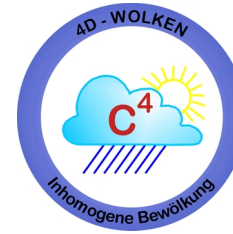
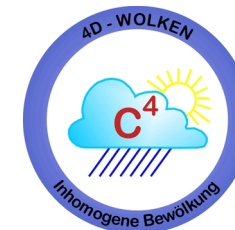


Scientific problems



- 1) Enhanced absorption in clouds may be due to cloud structure
- 2) Structure alters the relation between albedo and optical depth
- 3) Relation between dynamical exchange processes and 4D structure is not well understood



3D Measurements of the micro and macro physical properties of clouds

- Direct (aeroplane)
- Indirect (Radar, microwave radiometer, radiometer, satellite)

DWD, GKSS, MPI,

Modelling and measurements of main clouds effects

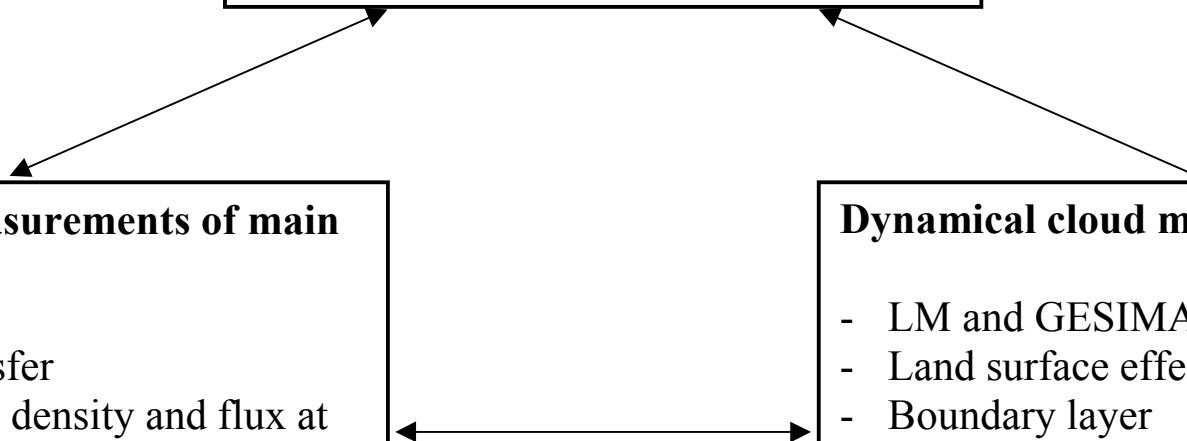
- 3D radiative transfer
- Spectral radiative density and flux at the ground and at cloud level

IfM, IfT, IPA, MIUB, TUD

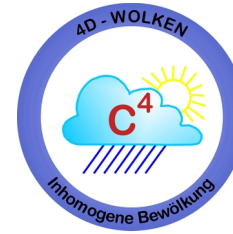
Dynamical cloud modelling

- LM and GESIMA
- Land surface effects
- Boundary layer
- Aerosol effects

GKSS, IPA, MIUB, MPI



Technical aims



- 1) Implement parameterisations for non-cloud resolving models (REMO & HRM)
- 2) Fast radiative transfer algorithms for cloud resolving models (LM & GESIMA)
- 3) Satellite retrieval algorithms for cloud properties which take cloud structure into account

Partners

University of Bonn

Simmer, Crewell, Venema

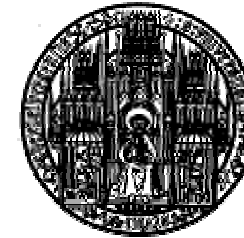
- Scanning microwave radiometer measurements (MICCY)
- Retrievals of the 3D cloud structures from radar and radiometer measurements
- 3D radiative transfer modelling of microwaves



University of Heidelberg

Pfeilsticker

- Radiation measurements (in situ and on the ground) for studying scaling properties
- Oxygen A band spectrometer measurements (ground) of photon path length distribution



University of Mainz

Trautmann (now at Leipzig)

- Development of 3D models for radiative transfer in the visible



- Development of parameterisations for 3D radiative transfer in the Lokal Model (LM) using measured and modelled clouds

Dresden University of Technology

Berger

- Development of method to characterise the temporal behaviour of 3D cloud fields using satellite and ground based observations
- Radiation and turbulence measurements (ground)



Free University of Berlin

Fischer

- Radiation flux measurements above, below and in clouds (Cessna) with high spectral resolution



Deutscher Wetterdienst

Steppeler

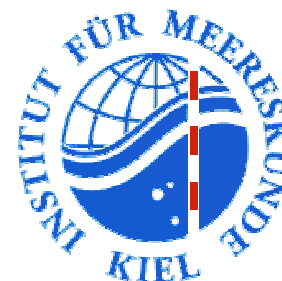
- Implement finding in NWP models



Institute for Marine Sciences, Kiel

Macke

- Development of multi-spectral (infrared) radiative transfer model for inhomogeneous cloud and validation by model comparisons
- Comparison between modelled and measured radiation fields



Institute for Tropospheric Research, Leipzig

Wendisch

- Particle size distribution measurements (Aerosol/cloud) and radiation flux measurements, both in situ (Partenavia)
- Study if inhomogeneous clouds are responsible for the difference between measured and modelled radiative properties of clouds



GKSS Research Centre, Geesthacht

Stuhlmann, Rockel, Quante

- Scanning radar measurements (MIRACLE)
- In situ measurements (PMS probe)
- Regional climate modelling (REMO/HRM) (inhomogeneous clouds and exchange processes)

