Satellite-derived VOC emission estimates based on TROPOMI HCHO and CHOCHO columns

Introduction

This dataset provides top-down global VOC emission distributions in 2021 for five categories: (i) isoprene, (ii) anthropogenic VOC glyoxal precursors, (iii) anthropogenic VOC non-glyoxal precursors, (iv) biomass burning VOC, and (v) unspecified VOC glyoxal precursor. The top-down emissions are inferred from an inverse modelling scheme built on the chemistry-transport model MAGRITTEv1.2 and its adjoint (Müller et al., 2019; Bauwens et al., 2016; Müller and Stavrakou, 2005), constrained by TROPOMI HCHO (De Smedt et al., 2018) and CHOCHO (Lerot et al., 2021) column data through a two-compound inversion framework.

The chemical mechanism of MAGRITTEv1.1 (Müller et al., 2019) already included the oxidation of six glyoxal precursors: isoprene (C_5H_8), acetylene (C_2H_2), and ethene (C_2H_4), and the common BTX aromatics benzene (C_6H_6), toluene (C_7H_8) and xylenes (C_8H_{10}). The new mechanism in MAGRITTEv1.2 includes the following additional aromatics: trimethylbenzene (C_9H_{12}), styrene (C_8H_8), ethylbenzene (C_8H_{10}), phenol (C_6H_6O), cresol (C_7H_8O), catechols ($C_6H_6O_2$) and methylcatechols ($C_7H_8O_2$), benzaldehyde (C_7H_6O), (methyl-) perbenzoic acid ($C_7H_6O_3$), methylperoxybenzoylnitrate ($C_7H_5O_5N$), nitrophenols and nitrocatechols ($C_6H_5O_3N$), generic C4 and C5 intermediates ($C_4H_4O_2$ and $C_5H_6O_2$).

More details can be found in the companion paper of Sfendla et al (in preparation).

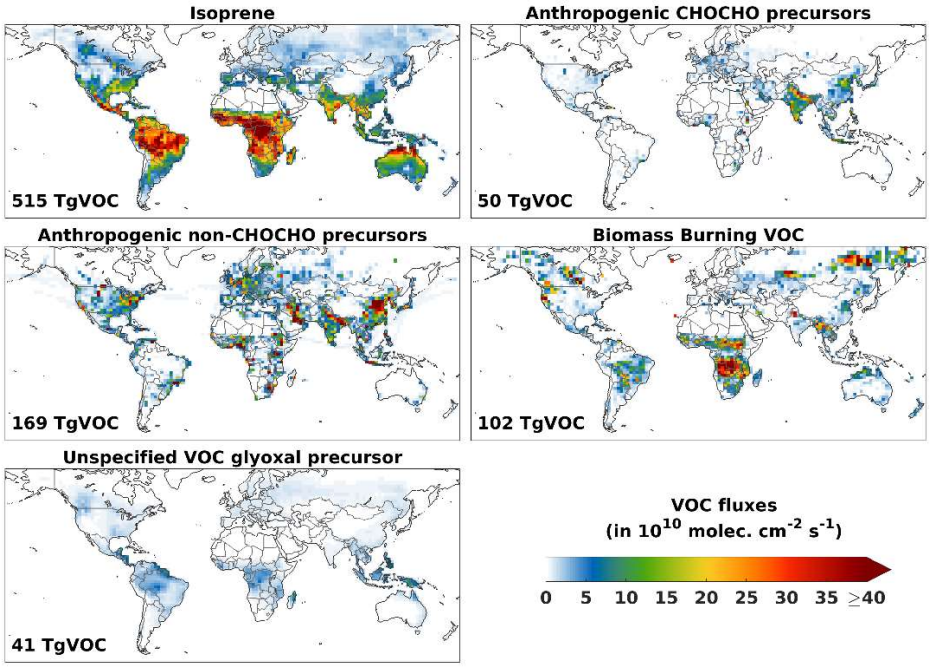

Figure: Top-down global VOC emission distributions in 2021 (in 10^{10} molecules cm^{-2} s^{-1}) with total global emissions in TgVOC for isoprene, anthropogenic VOC glyoxal precursors, anthropogenic VOC non-glyoxal precursors, biomass burning VOC, and unspecified VOC glyoxal precursor.

File format and contents

Global, monthly TROPOMI-based emissions are provided in NetCDF data format for 2021. They are expressed in kg VOC m^{-2} s^{-1} in a regular grid at a spatial resolution of 2°x2.5°. The mean molecular weight of the VOC mixture is also provided for each of the five categories.

Additional information

The dataset is available at at https://emissions.aeronomie.be or https://data.aeronomie.be.

Cite this as (APA format)

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