

EUCLIPSE Description of Work: Deliverable 3.1

Task 3.1.1: *Set up of the ASTEX and GPCI cases.* The ASTEX case will be determined from aircraft and ECMWF reanalysis data (Bretherton et al. 1999; De Roode and Duynkerke 1997). Select two GPCI columns on the basis of a maximum frequency of occurrence of shallow cumulus and stratocumulus, respectively. Obtain the mean large-scale forcings from ECMWF reanalysis data. In addition, determine more realistic time-dependent large-scale forcings on the basis of results from the participating ESMs.

Partners: METO, TUD, MPG, UW

D3.1: Description of the set-up for the following cases: ASTEX, the GPCI stratocumulus and shallow cumulus atmospheric columns, and the SCM equilibrium state study (Month 12).

Set up of the cases

The Table below summarizes the websites for the three modeling cases.

Case and Investigators	purpose and website
ASTEX De Roode, van der Dussen (TUD)	Validation of model results of an observed stratocumulus to shallow cumulus cloud transition using aircraft observations www.euclipse.nl/wp3/ASTEX_Lagrangian/Introduction.shtml
Composite cases Sandu, Stevens (MPG)	Evaluating the timing of the stratocumulus-cumulus transition in models and a comparison against results obtained from satellite data www.mpimet.mpg.de/en/mitarbeiter/irina-sandu/transition-cases.html
CGILS Zhang (Stony Brook), Bretherton (U Washington)	Equilibrium state solutions for three selected columns in the GPCI cross section to study cloud-climate feedback atmgcm.msrc.sunysb.edu/cfmip_figs/Case_specification.html

The websites present a motivation for the respective cases and the science questions to be addressed, and explain how the cases have been set up. They include data sets that are needed to initialize Single-Column Model versions of Earth System Models and Large-Eddy Simulation Models. Furthermore, large-scale forcing terms like the mean vertical advection (subsidence) and the (time-varying) sea surface temperature are provided. Analysis of model data will be performed on the basis of a detailed list of requested model output.

ECMWF reanalysis data

According to De Roode and van der Dussen (2010) results of the large-scale subsidence for the ASTEX observational area from ERA-40 and ERA-Interim are rather different. The large-scale subsidence has a large effect on the evolution of the stratocumulus cloud deck. The mean large-scale vertical velocity as obtained from ERA-40 changes sign during the transition. It is found from large-eddy simulation that such a forcing supports the maintenance of the stratocumulus cloud deck.

Reference

De Roode, S.R. and J.J. van der Dussen: Large-Eddy Simulation of a stratocumulus to cumulus cloud transition as observed during ASTEX. Boundary-Layers and Turbulence conference, Keystone, CO, USA, 2-6 August 2010. Paper available at http://ams.confex.com/ams/19Ag19BLT9Urban/techprogram/programexpanded_637.htm