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Implementation of the CALIPSO and CloudSat Satellite Simulator within the ECHAM5 GCM

C. Nam (1,2) and J. Quaas (2)

(1) International Max Planck Research School on Earth System Modelling, Hamburg, Germany, (christine.nam@zmaw.de),
(2) Max Planck Institute for Meteorology, Hamburg, Germany

Space-borne satellites provide a unique, un-obscured vantage point for observing atmospheric properties. The active remote sensing lidar instrument on-board the CALIPSO satellite provides a three-dimensional view of cloud structures as well as information regarding the formation and evolution of aerosols and clouds. Preliminary results from the implementation of the Cloud Feedback Model Intercomparison Project's 'CloudSat and CALIPSO Simulator' (COSP) within the ECHAM5 global atmospheric general circulation model will be presented. More specifically, results from the lidar simulator, which mimics CALIPSO signals within the model, will be analyzed.

Modeled atmospheric profiles are taken from ECHAM5 and used to diagnose the attenuated back-scatter lidar signals which would be observed by CALISPO passing over a similar atmosphere. The lidar profiles are then used to derive cloud fractions, thus allowing for a direct comparison between modeled clouds and satellite observations. COSP is a valuable tool for evaluating the representation of clouds in ECHAM5. Initial evaluation of ECHAM5's zonally averaged cloud fraction reveals an underestimation of mid-level clouds and overestimation of low-level clouds when compared to CALIPSO satellite data. A substantially altered picture arises when COSP was used in conjunction with ECHAM5. Simulations showed the lack of mid-level clouds became even more apparent, as well as the lack in low-latitude low-level clouds, which may be due to the excessive amount of high-level clouds.