

Interactive comment on “VPRM-CHINA: Using the Vegetation, Photosynthesis, and Respiration Model to partition contributions to CO₂ measurements in Northern China during the 2005–2009 growing seasons” by Archana Dayalu et al.

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(RC 1) I have a concern when setting NEE to missing values for shrubland vegetation classes, as this would mean that all simulated CO₂ values containing influence from that vegetation class are missing as well. How is this handled in the model? Would it not be better to either set NEE in those cases to zero, or to a value that is somewhat in the range of the observed fluxes?

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(AC 1) Thank you for the comment. Shrublands constitute less than 1.5% of the domain land use area and do not appreciably affect the modeled atmospheric CO₂ values. The 7-day-backtrajectory vegetation effect in ppm for each measurement hour is the result of a spatiotemporal sum of footprint*fluxes – as such, setting the NEE for these pixels to 0 is numerically the same as setting the pixels to missing. In order to estimate the influence on the CO₂ mixing ratio at Miyun from the shrubland (IGBP-6, IGBP-7), needleleaf (IGBP-1, IGBP-3), and permanent wetland (IGBP-11) land classes, we compare the sum of surface influence from pixels corresponding to those land categories to the total average (2005 to 2009) annual STILT surface influence. We find that these five land classes only account for 4% of the total influence mostly from the two the shrubland classes. The croplands, grasslands and mixed forests that are best represented in the VPRM training data account for 86% of the total influence.

We have edited the text in the manuscript to make this justification clearer.

Specifically:

P6 L13: “Pixels corresponding to these ecosystem types have NEE values set to missing. We justify this assumption in Sect. 3.”

P14 L1 to L9: “As noted in Sect. 2.2.2, NEE values for shrubland ecosystems are set to missing. The vegetation effect on CO₂ in ppm for each measurement hour is the result of a spatiotemporal sum of the product of the STILT footprint and surface fluxes. As such, an NEE pixel of ‘missing’ is numerically identical to an NEE pixel set to zero. Our choice to set these values as missing is based on the reasoning that a zero value (or a previously published value that has low confidence) implies that we know more about these shrubland ecosystems than we do in this domain. By comparing the sum of surface influence from shrubland, needleleaf, and permanent wetland ecosystems to the total average annual surface influence, we find these ecosystems contribute less than 5% to the total influence. As such, setting these classes to missing does not appreciably affect the conclusions.”

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(RC 2) 1. P3 L29: please clarify what is meant by “hourly CO₂ observations”. I assume atmospheric mole fractions have been measured.

(AC 2) We have replaced this wording (P3 L29): “We evaluate performance of the VPRM-CHINA during the growing season using five years (2005-2009) of hourly averages of continuously measured CO₂ (LI-COR Biosciences Li-7000).”

(RC 3) 1. Eq. 4a: LSWI_max should be described.

(AC 3) Thank you, we have edited the text to clarify this (P5 L14):

“Wscale is derived from both LSWI and the maximum LSWI (LSWI_{max}) for a particular growing season”

(RC 4) Fig. 4a: please mention what the colors (read, black) indicate

(AC 4) Thank you for noting this. We have edited accordingly: “Aggregated mean modeled (red) and measured (black) PAR for each eddy flux calibration site by season”

(RC 5) P19 L11: please explain in more detail what is meant by “unoptimized”

(AC 5) We have clarified our usage of this term (now P20 L10):

“We further examine the relative importance of the vegetation and anthropogenic influence by separately excluding each of the vegetation and anthropogenic components from the overall unoptimized (i.e., inventories uncorrected by observations) modeled hourly CO₂ (Fig. 9).”

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