



Effects of Land-Surface-Vegetation on the boreal summer surface climate of a GCM

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A Land Surface Model (LSM) has been included in the ECHAM4 Atmospheric General Circulation Model (AGCM). The LSM is an early version of ORCHIDEE (Organizing Carbon and Hydrology In Dynamic Ecosystems) and it replaces the simple land surface scheme previously included in ECHAM4. The purpose of this work is to document how a more exhaustive consideration of the land-surface-vegetation processes affects the simulated boreal summer surface climate.

In order to investigate the impacts on the present-day simulated climate, different sets of AMIP-type simulations have been performed with ECHAM4 alone and with the AGCM coupled with ORCHIDEE. Furthermore, to assess the effects of the increase in horizontal resolution the coupling of ECHAM4 with the LSM has been implemented at different horizontal resolutions.

The analysis reveals that the LSM has large effects on the simulated boreal summer surface climate of the atmospheric model. Considerable impacts are found in the surface energy balance due to changes in the surface latent heat fluxes over tropical and mid-latitude areas covered with vegetation. Rainfall and atmospheric circulation are substantially affected by these changes. In particular, increased precipitation is found over evergreen and summergreen vegetated areas.

Due to the socio-economical relevance, particular attention has been devoted to the Indian Summer Monsoon (ISM) region. Our results indicate that precipitation over the Indian subcontinent is better simulated with the coupled ECHAM4-ORCHIDEE model compared to the atmospheric model alone.