Geophysical Research Abstracts
Vol. 17, EGU2015-10800, 2015
EGU General Assembly 2015

Contributions of different boundary layer sources in Asia to the Asian monsoon anticyclone and associated transport pathways to the lowermost stratosphere over northern Europe in 2012

Bärbel Vogel (1), Gebhard Günther (1), Rolf Müller (1), Jens-Uwe Grooß (1), Heiko Bozem (2), Peter Hoor (2), Martina Krämer (1), Stefan Müller (2), Andreas Zahn (3), and Martin Riese (1)

(1) Forschungszentrum Jülich, Institute of Energy and Climate Research - Stratosphere (IEK-7) , Jülich, Germany (b.vogel@fz-juelich.de), (2) Institute for Atmospheric Physics, University of Mainz, Mainz, Germany, (3) Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe, Germany

The impact of different boundary layer sources in Asia to the chemical composition of the air in the Asian monsoon anticyclone in 2012 is analysed by CLaMS model simulations using artificial emission tracers. Our simulations show that the Asian monsoon anticyclone is highly variable in location and shape. The model behaviour is in agreement with satellite measurements of O_3 and CO (MLS). The contribution of different boundary sources regions to the Asian monsoon anticyclone is more complex than hitherto believed, but in general the highest contribution are from North India and Southeast Asia at 380 K. In the early ($\sim$ June/July) and late period (Sep/Oct) of the monsoon 2012, contributions of emissions from Southeast Asia are highest and in the intervening period ($\sim$ August) emissions from North India have the largest impact. Further, long-range transport of air masses from the Asian monsoon anticyclone to the extratropical lowermost stratosphere occurs by eastward migrating smaller anticyclones and filaments separated at the northeastern flank of the anticyclone transporting within approximately 8-14 days water vapour and pollutants into the lowermost stratosphere over northern Europe. Remnants of this long-range transport processes were measured during the TACTS/ESMVal campaign and could be reproduced by our simulations. In addition, emissions from Southeast Asia can be uplifted at the edge of the anticyclone by deep convection and afterwards are entrained into the circulation around the Asian monsoon anticyclone. Moreover, they also experienced diabatic upward transport in the tropics and subsequently isentropic transport polewards occurs at around 380 K with the result that the extratropical lowermost stratosphere is flooded end of September with air masses originating in Southeast Asia. Our simulations demonstrate that emissions from Asia and Southeast Asia have a significant impact on the chemical compositions of the lowermost stratosphere of the northern hemisphere in particular after the end of the monsoon season in September / October 2012.