Experimento de Grande Escala da Biosfera-Atmosfera na Amazônia

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Soil-Atmosphere Flux of Nitrous Oxide and Methane Measured Over Two Years on Sand and Clay Soils in Undisturbed Forest at the FLONA Tapajos, Brazil

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Nitrous oxide (N_2O) and methane (CH_4) are important greenhouse gases. Tropical forest soils account for the largest natural source of N_2O . Most upland tropical forest soils studied so far consume CH₄. We measured soil-atmosphere flux of N_2O and CH₄ using static chambers during 30 minute long emplacements. Four samples were removed at equal time intervals in nylon syringes and transported to our laboratory in Santarem for analysis within about 24 hours of collection. We analyzed N_2O and CH₄ using gas electron capture and flame ionization gas chromatography. To determine concentrations, integrated sample peak areas were compared to peak areas for commercially prepared standards that had been calibrated against the LBA-ECO standards. We calculated fluxes by linear regression of 3-4 concentration-time pairs. Our sampling points were randomly selected at intervals of 2-4 weeks at mature undisturbed forest sites near the km 83 IBAMA base in the Tapajos National Forest (FLONA Tapajos). Approximately 8 chamber measurements were made during each sampling period on both sandy Ultisols and clayey Oxisols. Soil and air temperature and soil moisture were measured at the same time as gas fluxes.

 N_2O emissions from clay greatly exceeded the emissions from sand. During 2 years of measurement, N_2O emissions from clay soils averaged 7 ng-N cm⁻² h⁻¹ while emissions from sand soils averaged only 2 ng-N cm⁻² h⁻¹. Sand soils generally consumed more CH₄ than clay soils -1 mg-CH4 m⁻² d⁻¹ vs.0 mg-CH4 m⁻² d⁻¹). Seasonal variation of both N_2O and CH₄ fluxes appeared to be controlled primarily by soil moisture. For N_2O , wet season (January-June) emissions greatly exceeded dry season (July – December) emissions. In the case of CH₄, fluxes were near zero or positive during the wet season but notably negative (indicating consumption of methane in the soil) during the dry season.