ESTIMATING SURFACE-ATMOSPHERE EXCHANGE RATES OF CO_2, VOC AND OTHER COMPOUNDS USING CONCENTRATION MEASUREMENTS WITHIN AND ABOVE THE ATMOSPHERIC BOUNDARY LAYER

Guenther, Alex (1) Baker, Brad (1,2)
Greenberg, Jim (1) Harley, Peter (1,2) Vega, Oscar (3)
(1) NCAR-ACD, Boulder CO (USA); (2) University of Colorado, Boulder CO (USA)
(3) IPEN, Sao Paulo, SP (Brazil)

We have used a tethered balloon sampling system to characterize trace gas concentrations within and above the daytime atmospheric boundary layer (ABL). This is accomplished by making real-time, in-situ measurements (e.g. CO_2) or by collecting integrated samples for later analysis (e.g. VOC). Simplified ABL scalar conservation equations are then used to estimate surface fluxes. We have previously used this method for estimating fluxes of reactive compounds, such as isoprene, but here examine the potential for extending this technique to longer-lived compounds including CO_2, acetone and methanol. Different assumptions are used depending on whether there is significant chemical production or loss of the compound in the ABL on an hourly time scale. The uncertainties associated with flux estimates of various compounds are described and the desired analytical precision is determined. Data from recent field measurements at forest and pasture sites in the Amazon basin are presented. The results demonstrate that this method can be used to estimate 30-minute average fluxes of CO_2 and at least some VOC on a nearly continuous basis during daytime. The estimated fluxes and diurnal variations are compared with regional model estimates. The relative importance of volatile carbon compounds, other than CO_2, to the net ecosystem carbon flux is discussed.

Presenter:
Guenther, Alex, B.
NCAR-ACD, PO Box 3000,
Boulder, CO 80307-3000 USA
1 303 4971447, 1 303 4971477, guenther@ucar.edu
oral presentation
Session 1