Large variability in ecosystem models explains a critical parameter for quantifying GPP with carbonyl sulfide

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Understanding gross primary production (GPP) at regional and global scales is challenging with existing methods but critically important for exploring carbon-climate feedbacks. An emerging technique for quantifying large-scale GPP is based on the relationship between atmospheric carbonyl sulfide (COS) and GPP. The COS tracer approach hinges on a robust understanding of the relative uptake of COS to CO₂ by plants. While ground-based studies using plant chambers and eddy flux platforms finds a narrow range of possible values for relative uptake, results from atmospheric modeling studies are inconsistent. Here we study this discrepancy by exploring the underlying data from previous atmospheric modeling studies and conducting new regional modeling simulations over North America. We find that the inconsistency in previous atmospheric modeling studies can be explained by the variability in ecosystem model estimates of GPP. Furthermore we find that the uncertainty in relative uptake is much smaller than the uncertainty in GPP which suggests that the COS tracer approach could be useful for constraining GPP at regional and global spatial scales.