Geophysical Research Abstracts
Vol. 12, EGU2010-2714, 2010
EGU General Assembly 2010

Improving the global tropospheric methanol budget through inverse modelling of spaceborne IASI methanol columns and in situ data

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New insights into our understanding of methanol sources and sinks in the global troposphere are brought forward by recent measurements of tropospheric columns of methanol retrieved from the IASI satellite sensor. These data are expected to reduce the uncertainties in the knowledge of the methanol distribution in the troposphere, thanks to the unprecedented global spatiotemporal coverage offered by the IASI instrument. According to current estimates, the ocean biosphere and the terrestrial growth source represent two thirds of the total methanol source, whereas plant decay, atmospheric production, anthropogenic and biomass burning sources account for the remainder. In this study we use the IMAGESv2 global chemical transport model and its adjoint module, in order to interpret the new dataset and derive updated methanol source strengths which bring the model predictions closer to the observed abundances. The resulting fluxes are evaluated against an extensive compilation of air- and ground-based methanol measurements, and the implications for the atmospheric chemistry are discussed.