Hydrological and biogeochemical controls on the nitrous oxide (N_2O) production and consumption in subtropical isolated wetlands

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Wetlands are potential sources of greenhouse gases including nitrous oxide (N_2O). N_2O emissions are highly regulated by the wetland hydroperiod and water-table fluctuations. To reduce N_2O emissions and to develop mitigation strategies, it is important to understand the effect of hydrology and biogeochemical factors on production and consumption of N_2O in soils. The objective of this study was to quantify the potential soil N_2O production and consumption rates within soil profile. Laboratory incubation experiments were carried out using soils from an isolated wetland located in agricultural watershed in the Okeechobee Drainage Basin. Soil samples were collected at four depths (0-10cm, 10-30cm, 30-50cm, and 50-70cm) from three areas with different hydroperiods. Soil physical and chemical properties and microbial biomass were performed on soil subsamples. Potential rates of N_2O production from nitrification (PN_2O-nit), and denitrification (PN_2O-den) and consumption (PN_2O-con) were determined for all soil samples. The results indicated higher N_2O potential production rate in soils from location with higher water table. Most of the N_2O production (~70%) and consumption (~80%) in soils occurred in the upper layer (0-10cm) and N_2O was mainly produced by denitrification. Furthermore, microbial biomass and nitrate content were two critical factors that controlled N_2O production and consumption along the soil profile.