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Echam5 sensitivity runs for analysis of deep convective clouds using ISCCP simulator

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Clouds are one of the most important components of the climate system, regulating the radiation budget of the earth. In the simulation of the global climate using General Circulation Models (GCMs), cloud feedbacks contribute to a major uncertainty on account of poorly represented cloud related processes in the model. In particular, the representation of convection and convective clouds constitutes at the same time a crucial component of GCMs and a main source of uncertainty. Satellite observations provide the most comprehensive view of cloud related quantities at a global scale, and are an important data source for the evaluation of parameterization schemes.

The International Satellite Cloud Climatology Project (ISCCP) simulator is a valuable tool for analysis of a GCM output related to clouds. In this work we present the diagnostic applications of the ISCCP simulator to pin point the deficiencies in ECHAM5 GCM, focusing on the convection parameterization. A subgrid-scale cloud generator based on the approach suggested by Räisänen et al (J. Clim., 2007) is implemented in the ECHAM5 GCM and a couple of sensitivity runs are performed in order to determine the behavior of model variables associated with deep convective clouds. We also present a small case study similar to that suggested by Willams and Webb (J. Clim., in press) using the clustering technique to classify the model output into various cloud regimes.

The model output with ISCCP simulator diagnostics is compared with the International Satellite Cloud Climatology Project (ISCCP) products and data from the MODerate Resolution Imaging Spectroradiometer (MODIS) instrument.