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Sensitivity of isoprene emissions estimated using MEGAN to the time resolution of input climate data

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Abstract. We evaluate the effect of varying the temporal resolution of the input climate data on isoprene emission estimates generated by the community emissions model MEGAN (Model of Emissions of Gases and Aerosols from Nature). The estimated total global annual emissions of isoprene is reduced from 766 Tg y^{-1} when using hourly input data to 746 Tg y^{-1} (a reduction of 3%) for daily average input data and 711 Tg y^{-1} (down 7%) for monthly average input data. The impact on a local scale can be more significant with reductions of up to 55% at some locations when using monthly average data compared with using hourly data. If the daily and monthly average temperature data are used without the imposition of a diurnal cycle the global emissions estimates fall by 27–32%, and local annual emissions by up to 77%. A similar pattern emerges if hourly isoprene fluxes are considered. In order to better simulate and predict isoprene emission rates using MEGAN, we show it is necessary to use temperature and radiation data resolved to one hour. Given the importance of land-atmosphere interactions in the Earth system and the low computational cost of the MEGAN algorithms, we recommend that chemistry-climate models and the new generation of Earth system models input biogenic emissions at the highest temporal resolution possible.

Final Revised Paper (PDF, 1305 KB) Supplement (293 KB) Discussion Paper (ACPD)

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