Geoscientific

Model Development

Discussions

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comment

Interactive comment on "Sensitivity of biogenic volatile organic compounds (BVOCs) to land surface parameterizations and vegetation distributions in California" *by* Chun Zhao et al.

Anonymous Referee #1

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Overview:

This study investigates the impact of different land surface parameterizations and vegetation distributions on emissions and mixing ratios of biogenic VOCs (and related oxidation products) simulated in California. Isoprene, MACR, MVK and monoterpenes are especially considered. Two different versions of the Model of Emissions of Gases and Aerosols from Nature (MEGAN v2.0 and MEGAN v2.1), together with two different land surface schemes (Noah and CLM4.0) and 5 different vegetation distributions (VEGM, USGS, VEG1, VEG2, VEG3) are alternatively used. Data collected during two field campaigns, CalNex and CARES, providing ground-based or flight observations, are also considered for model evaluation.

This manuscript is well written and clearly presents an extensive work, which I really enjoyed reading, a work that provides clues to better understand the variability and uncertainty of biogenic VOC estimates between models. To some extent, the manuscript lacks of precise information, especially regarding the model framework. For example, the differences in emission calculation between the two versions of MEGAN used, or the connexions between the emission model and the land-surface scheme should be better described, in order to fully understand the possible source of variability in results provided. I therefore give a list of corrections and comments to improve the clarity of the manuscript, which I warmly recommend for publication in GMD.

Specific comments:

Section 2.2 and 2.3:

These sections lack of clear information regarding the differences between the emission models or land-surface schemes, and connexions between them. First if CLM4 considers 16 PFTs, how many are taken into account in Noah?

From page 9, lines 199-203, it is not really clear to me which meteorology is considered when using MEGAN v2.0: is it eventually provided by WRF-CHEM or based on a monthly climatology?

Differences in emission schemes between MEGAN 2.0 and MEGAN 2.1 should also be more precisely stated in the text regarding number of vegetation classes, emission factors (are they prescribed for each PFT for both MEGAN v2.0 and MEGAN v2.1 or is one using EF maps?).

Connexions and variables coupling between emission model and land-surface scheme (any version) should be given in details: which of the variables calculated by the land-surface scheme are actually used in MEGAN v2.0 and v2.1 to calculated emissions? This is also especially important in section 4, when analyzing the impact of using different land-surface parameterizations.

Finally, nothing is said anywhere in the manuscript about the leaf area index, which is yet a crucial driving variable in emission estimate in MEGAN. How is it taken into account: is LAI prescribed or is it calculated by each land-surface scheme, and if so what are the LAI differences or similarities between them?

Page 9, lines 186-194: please also specify here in the text that MEGAN v.2.0 considers 4 PFTs only. Results from both MEGAN v2.0 and v2.1 are eventually compared with each other, and with observations. Is this comparison actually consistent since MEGAN v2.0 emission factors represent the net emission flux into the atmosphere, and MEGAN v2.1 ones the net primary emission that escape into the atmosphere? Are there significant differences between the two set of emission factors? MEGAN v2.0 emission factors should also be given, as is done for MEGAN v2.1 in figure 3. Ideally, maps of emission factors, projecting emission factor values over PFT distribution, would really help understanding the differences between both emission models.

Technical corrections:

Page 3, line 69; page 4, line 74; page 5, line 105: change "BVOCs" to "BVOC"

Page 5, line 100: change "during the day but a factor of three" to "during the day but by a factor of three"

Page 7, line 145: please write what RRTMG stands for

Page 8, line 172: change "PFT's to "PFTs"

Page 9, line 191: change "defined" to "defines"

Page 10, line 215: change "MEGAN to "MEGAN v2.1

Page 12, line 276: change "PFT's" to "PFTs"

Page 14, line 312: change "BVOCs simulation" to "BVOC simulation"

Page 18, line 396: change "monterpene" to "monoterpene"

Page 19, line 422: change "and monoterpene" to "and monoterpenes"

Page 19, line 423: add "and Figure 13" (for monoterpenes) after "Figure 12" Page 21, line 463-464: change "while both experiments are slightly smaller" to "while both experiment mixing ratios are slightly smaller"

Page 28, line 634: change "and hence the atmospheric VOC mixing ratios" to "and hence of atmospheric VOC mixing ratios"

Page 30, lines 688, 689 and 690: change "BVOCs emission" to "BVOC emission"

Page 31, line 701: change "v20" and "v21" (twice) to "v2.0" and "v2.1" respectively

Page 41, line 915: the font used for "Müller J." seems different to me than the one used for the rest of the text

Tables and Figures:

Table 1 and Figure 2 captions: change "PFT's" to "PFTs"

Figure 12, bottom left plot: Is actually isoprene mixing ratio plotted or isoprene+MVK+MACR?

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