



Interannual Variability in a changing Climate

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In a recent paper, we have proposed that land-surface processes may give rise to a pronounced increase in interannual variability during the summer season. Such an increase in variability would have important repercussions for the frequency of extreme summer heat waves, and would also represent a challenge to adaptive response strategies designed to cope with climate change. In the current study, we present a detailed intercomparison of a large set of global and regional climate models (GCMs and RCMs). Both sets of simulations consider future climates in scenarios with increasing atmospheric greenhouse-gas concentrations.

The GCM simulations considered include recent simulations from a total of 12 modeling groups that have been coordinated within the IPCC fourth assessment report. Analysis is performed on a global scale but with an emphasis on the summer extratropics. The RCM simulations considered include the simulations of a total of 9 modeling groups that have been coordinated within the European Project PRUDENCE. The domain of these experiments covers the European continent.

Intercomparison of model simulations suggests that there is considerable agreement between different models regarding the occurrence of the effect, but there are substantial differences regarding its geographical distribution, amplitude, and seasonal evolution. Detailed analysis shows that these differences partly relate to large-scale circulation changes and partly to the formulation of physical processes. In particular, analysis of RCM simulations driven by the same GCM serves to demonstrate that the differences relate at least partly to model differences, among them the representation of the continental-scale water cycle during the summer season.