Geophysical Research Abstracts
Vol. 18, EGU2016-7765, 2016
EGU General Assembly 2016

Spatial and temporal variability of soil moisture-atmosphere coupling on global scale

Clemens Schwingshackl, Martin Hirschi, and Sonia I. Seneviratne
Institute for Atmospheric and Climate Science, ETH Zürich, Switzerland (clemens.schwingshackl@env.ethz.ch)

Climate in different regions of the world is affected by a variety of processes. One important factor influencing climatic conditions is the energy partitioning at the land surface into latent, sensible and ground heat fluxes. In some regions of the world, the magnitude of latent heat flux is dependent on available soil moisture. In these regions, one finds an essentially linear relation between soil moisture and evaporative fraction (i.e. the fraction of net radiation that goes into latent heat flux). However, the coupling strength at distinct locations can change in the course of the year or during particular weather conditions when the soil dries out. Using re-analysis and observation-based data we identify regions with strong coupling between soil moisture and evaporative fraction and investigate temporal variations of the coupling strength. Moreover, we determine the critical soil moisture value that separates the regime in which evaporative fraction is independent of soil moisture from that in which both variables are linearly coupled.

Since the coupling between soil moisture and evaporative fraction influences strongly the energy partitioning at the surface, it affects as well the magnitude of sensible heat flux. Especially during dry spells, decreasing soil moisture and concomitant decreasing evaporative fraction cause increasing sensible heat flux, which might further lead to higher surface air temperatures. We investigate the strength of the single couplings (soil moisture → latent heat flux → sensible heat flux → temperature) in order to quantify the influence of soil moisture on surface air temperature. This allows us to comprehensively analyse temporal and spatial variations of the soil moisture-temperature coupling strength.