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New constraints on the global budget of formic acid from IASI column data

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Formic acid is ubiquitous in ambient air, but its sources are far from being fully understood. Its dominant source is believed to be the oxidation of biogenic volatile organic compounds, and in particular isoprene, whereas sinks comprise oxidation by OH, dry and wet deposition. However, ground-based and airborne formic acid concentration measurements are underpredicted by global models by a factor of two to four, especially in the boundary layer, and in the high northern latitudes.

New insights into our understanding of the tropospheric formic acid budget are brought forward by recent measurements of global tropospheric columns of formic acid retrieved from the thermal infrared IASI sensor aboard the MetOp-A satellite platform. In this communication, we use the IMAGESv2 global chemical transport model to interpret surface concentrations of formic acid in the gas phase and in precipitation, as well as aircraft and satellite observations, and build constraints on the formic acid budget. Furthermore, the adjoint IMAGESv2 model is used to derive updates of the formic acid emission fluxes bringing the model simulations closer to the IASI abundances. The inferred fluxes are evaluated against an extensive compilation of independent formic acid measurements, whereas recently suggested evidence for a missing secondary formic acid source related to the aging of organic aerosols is also investigated.