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# A statistical evaluation of $NO_2$ long-range transport events using GOME-2 observations

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Long-range transport events in the atmosphere have the potential to relocate trace gases from emitting to downwind regions on an intercontinental scale, thus yielding the potential of drastically altering atmospheric chemistry in remote regions. The characteristics of such transport events are influenced by meteorological conditions, source strength and life-time of the particular trace gas species in the lower atmosphere.

Remote sensing satellite instruments allow for a thorough investigation of this phenomenon. Their spatial and temporal coverage allows in-depth analysis not only of individual transported plumes, but also the evaluation of global statistics of frequencies, amplitudes and routes of such events.

Using measurements of $NO_2$ columns from the GOME-2 instrument, we show that long-range transport events are not a rare phenomenon. They are, however, often associated with clouds which complicates quantitative retrievals as the presence of clouds strongly alters the radiative transfer in the atmosphere. Therefore, most current satellite tropospheric products exclude cloudy measurements.

Here, we utilize image analysis on daily GOME-2 measurements to identify transported $NO_2$ from 2007 to 2009 in several regions of the world. A strong seasonality can be seen in both the transport routes and the intensity of transport events. For a semi-quantitative analysis, we investigate the frequency and typical transport mass of $NO_2$ of the plumes. Also, we discuss the peculiarities of satellite measurements of trace gases in long-range transports, which are often associated with clouds and vertical transport.