EGU2020-7289
https://doi.org/10.5194/egusphere-egu2020-7289
EGU General Assembly 2020

Climate impact of clear air turbulence induced mixing in the UTLS

Holger Tost and Peter Hoor
Johannes Gutenberg University Mainz, Institute for Atmospheric Physics, Mainz, Germany (tosth@uni-mainz.de)

The upper troposphere / lower stratosphere (UTLS) region has been identified as a region with a high climate sensitivity of the Earth's atmosphere. Past studies have shown that mixing processes can have a substantial impact on the radiative budget of the atmosphere with implications for the climate of the planet. However, in most large-scale models some of these mixing processes are hardly resolved or considered explicitely.
In this study, we focus on clear air turbulence (CAT) as a dynamically driven mixing process, which can induce vertical mixing of radiative active trace gases. For this purpose, we have equipped a chemistry-climate model with a diagnostics for dynamical CAT including vertical stability conditions and a mixing parameterisation for CAT-induced vertical exchange of trace gases.
With the help of this tool we analyse the occurrence of CAT, the mixing of chemical compounds and the resulting radiative impact of this mixing.
The model simulations indicate a more efficient mixing of trace species in the UTLS, weakening some of the strong gradients of compounds, such that an occasional deeper penetration into the lower stratosphere becomes possible.
A suitable choice of simulation configuration also allows us to disentangle the radiative forcing of climate active gases (e.g., N_2O, O_3, CH_4) from
feedback processes occurring in the holistic system.