Quantifying Seasonal NOx flux in the Sahel

Laura Fitch[1], Jonathan Hickman[2], Cheryl A. Palm[2], Willy Diru[3], Gerson Nyadzi[3], Bocary Kaya[3], Serigne Kandji[3], & Abhraham Kebede[3]

[1]Departments of Biology & Earth and Environmental Science, Barnard College, Columbia University, New York, NY 10027, USA [2]Agriculture and Food Security Center, Earth Institute at Columbia University, New York, NY 10027, USA [3]Millennium Promise Organization, New York, NY 10027, USA

Soils are a major driver of nitric oxide (NO) emissions following the onset of precipitation in seasonally dry regions. NO is a precursor to tropospheric ozone, which is a greenhouse gas and a major air pollutant that adversely affects human health and crop production. The first precipitation events following a dry season can increase emissions 50-fold, and can important short-term impacts on air quality early in the growing season (Jaeglé, 2004). Soils collected at 4 Millennium Village sites across the Sahel (Pampaida, Nigeria; SADA, Ghana; Tiby, Mali; and Koraro, Ethiopia) during the dry season from 3 farms and 3 adjacent natural savannah locations at each site were subjected to lab incubations to simulate the effects of a 10mm rainfall event on NO fluxes from 100g of soil for each collection location using the LMA-3D NO_x analyzer. Preliminary results indicate that NO_x gas fluxes increase following precipitation events in the case of both savannah and farm soils from each country, the magnitude of which are similar to those observed in soils from Senegal (Dick et al. 2006). And while no significant difference in magnitude of fluxes was demonstrated between savannah and cultivated regions, the fluxes observed from fertilized soils in our measurements are roughly 2 to 5 times larger than fluxes observed in unfertilized peanut and sorghum fields in Senegal (Dick et al. 2006), indicating that fertilization and land use practices can influence NO_x fluxes in a meaningful way.