Geophysical Research Abstracts
Vol. 18, EGU2016-14603, 2016
EGU General Assembly 2016

Enhanced Brewer Dobson circulation reduces N2O warming potential under climate change

Daniela Kracher (1), Christian Reick (1), Elisa Manzini (1), Martin Schultz (2), and Olaf Stein (2)

(1) Max Planck Institute for Meteorology, Land in the Earth System, Hamburg, Germany (daniela.kracher@mpimet.mpg.de), (2) Forschungszentrum Juelich

One implication of climate change is an enhancement of the Brewer Dobson circulation (BDC) triggering the exchange between troposphere and stratosphere. This change in atmospheric dynamics will have effects on atmospheric constituents, especially those with stratospheric sinks such as ozone depleting substances (ODS) including nitrous oxide (N2O). N2O is the most important currently emitted ODS, and the third most important anthropogenic greenhouse gas. Under enhanced BDC, more N2O is transported from the troposphere into the stratosphere, reaching higher altitudes, resulting in an increased N2O sink and a decrease in N2O lifetime.
Some aspects of the effect of an enhanced BDC on lifetimes of ODS have already been examined with focus on its implications for ozone. In this study, we examine the effect of a decreasing N2O lifetime in light of climate change. To this end we conduct idealized transient global warming simulations with ECHAM, the atmosphere component of the MPI Earth System Model. As we prescribe surface flux boundary conditions for N2O, we are able to examine further implications of an enhanced N2O sink on atmospheric abundance, which is an important factor for e.g. generating concentration scenarios. Due the idealized simulation setup, we derive findings that are scenario-independent and can easily be extended to other global warming scenarios.