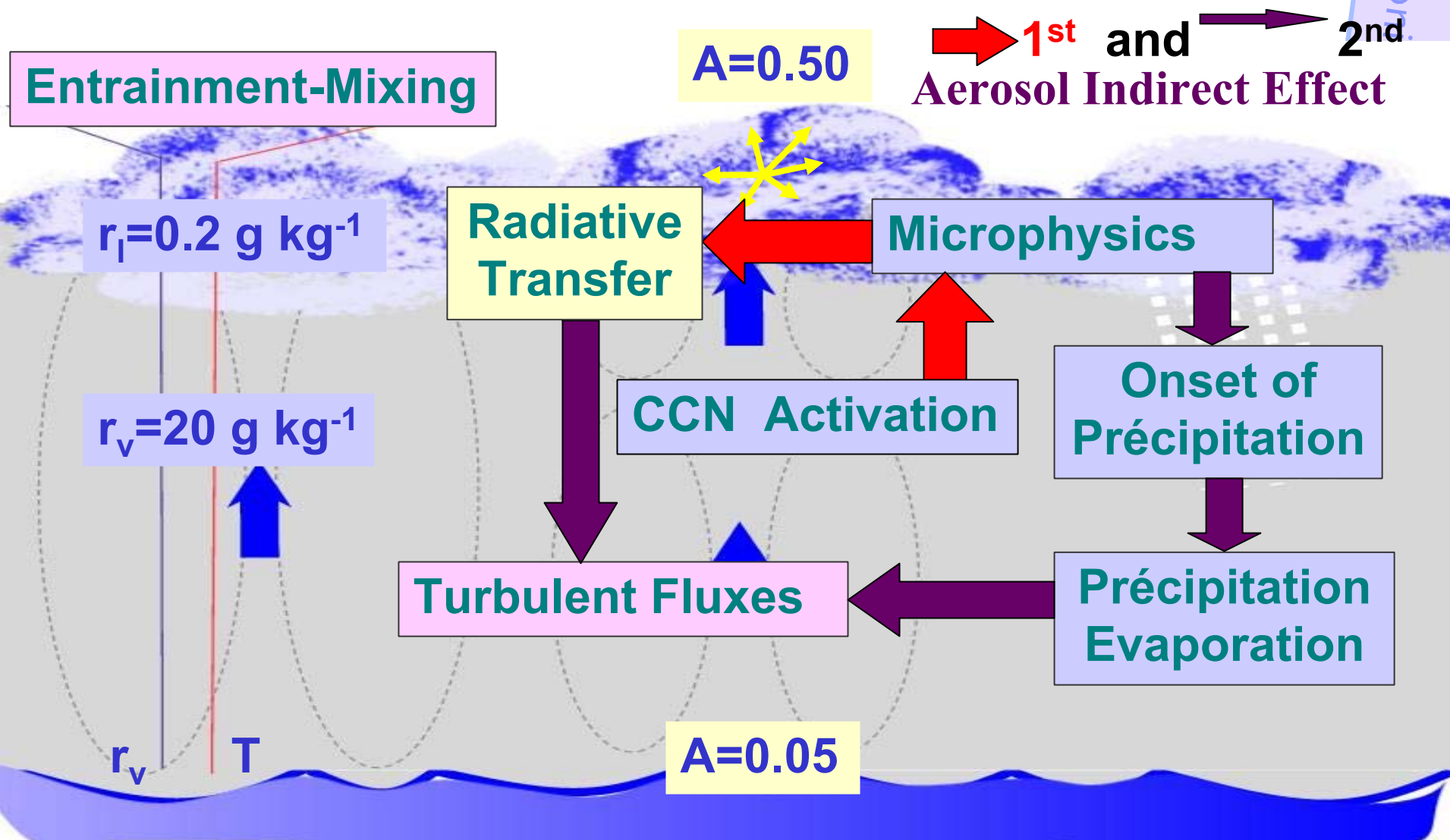
- 1 year of reference data (2005)
- 2 intensive measurements campaigns (summer, winter 2006)

MeteoMap, EuratObs

National funding: BSIC, USP, ALW, ..

Boundary Layer Clouds

Kor.



web-access ... to KNMI data

- [www.knmi.nl / samenw / cesar](http://www.knmi.nl/samenw/cesar)
- [www.knmi.nl / samenw / cliwa-net](http://www.knmi.nl/samenw/cliwa-net)
- [www.knmi.nl / samenw / bbc2](http://www.knmi.nl/samenw/bbc2)