



Impact of soil moisture variability on circulation in Western Europe

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The European summers of 2003 and 2006 have increased the awareness of enhanced drought risks in Europe as one of the possible consequences of a warmer global climate. The mechanism of large scale and long term droughts involves complex feedbacks between soil moisture, evaporation, precipitation and large scale atmospheric circulation that affects the advection of moisture via the atmosphere.

In simulations with the ECHAM5 GCM - carried out in the context of the Dutch/German/Swiss ESSENCE project - the interaction between soil moisture and atmospheric circulation in Western Europe is investigated for present day and future climate conditions. In one simulation soil moisture is treated as an interactive prognostic variable, influenced by precipitation, evaporation and runoff. A second simulation was carried out in which soil moisture was prescribed from a climatological value, derived from a multi-member ensemble simulation with the same GCM. With this set of experiments it is tested whether the interactive soil moisture evolution has an impact on the frequency distribution of atmospheric circulation patterns during summer.

As a simple indicator for the atmospheric circulation the strength of the daily mean zonal geostrophic wind speed (calculated from sea level pressure fields) was considered. A number of analyses (concerning the frequency distribution of this zonal wind speed, the temporal persistence and others) is carried out, revealing a modest but systematic role of soil moisture variability in the variability of the atmospheric flow.