Amazonian GPP Estimated from Satellite-observed Carbonyl Sulfide Mixing Ratios

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In recent decades gross primary production (GPP) has annually removed roughly 25% of anthropogenic carbon dioxide from the atmosphere. Global GPP magnitude and spatial attribution are highly uncertain, making these terrestrial biosphere-atmosphere carbon cycle feedbacks a first-order uncertainty in future climate predictions. The Brazilian Amazon contributes a large proportion of that uncertainty, with Coupled Model Intercomparison Project Phase 5 (CMIP5) and TRENDY GPP model ensemble estimates diverging by a factor of three from minimum to maximum. Here we use Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) satellite estimates of atmospheric carbonyl sulfide concentrations to constrain these GPP estimates to the mid-to-high end of the CMIP5/TRENDY range.
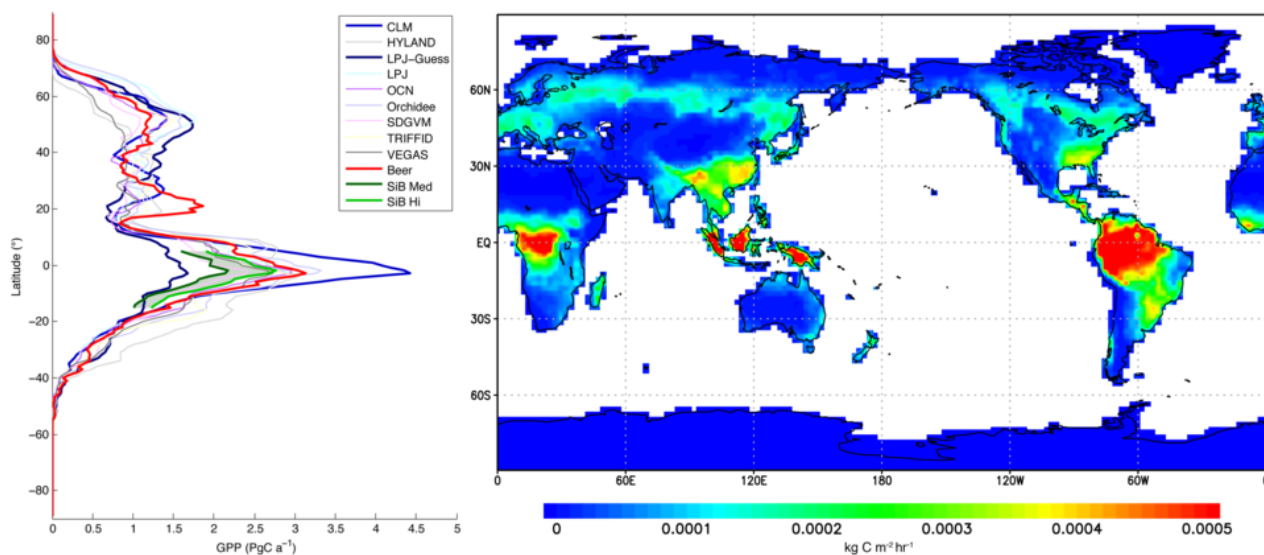
Figure 1. Left: Variation in terrestrial GPP by latitude. Bars have 1° width. Red line is approximate "data driven" line from Beer et al. (2010), scaled up by land areas in each grid cell. Dark and lighter green lines are SiB medium and SiB high estimates of GPP, calculated from linear trend between carbonyl sulfide (COS) plant uptake variable and SiB's GPP variable. Blue CLM; Dark blue LPJ Guess. **Right**: map of annual average GPP in CLM (the high model). Units are kg C m^{-2} hr^{-1}.