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Supplement of

Evaluation of regional isoprene emission factors and modeled fluxes in California

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S1. Ecoregion codes (Legend to Figure 1)

Figure S1. Legend to Figure 1 describing ecoregion codes.

S2. MEGAN architecture and main differences between versions

The main differences of MEGAN v.2.1 to MEGAN v.2.04 are:

1) v2.04 does not have soil moisture or CO2 response (but these were not used for MEGAN v.2.1 simulations in this study);

2) MEGAN v.2.04 uses a different emission factor database and has different light response algorithms (which are nearly the same for isoprene and mostly impact other compounds);

3) MEGAN v.2.04 uses different parameters in the canopy environment model.

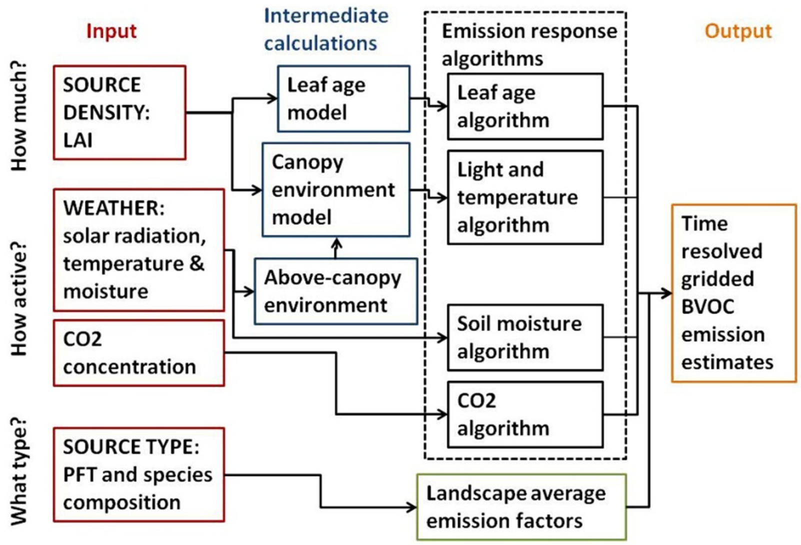

Figure S2. Schematic of MEGAN v.2.1 model components and driving variables (taken from Guenther et al., 2012).

S3. Timeseries of simulated and observed emissions

In Figure S3, the time series of simulated and measured emissions are shown (plotted along the complete flight tracks).

Local similarities and discrepancies are observed in specific areas along the flight track and are discussed in the manuscript. Although there are different sources of uncertainty, the largest discrepancy occurs if the trees are significantly under or overrepresented, which could be due to fires, new growth, or incomplete landcover.

