Geophysical Research Abstracts
Vol. 17, EGU2015-10891, 2015
EGU General Assembly 2015

Investigation of links between low-cloud feedback and the surface energy budget

Florent Brient (1), Tapio Schneider (1,2), Zhihong Tan (1,2)

(1) ETH, Climate Dynamics, Zurich, Switzerland (florent.brient@erdw.ethz.ch), (2) California Institute of Technology, Pasadena, CA, USA

In the latest-generation climate models (CMIP5), cloud-radiative feedbacks continue to dominate the inter-model spread of climate sensitivity. The complexity of climate models and the large number of processes potentially involved make the analysis of the cloud-radiative feedbacks difficult. A previous study showed that how models represent the vertical distribution of low clouds in the present climate affects their climate sensitivity. Additionally, whether tropical boundary-layer clouds deepen or shallow in response to warming exerts an important control on a model's climate sensitivity. The relative intensity of these two changes controls the spread of tropical low-cloud feedback in climate models.

The robustness of these mechanisms is related to constraints on the surface energy budget as the climate warms. Under global warming, some robust changes occur: The near-surface relative humidity increases, sensible heat fluxes decrease, and surface wind speeds generally weaken. These characteristics strongly influence the hydrological cycle and their relative magnitudes are model-dependent. Here we show that these changes in the surface energy budget and in low-cloud feedback are related. We investigate how characteristics of the present climate (linked to low clouds) influence the surface energy budget in both the present and future climates. Our goal is to improve our knowledge about physical mechanisms explaining differences among climate models.