Abstract

The high degree of spatial and temporal variability often associated with nitrous oxide (N_2O) emissions from the terrestrial surface to the atmosphere makes difficult the representative monitoring and characterization of the environmental variables that are significant in shaping the magnitude of these greenhouse gas fluxes. By applying the eddy covariance technique, in which N_2O concentrations were measured at high frequency with a tunable diode laser (model TGA100, Campbell Scientific, Inc.), we were able to continuously monitor field-scale N_2O fluxes over an eight-month period for a heavily fertilized pastureland site located near the town of Donoughmore in Co. Cork, Ireland. The N_2O flux time series is dominated by extended periods in which the flux remains relatively steady at between 5-50 ng N_2O $m^{-2}s^{-1}$, but these background levels are interrupted by instances in which the mean daily fluxes abruptly rise and, in some cases, exceed 500 ng N_2O $m^{-2}s^{-1}$. Fertilizer applications are primarily responsible for triggering the large episodic fluxes, however the timing of these applications relative to the status of soil moisture and temperature plays a critical role in regulating the magnitude of the fluxes via nitrification and denitrification processes.