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Global observations of glyoxal columns from OMI/Aura and GOME-2/Metop-A sensors and comparison with multi-year simulations by the IMAGES model

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Volatile organic compounds (VOCs) originating from both natural and human activities play a key role in air quality. Information on their atmospheric concentrations can be derived using remote sensing techniques for a limited number of species, including formaldehyde (HCHO) and glyoxal (CHOCHO). The latter is mostly produced in the atmosphere as an intermediate product in the oxidation of other non-methane VOCs. It is also directly emitted from fire events and combustion processes. Owing to its short lifetime, elevated glyoxal concentrations are observed near emission sources. Measurements of atmospheric glyoxal concentrations therefore provide quantitative information on the different types of VOC emission and can help to better assess the quality of current inventories. In addition, glyoxal is also known to significantly contribute to the total budget of secondary organic aerosols.

Global observations of glyoxal columns have been realized from different space-borne spectrometers using the well-known DOAS retrieval technique. In the past, we developed an algorithm to retrieve glyoxal columns from spectra measured by the GOME-2 instrument aboard METOP-A (Lerot et al., 2010). Specificities of this algorithm were an original two-step approach in the DOAS fit to minimize the impact of spectral interferences with the liquid water absorption as well as the use of a priori information from the Chemical Transport Model IMAGES in the air mass factor calculation.

In this work, we present the adaptation of this algorithm to the OMI sensor on the AURA platform. The time series of glyoxal columns derived from OMI and GOME-2 are compared in different parts of the world and a high level of consistency is found. The OMI glyoxal data product is found to be very stable over the entire duration of the mission, in contrast to the GOME-2 product which is affected by instrumental degradation. We present validation results using several years of MAX-DOAS glyoxal measurements successively performed in Beijing and Xianghe, China, since 2008. Also, comparisons of the satellite data sets with simulations by the IMAGES chemistry transport model show generally good correlation. Sensitivity tests on the VOC emissions used in the model will also be discussed.

Lerot, C., Stavrakou, T., De Smedt, I., Müller, J.-F., and Van Roozendael, M.: Glyoxal vertical columns from GOME-2 backscattered light measurements and comparisons with a global model, Atmos. Chem. Phys., 10, 12059-12072, doi:10.5194/acp-10-12059-2010, 2010.