Role of air-sea exchanges in the atmospheric budget of oxygenated volatile organic compounds: Model evaluation based on the MANCHOT campaign

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The role of the air-sea exchange process in the atmospheric budget of a selection of Volatile Organic Compounds (VOC) has been studied with a new mechanistic parameterization, applied in the coupled chemistry-climate model ECHAM5/MESy [Joeckel, 2004].

Focus of the study has been the global acetone budget. A total net global acetone deposition to the oceans of ~10Tg/yr has been inferred based on a top-down budget analysis, in agreement with a previous study with a focus on the Pacific Ocean [Singh, 2003]. Even though on a global scale the ocean is a net sink of atmospheric acetone, our model simulations indicate that regionally the ocean can be a source, mainly in the Southern Hemisphere. Our preliminary approach has been tested against measurements within the MANCHOT ship campaign (Measurements of Anthropogenic and Natural Compounds in the southern Hemispheric Oceanic Troposphere), which took place in December 2004 over the Indian Ocean.

During MANCHOT simultaneous measurements of the concentration of different organic tracers in the air and in the water have been performed using a PTR-MS (Proton Transfer Reaction-Mass Spectrometer) and a GC-MS (Gas Chromatography-Mass Spectrometer). The measurements, used to evaluate our calculated VOC exchange fluxes, also provide information about the variability of the oceanic VOC concentrations and their correlation with other biogeochemical properties, e.g., chlorophyll or DMS concentrations. Such relationships may be used to develop a more advanced representation of oceanic VOC concentrations in chemistry-climate models, and consequently improve the simulations of VOC air-sea exchanges.

REFERENCES