Quantifying the influence of climate and land use change on primary production using carbonyl sulfide measurements

1Campbell, J.E., 2Berry, J.A.
1Sierra Nevada Research Institute, University of California, Merced, 2Dept. of Global Ecology, Carnegie Institution for Science

Relationship of CO₂ to Carbonyl Sulfide

While regional-scale analysis of atmospheric CO₂ measurements is useful for determining CO₂ fluxes, additional tracers are helpful in determining the underlying processes. Regional analysis of the atmospheric carbonyl sulfide tracer over North America suggests a strong relationship to primary production (Campbell et al., Science, 2008). Here we show how COS could be applied to deconvolve processes that underlie net carbon fluxes.

Top-Down Primary Production Assessment

Top-down CO₂ analysis provides constraint on net CO₂ flux
GPP and respiration components are large relative to net flux, suggesting the need for a tracer
Three flux models show variability in the GPP estimate with the CASA-GISS flux as the largest
The large flux from CASA-GISS also appears to overestimate the COS drawdown, but looking at CO₂ also, its clear that respiration is underestimated.

Primary Production During Biofuel Crop Surge

High yields of corn relative to other crops (above) and rapidly expanding corn areas (below) can influence regional NPP
New flux estimates account for crop yields and expansion
Assessing these surface flux estimates may be supported by the simultaneous analysis of CO₂ and COS.

References

Contact
Elliott Campbell, Sierra Nevada Research Institute, UC Merced Email: campbell3@sierranevada.edu Phone: 209.331.3912