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Modeling the impact of spatial and temporal variation of a semi-arid climate upon timing and potential of N2O gas emissions from soil for risk assessment

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There currently exists very little data to assess how nitric oxide (NO) and nitrous oxide (N2O) emissions vary in space and time throughout the semi-arid, agricultural southwest of Western Australia. Studies from semi-arid regions suggest that emissions will likely be pulsed and limited by soil moisture. Using a statistical model of rainfall and climate in conjunction with a simple water balance model and an emissions potential function, we make predictions how NO and N2O emission event statistics in space and time throughout the region. A comparison with one available study in the region suggests that the frequency of summer emission events may be predictable with soil texture and geographical co-ordinates as the minimum of information required. It is found that for sandy soils the mean annual emissions potential of NO and N2O increases to the southwest, NO emissions dominating N2O. For clayey soil however, the emissions potential increases from the west to the east. Pulsed emissions, resulting from the wetting of a dry soil, are strongly clustered during spring months, but during summer the temporal statistics indicate that emission events can be considered to be independent of each other.