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Measurements of O_3, NO_2 and BrO during the INDOEX campaign using ground based DOAS and GOME satellite data

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Abstract. The INDian Ocean EXperiment (INDOEX) was an international, multi-platform field campaign to measure long-range transport of air masses from South and South-East-(SE) Asia towards the Indian Ocean. During the dry monsoon season between January and March 1999, local measurements were carried out from ground based platforms and were compared with satellite based data. The objective of this study was to characterise stratospheric and tropospheric trace gas amounts in the equatorial region, and to investigate the impact of air pollution at this remote site. For the characterisation of the chemical composition of the outflow from the S-SE-Asian region, we performed ground based dual-axis-DOAS (Differential Optical Absorption Spectroscopy) measurements at the KCO (Kaashidhoo Climate Observatory) in the Maldives (5.0° N, 73.5° E). The measurements were conducted using two different observation modes (off-axis and zenith-sky). This technique allows the separation of the tropospheric and stratospheric columns for different trace gases like O_3 and NO_2. These dual-axis DOAS data were compared with O_3-sonde measurements performed at KCO and satellite based GOME (Global Ozone Measuring Experiment) data during the intensive measuring phase of the INDOEX campaign in February and March 1999. From GOME observations, tropospheric and stratospheric columns for O_3 and NO_2 were retrieved. In addition, the analysis of the O_3-sonde measurements allowed the determination of the tropospheric O_3 amount. The comparison shows that the results of all three measurement systems agree within their error limits. During the INDOEX campaign, mainly background conditions were observed, but in a single case an increase of tropospheric NO_2 during a short pollution event was observed from the ground and the impact on the vertical columns was calculated. GOME measurements showed evidence for small tropospheric contributions to the BrO budget, probably located in the free troposphere and present over long periods of the year. The amounts of BrO have been investigated by the comparison of satellite pixels influenced by high and low cloud conditions based on GOME data which allows the determination of the detection limit of 3.8×10^{13} molecules cm^{-2} of tropospheric BrO columns.

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