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Is a scaling factor required to obtain closure between measured and modelled O4 absorptions? - A case study for two days during the MADCAT campaign

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Measurements of the oxygen dimer O4 are often used in remote sensing applications to infer information on the atmospheric light path distribution. Such information is interesting in itself, but can also be used to retrieve properties of clouds and aerosols, e.g. from ground based Multi-AXis-Differential Optical Absorption Spectroscopy (MAX-DOAS) observations.
In recent years, a scaling factor (between about 0.7 and 1) was applied by several groups to the retrieved O4 slant column densities in order to obtain meaningful aerosol profiles from MAX-DOAS observations. However, other groups did not report the need for such a scaling factor. Up to now, this discrepancy is neither understood nor resolved.
Here we compare measured and modelled O4 slant column densities for two days during the MADCAT campaign (http://joseba.mpch-mainz.mpg.de/mad_cat.htm). Clouds were mostly absent during both days, and the aerosol profiles are constrained by simultaneous sun photometer and ceilometer measurements. One important difference between both days is the amount of aerosol in the lowest atmospheric layer. Our comparison study addresses several important steps of the O4 data analysis, such as the spectral retrieval and the radiative transfer simulations. We also investigate the effects of temperature and pressure variations on the calculation of the O4 vertical column density. Preliminary results are are not conclusive but indicate that a scaling factor is needed to bring measurements and simulations into agreement at least for one of the two selected days.