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Seasonal cycle of isoprene fluxes from a tropical ecosystem

M. Potosnak (1), J. Rinne (2), A. Guenther (3), P. Harley (3), J. Greenberg (3), T. Karl (3), L.V. Gatti (4), S. Avione (4), J.W. Munger (5) and S. Wofsy (5)

(1) Desert Research Institute, [mark.potosnak@dri.edu], (2) University of Helsinki [janne.rinne@helsinki.fi], (3) National Center for Atmospheric Research [guenther@ucar.edu, harley@ucar.edu, greenber@ucar.edu, tomkarl@ucar.edu], (4) IPEN [lvgatti@net.ipen.br], (5) Harvard University [jwm@io.harvard.edu, scw@io.harvard.edu]

Isoprene emissions from tropical regions account for a majority of isoprene produced globally. Current estimates of global isoprene emissions use meteorological inputs (temperature and light), ecosystem leaf area, and a time invariant, ecosystem specific basal emissions factor for the canopy which is modified in time by a series of empirical relationships. This approach has been verified to work well for deciduous mid-latitude forests, but the approach has not been tested for tropical ecosystems where seasonality is induced by precipitation. The flux study in the tropics reported here found strong effects of precipitation regime (dry vs. wet season) on isoprene emissions. The field site is near Santarem, Brazil in the Floresta Nacional do Tapajos (2^o $51'$ S, 54^o $58'$ W, precipitation 2000 mm yr^{-1}), and is part of the Large scale Biosphere-atmosphere experiment in Amazonia (LBA). The site is run by the Wofsy group at Harvard University, and all ancillary data was collected by that group. The first field campaign was conducted by Janne Rinne during the 2001 wet season. The second field campaign was conducted during the dry season of 2003. Both campaigns deployed a Fast Isoprene Sensor to measure fluxes using the eddy covariance method in conjunction with instrumentation in place at the km 67 tower (i.e., a sonic anemometer and meteorological sensors). Using a simple canopy emission model developed by Alex Guenther at NCAR, basal emission rate of the canopy was found to increased by a factor of 6, from 1.1 to 6.8 nmol m^{-2} s^{-1} from the wet to the dry season.