SATELLITE-BASED ISOPRENE EMISSION ESTIMATES 2007-2012: FIRST RESULTS OF GlobEmission PROJECT.

Isoprene is the most largely emitted biogenic NMVOC. It is believed to enhance tropospheric ozone formation, leading to its strong formation, to decrease the oxidizing capacity of the troposphere, and to contribute to the production of secondary organic aerosols. Therefore it is important to have accurate emission estimates for isoprene. The Model of Emissions of Gases and Aerosols from Nature version 2 (MEGANv2) is the most commonly used bottom-up isoprene inventory. However, substantial uncertainties remain, owed to the large spatiotemporal variability of the emitting source and to the limited representativeness of field studies.

Inversion methods provide an independent estimate of isoprene emission strengths and are used to complement the bottom-up approach. Here we use an inverse modeling scheme based on top-down constraints of formaldehyde (HCHO) columns retrieved from the Global Ozone Monitoring Experiment 2 (GOME-2). The discrepancies between modelled and observed HCHO columns are defined by the adjoint of the Global Atmosphere Chemistry Model (GACM) and used to update the isoprene emissions. The inverse modeling scheme uses HCHO columns retrieved from the Scanning Imaging Absorption Spectrometer for Atmospheric Chemistry (SCIAMACHY) in combination with measurement of the emission estimates.

The updated global isoprene emissions are found to be relatively close to the prior: between 5% lower and 10% higher. However, large increases are derived in the European and South Africa (GOME-3) measurements above values for Europe and eastern US.

On the global scale, the updated isoprene emissions are found to be relatively close to MEGANv2. In particular, the interannual variability of MEGANv2 is preserved. The inversion suggests emission decreases above Australia, Europe and North America, whereas over Amazon a strong increase of isoprene emissions is inferred. The updated isoprene emission estimates are validated through comparison with independent bottom-up and top-down inventories reported in literature. Furthermore, an additional inversion performed by HCHO columns retrieved from the Scanning Imaging Absorption Spectrometer for Atmospheric Chemistry (SCIAMACHY) is conducted for evaluation of the emission estimates.

The updated global biogenic emissions are found to be close to the prior: between 5% lower and 10% higher. However, large increases are derived in the European and South Africa (GOME-3) measurements above values for equatorial Africa and Russia, emission decreases above Australia, Europe and eastern US.

In most cases the interannual variability observed by the inversion is similar to the prior. In South America and Africa, GOME-3 measurements suggest a higher increase in 2007 than for the other years, by about 30-40%.

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**Results of inversion**

**Prior isoprene emissions in 2012**

**GOME-2 based isoprene emissions in 2012**

**Inversion results**

**Average increment and interannual variability**

**Seasonal variations**

**Comparison to literature**

**Isoprene updates: GOME-2 vs. SCIAMACHY**

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**References**

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