N_2O FLUXES FROM KALAHARI SANDS AFTER SIMULATED LIGHT AND HEAVY RAINFALL

Manoj Menon[1], Andrew J. Dougill[1], Andrew D. Thomas[2], Stephen R. Hoon[2] and James B. McQuaid[1]*
[1] School of Earth and Environment, University of Leeds, Leeds, U.K.
[2] Department of Environmental and Geographical Sciences, Manchester MetropolitanUniversity, Chester Street, Manchester, U.K.
*Email: m.menon@leeds.ac.uk

Dryland soils are increasingly seen as having global significance in regulating biogeochemical fluxes and important feedbacks are seen between climate and land use systems. Much attention has been focused on carbon dynamics, but there is also increasing concern over nitrogen oxide fluxes and a demonstrated need for improved understanding of the microbial and biochemical controls on nitrogen cycling processes for major dryland soil biomes.

This paper provides a contemporary review of nitrogen cycling processes in Kalahari soils that cover an extensive portion of Southern Africa (over 2 million km^2), including reflections on the limitations on our understanding of N fixation, mineralisation, ammonia volatilisation, leaching and denitrification rates. Notably, we present the first *in-situ* analysis of gaseous flux measurements of soil nitrous oxide (N_2O) emissions associated with the denitrification process after simulated pulses of light and heavy rainfall.

Measurement of these fluxes has been enabled through the development of portable field respiration chambers that allow investigation of soil-atmosphere gas fluxes under experimental conditions to assess the controls of flux rates. Here we quantify the impact of temperature, moisture and crust cover on N_2O losses from 5 sites along a rainfall aridity gradient across the Botswana Kalahari sandveld. These findings add to those from other dryland regions (notably the US and China) suggesting that gaseous loss after precipitation events, especially denitrification, is a significant pathway of N loss for dryland ecosystems contributing a significant fraction of global N gas fluxes.

This paper also outlines the future research needs for improving understanding of nitrogen fluxes within, and out of, Kalahari soils. In particular, we will reflect on the preliminary findings of further in-situ experiments conducted in 2009 and outline how continued field-based experimental studies can reduce uncertainties associated with N flux assessments from dryland soils.