

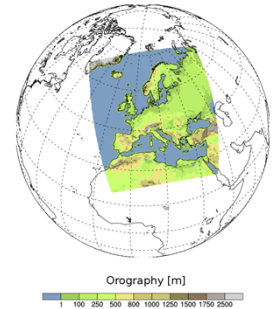
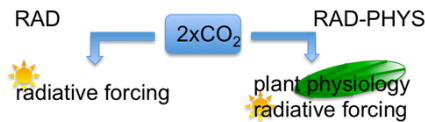
Introduction

The aim of this study was the modelling of the CO₂ physiological forcing (CO₂PF) at regional scale. Field experiments⁽¹⁾ prove the physiological effect of stomatal closing, when put under enhanced CO₂ concentration. Global climate model studies^(2,3,4) show the continental scale implications of this feedback.

To be able to investigate feedback effects at regional scale, the regional climate model REMO^(5,6) was coupled to the land surface scheme JSBACH⁽⁷⁾. The newly developed model REMO-iMOVE⁽⁸⁾ was tested and is able to model the European climate like its mother-model REMO.

Methodology

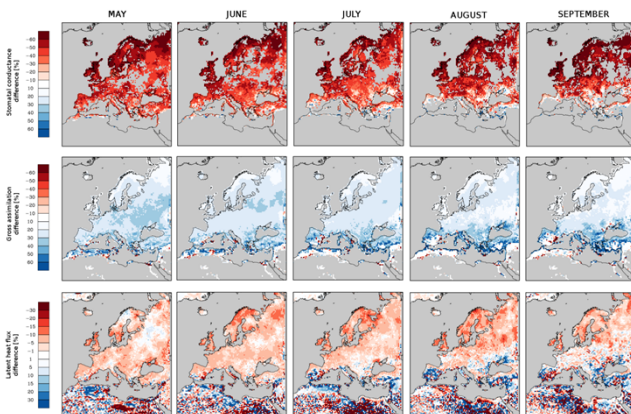
- Two 10 year simulations with REMO-iMOVE, forced by boundary conditions derived from an ECHAM5 doubled CO₂ (696ppm) experiment, which was coupled to a mixed layer ocean⁽⁹⁾.
- Simulation period 2090 – 2099 + 5 years soil spin up
- Experiment 1 (RAD): elevated CO₂ took effect only on the radiative forcing
- Experiment 2 (RAD-PHYS): elevated CO₂ took effect on plant physiology and radiative forcing



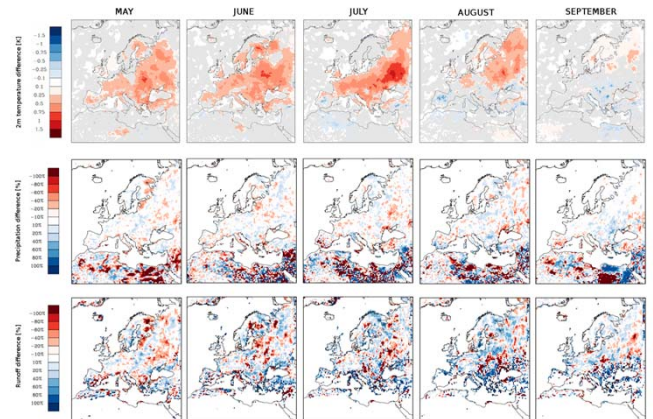
RESULTS

The simulated effects on stomatal conductance and gross assimilation are in the range of field experiments⁽¹⁾.

The effect on latent heat flux is most important, as we can observe regionally differing patterns, which cannot be modeled with a GCM.



RAD_PHYS – RAD



Implications on the climatology:

- Changes in 2m temperature due to differences in the latent heat flux
- Strongest effects in the eastern parts of the domain in late summer

CONCLUSION / OUTLOOK

- With REMO-iMOVE we are able to simulate also the CO₂PF effect on future climate
- The model is able to simulate the regional characteristics of CO₂PF in high resolution and gives a detailed picture of the CO₂PF with regional effects captured
- The experiment has the advantage to simulate not only island effects like in field experiments but also take into account the nonlinearity of the climate system
- Conduct more doubling CO₂ experiment forced by different boundary conditions to proof robustness of the given effects
- Conduct transient climate change scenarios to study the CO₂PF effect under continuously changing CO₂ concentrations

LITERATURE

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We are thankful for the computing time and technical support provided by the German Climate Computing Centre (DKRZ).