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IO columns and the relation to chlorophyll-a as observed from satellite

A. Schönhardt, A. Richter, and J. P. Burrows
Institute of Environmental Physics, University of Bremen, Germany

Halogens and their oxides are important for atmospheric composition. In the troposphere, relevance of iodine is linked to the depletion of ozone, the alteration of the HO_x and NO_x ratios, and the formation of new atmospheric particles. The release pathways, relations and implications of atmospheric iodine are currently being investigated by means of field measurements, satellite observations, laboratory studies and modeling activities. Some biogenic sources of iodine such as from algae and phytoplankton have been identified, however, their overall importance, relative and absolute, is not yet clarified.

This presentation concentrates on measurements of iodine monoxide (IO) from satellite, their analysis and interpretation. Using a long term data set of up to 8 years signal quality can be improved by suitable temporal averaging. Applying basic radiative transfer, IO vertical columns are computed in spite of unknowns such as the IO vertical profile. The retrieval of IO, its challenges, and the air mass factor calculations are explained.
In order to investigate the relation between biological activity and IO, chlorophyll-a concentrations in the oceans are compared to IO maps. For these comparisons, observations from the SCIAMACHY and SeaWiFS sensors are used. Especially interesting regions are the ocean upwelling areas, where biology is active, and emissions of biogenic compounds to the atmosphere take place. Observation of IO above water bodies is challenging as the present amounts are close to the detection limit, and absolute amounts need to be treated with care. The application of a large IO satellite data set improves this situation to some extent.

Largest amounts of wide spread enhanced IO are found around the Antarctic, an area where chlorophyll-a concentrations in the Southern Ocean reveal a similar spatial pattern as IO. Above the sea ice, where chlorophyll-a measurements are not possible, IO appears mainly in late spring time, when the ice porousness and amounts of open leads increase. In the tropics, IO enhancements are observed above the Eastern Pacific upwelling regions (Humboldt current). Here also, areas with large amounts of chlorophyll-a coincide to some extent with IO enhancements. In contrast, several other regions show large chlorophyll-a abundances where no IO amounts above the detection limit are seen, e.g. the Mauritanian upwelling region or some African inland lakes. From the present observations, the relation between IO and chlorophyll-a is somewhat ambiguous, the presence of active biology alone does not suffice as precondition for iodine emissions to the atmosphere, other aspects such as specific types of phytoplankton species will need to be considered.