Geophysical Research Abstracts
Vol. 15, EGU2013-596, 2013
EGU General Assembly 2013

Extreme European summer heatwaves: can we catch them with our models?

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The variability of European summers is expected to increase in the next century, probably leading to more frequent and more severe heatwaves. Heatwaves are known for their impact on society but also heavily impact ecosystems such as forest and their carbon cycle. Although recently an increasing amount of research is done on heatwaves and their impacts, it remains unclear whether present climate models are able to simulate the most extreme events, and thus their impact on ecosystems.

In this study the regional climate model WRF (Weather Research and Forecast) will be analyzed on its ability to simulate the extreme summer event of 2003 and its associated land-atmosphere feedbacks against observations of amongst others temperature and heat fluxes. A second phase of this research is to study the impact of extreme heatwaves on forests and their carbon cycle with a process based biosphere model, ORCHIDEE, forced with the climate variables simulated by WRF.

Preliminary results suggest that there is an underestimation of temperature during the hottest days of the 2003 heatwave over central and southern Europe. If climate models are not able to simulate current extreme events, the question remains whether they will be able to simulate future, perhaps even more extreme events with the right magnitude. Furthermore, their impact on forest and the carbon cycle might then be underestimated.

With this study we hope to shed light on the ability of current generation climate models to simulate the most extreme heatwaves in order to increase knowledge on possible future scenarios.