Project: **1143**
Project title: **FORCES**
Principal investigator: **Johannes Quaas**
Report period: **2020-11-01 to 2021-08-31**
Text: maximum of two pages including figures.

In the reporting period, FORCES saw some slight disruptions because a project scientist went to maternity leave. For this reason, some of the works (on the hemispheric contrast) are somewhat delayed compared to the proposal.

The work in the FORCES project is nevertheless progressing. In the reporting period, this in particular concerned the anticipated work on the rapid adjustments. This built on work that analysed simulations performed at DKRZ in the HD(CP)² project focusing on the rapid adjustments to aerosol-radiation interactions (Senf et al., in revision) but for GCM simulations and focusing on the rapid adjustments to CO2 perturbations (following also Nam et al., 2018).

Some initial results are shown in Fig. 1 that demonstrate the time scales at which the rapid adjustments operate. Currently we also work on rapid adjustments for other climate forcers, and these results will be fed into a model intercomparison study led by the partners at the University of Oslo.

The study of the high-resolution simulations started as well, and will be used as a reference for the GCM results that, in turn, help to extrapolate the local results to the global scale.

References

Nam, C., P. Kühne, M. Salzmann, and **J. Quaas**, A prospectus for constraining rapid adjustments in general circulation models, J. Adv. Model. Earth Syst., 10, 2080-2094, doi:10.1029/2017MS001153, 2018.

Senf, F., **J. Quaas**, and I. Tegen, Absorbing aerosol decreases cloud cover in cloud-resolving simulations over Germany, Quart. J. Roy. Meteorol. Soc., in revision.

Figures

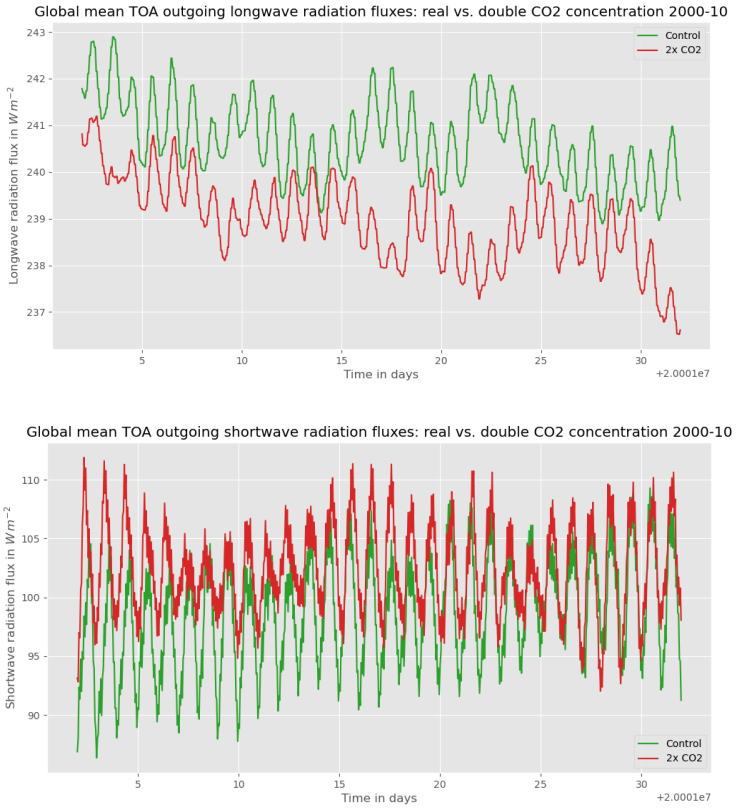

Fig. 1. Rapid adjustments to CO2 perturbation in simulations with the ICON GCM. The top-of-atmosphere net fluxes in (a) the long-wave and (b) the short-wave spectra are shown for control (green) and doubled-CO2 simulations (red) as a function of time. The initial imbalance highlights the role of the rapid adjustments. Detailed process analysis (following Nam et al., 2018; Senf et al., in revision) is ongoing.