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Modelling of atmospheric dispersion of trace gases emitted from oasis in the Taklimakan (NW-China) desert on regional scale

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In north-west China, the contribution of biogenic emissions of trace gases are supposed and expected to increase in near future due to land use change from desert and grassland to irrigated and fertilized fields with intensive oasis agriculture. For that, understanding regional atmospheric transport it is important for the determination of the corresponding source strengths. However, for the region of NW China, both, measurements and simulations of trace gas concentrations are very scarce or lacking at all. Here, we like to present a first simulation of the 3D distribution of CO2, O3 and NO over the Milan oasis (39.25°N, 88.92°E) in the Taklimakan desert (NW China).
We used two different models to describe the dispersion of trace gases on regional-scale. LASAT (LAngrange Simulation of Aerosol Transport) is simulating, based on a 3D dynamic wind field calculation, the 3D distribution of biogenically emitted of NO (including the conversion to NO2) in a simulation area of 150 x 100 km with a horizontal grid resolution of 5 x 5 km. A nested grid of 30 x 30 km (0.1 x 0.1 km resolution) is spread over the Milan oasis (which is entirely surrounded by the Taklimakan desert). Necessary input data (meteorological parameter and emission rates) originating from a exploratory field campaign in July 2010.
The second approach to simulate the dispersion of NO, CO2, O3 and H2O is based on the Weather Research and Forecast model (WRF/Chem). Here, we nested in a domain (D1) of 2000 x 1500 km (grid resolution 20 x 20 km) two grids of 100 x 150 km (D2, resolution of 5 x 5 km) and 30 x 30 km (D3, a resolution of 1 x 1 km). To model the real time WRF meteorological values, GRIB2 data were used from NCEP FNL (Global Analysis data on 1.0x1.0 degree grids). The simulation was calculated for all domains in a time resolution of 3h for the period of 14. - 28. July 2010.
Due to the different algorithms and working flows of the two models as well as differences of precision and resolution of the input data, the results of the trace gases dispersion from LASAT and WRF are significantly different. We will discuss the reasons for the discrepancy and propose a measurement strategy to verify the model runs (based on a new balloon and kite borne sensor system for profiling the first 500-1000 m of the Milan oasis and Taklimakan desert boundary layers).