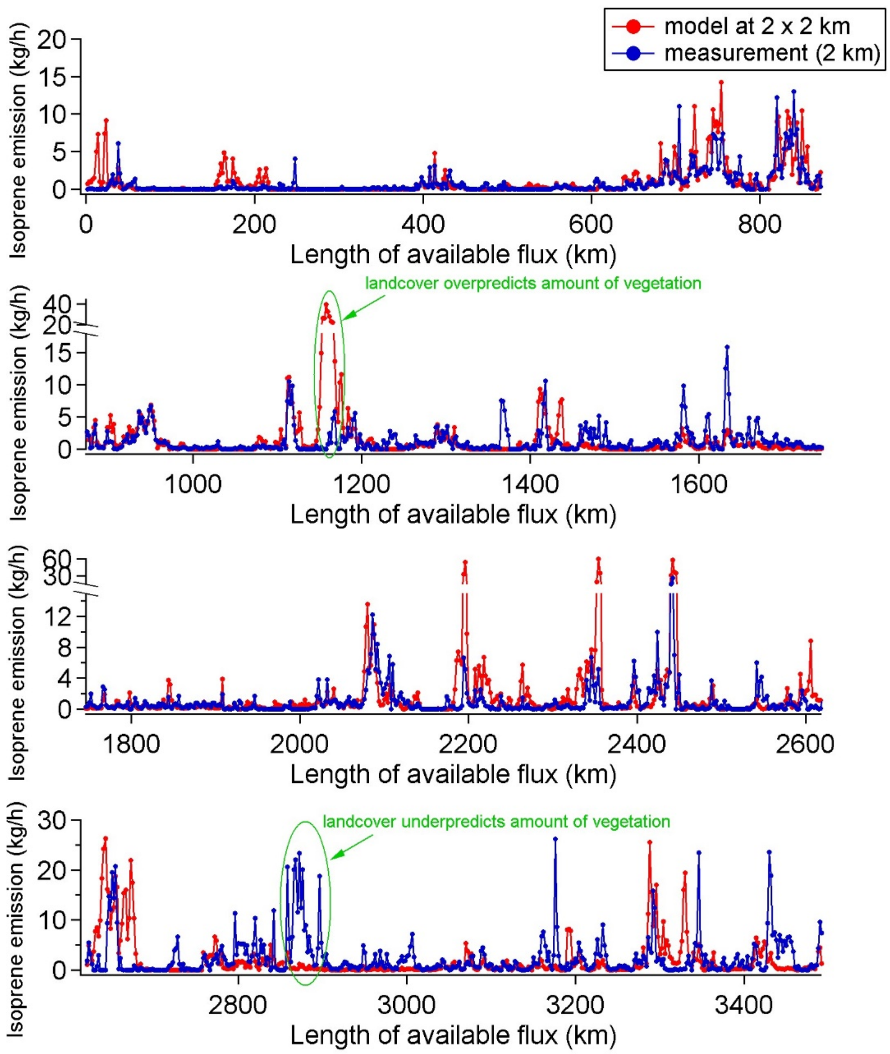

Figure S3. Time series for modeled and measured isoprene fluxes using the approximated circular footprint areas (only the data when flux was available are shown) along the full length of the flight tracks during the CABERNET campaign.

S4. The inverse G06 algorithm used in airborne emission factor derivation

In the original G06 algorithm (equation below), F_{G06} is the unknown, and BER is the known emission factor at standard temperature and PAR conditions. We inverse the equation so the BER is unknown and F is the airborne-derived surface flux. This BER is referred to as airborne basal emission factor (BEF) or just emission factor which represents the airborne flux inferred for the standard conditions of PAR=1000 µmol m-^{2} s^{-1} and temperature = 30 °C.

$$F_{G06} = \mathrm{BER}\cdot \underbrace{\mathrm{b}_3\cdot\exp\left[\mathrm{b}_2\cdot(P_{24}-P_0)\right]\cdot(P_{240})^{0.6}\cdot\frac{\left[\mathrm{b}_1-\mathrm{b}_2\ln(P_{240})\right]\cdot\mathrm{PAR}}{\sqrt{1+\left[\mathrm{b}_1-\mathrm{b}_2\ln(P_{240})\right]^2\cdot\mathrm{PAR}^2}}}_{\gamma_P}\cdot\underbrace{\mathrm{b}_5\cdot\exp\left[\mathrm{b}_6\cdot(T_{24}-297)\right]\cdot\exp\left[\mathrm{b}_6\cdot(T_{240}-297)\right]\cdot\frac{\mathrm{C}_{T2}\cdot\exp\left[\mathrm{C}_{T1}\cdot\left(\frac{1}{T_{opt}}-\frac{1}{T}\right)\cdot\frac{1}{0.00831}\right]}{\mathrm{C}_{T2}-\mathrm{C}_{T1}\cdot\left[1-\exp\left(\mathrm{C}_{T2}\cdot\left(\frac{1}{T_{opt}}-\frac{1}{T}\right)\cdot\frac{1}{0.00831}\right)\right]}}_{\gamma_T}$$

The micrometeorological variables include temperature close to the surface (T) and PAR. Previous 24 and 240-hour history of temperature and PAR are accounted for in T_{24}, P_{24}, T_{240}, P_{240} variables. The parameters of the algorithm were used as default (i.e. C_{T1}=95, C_{T2}=230, T_b=313, P_0=200, b_1=0.004, b_2 = 0.0005, b_3=0.0468, b_4=0.6, b_5=2.034, b_6=0.05).

Supplementary references:

Guenther, A. B., Jiang, X., Heald, C. L., Sakulyanontvittaya, T., Duhl, T., Emmons, L. K., and Wang, X.: The Model of Emissions of Gases and Aerosols from Nature version 2.1 (MEGAN2.1): an extended and updated framework for modeling biogenic emissions, Geosci Model Dev, 5, 1471-1492, 10.5194/gmd-5-1471-2012, 2012.