Solar UV irradiation-induced production of N\textsubscript{2}O from plant surfaces - low emissions rates but all over the world - DTU Orbit (19/03/2019)

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Nitrous oxide (N\textsubscript{2}O) is an important long-lived greenhouse gas and precursor of stratospheric ozone depleting mono-nitrogen oxides. The atmospheric concentration of N\textsubscript{2}O is persistently increasing; however, large uncertainties are associated with the distinct source strengths. Here we investigate for the first time N\textsubscript{2}O emission from terrestrial vegetation in response to natural solar ultra violet radiation. We conducted field site measurements to investigate N\textsubscript{2}O atmosphere exchange from grass vegetation exposed to solar irradiance with and without UV-screening. Further laboratory tests were conducted with a range of species to study the controls and possible loci of UV-induced N\textsubscript{2}O emission from plants. Plants released N\textsubscript{2}O in response to natural sunlight at rates of c. 20-50 nmol m\textsuperscript{-2} h\textsuperscript{-1}, mostly due to the UV component. The emission rate is temperature dependent with a rather high activation energy indicative for an abiotic process. The prevailing zone for the N\textsubscript{2}O formation appears to be at the very surface of leaves. However, only c. 26\% of the UV-induced N\textsubscript{2}O appears to originate from plant-N. Further, the process is dependent on atmospheric oxygen concentration. Our work demonstrates that ecosystem emission of the important greenhouse gas, N\textsubscript{2}O, may be up to c. 30\% higher than hitherto assumed.

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