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Modelling the Covid-19 impact on CO_2 concentrations in Germany

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The sharp decrease in emissions caused by the Corona crisis entails the question: where, when, and how strong impacts on observations can be expected? The *Icosahedral Nonhydrostatic* (ICON) model is online-coupled to the modules for *Aerosols and Reactive Trace gases* (ART). With the model system ICON-ART run at roughly 13km resolution we determine how CO_2 emission reductions in Germany relate to a reduction in CO_2 concentrations. This varies over several orders of magnitude, depending on the weather related atmospheric transport. We compare this with the emission reduction effect originating from outside Germany. In a case study, we identify locations and times, where either effect reaches a magnitude to be observable at the *Integrated Carbon Observation System (ICOS)* towers in Germany. In contrast, there are also weather situations, where both contributions (from inside/outside Germany) are negligible with respect to the background variability. Reducing background uncertainty, as foreseen in the CoCO2 project, will allow better disentangling of the national contribution in future. Here we focus on the height dependency of the modelled concentration change with respect to recent anthropogenic emissions. We draw conclusions on measurement and modelling capabilities essential for an integrated greenhouse gas monitoring system for Germany to detect anthropogenic emission reductions.