Project: 671  
Project title: **EUCLIPSE**  
Project lead: **Bjorn Stevens**;  
Contact person: **Traute Crueger**  

**Project Report 2014/2015**

**Project overview**

It is thought that cloud-radiative effects control many aspects of the present and future climate, e.g. precipitation, large-scale circulation, variability (especially on tropical intra-seasonal timescales) up to climate sensitivity. The overall goal of the EUCLIPSE project was to identify robust effects and related processes of the role of clouds on climate and climate change. This has been performed in a coordinated way and through a wide range of model configurations and complexity. Five European centres contributed to the model simulations (UKMO, CNRM, IPSL, KNMI and MPIM), allowing model inter-comparison. Most of the data are now stored with public access at the DKRZ. The EUCLIPSE initiative is also incorporated through a new program (Grand Challenges) of the WGCM.

The other focus of EUCLIPSE was how moisture-radiation and moisture-convection feedbacks are represented in ECHAM6. For that reason, the CREAM package had been extended in 2014 by a wide range of sensitivity experiments of AMIP-style. To address the issue of moisture-convection feedback, a special model configuration, the Radiative-Convective-Equilibrium (RCE) version of ECHAM6, has been utilized.

![Figure 1: Sensitivity of tropical precipitation to tropospheric relative humidity for four models contributing to the COOKIE experiment. Also included is the quantity for the ERA-interim winds/GPCP precipitation. Black: clouds-on, grey: clouds-off. (Crueger and Stevens, 2015).](image-url)
A better understanding of the couplings between tropospheric humidity and convection, surface fluxes and convection as well as clouds and radiation has also been obtained by sensitivity tests in the idealized RCE version of ECHAM6. Eventually, the impact on convective aggregation can be assessed by these experiments, which were performed in collaboration with the LMDZ, and NCAR, allowing model inter-comparison.

The EUCLIPSE experiments will not only be utilized by the EUCLIPSE partners, but also by the scientific community in general. E.g. Dave Thompson at Colorado State University, and Felix Pithan from the University of Reading currently work with the data. Also non-European groups, e.g. from the University of Washington, Columbia and GFDL and the Japanese JAMSTECH expressed interest in the EUCLIPSE data.

Figure 2: Strength of tropical intra-seasonal variability for four models contributing to the COOKIE experiment. Also included is the quantity for the ERA-interim winds/GPCP precipitation. Black: clouds-on, grey: clouds-off. (Crueger and Stevens, 2015).

Performed work
Several experiment packages have been performed in EUCLIPSE. These packages have been continued and finalized in 2014 and 2015. The packages are the following: The so-called COOKIE (Clouds On/Off Klima Intercomparison Experiment), where clouds have been made invisible for radiation in atmosphere-only models (Stevens et al., 2012). These experiments were finalized in 2014 and the data are now available for public access from the ESFG server. The CREAM experiment package (Clouds Radiation, Easy Aerosol and More) have been performed, especially Easy Aerosols, where aerosols are represented in an idealized manner. In addition, a wide range of sensitivity experiments with the AMIP and the RCE version of ECHAM6 extended this package in 2014 and 2015. E.g. overall, 40 AMIP-type runs have been performed in the last two years (in total 1200 years).