Fluxes of Nitrogen Oxide using Laser-Induced Fluorescence with the Eddy Covariance Method

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Abstract

Nitrogen oxides ($NO + NO_2 = NO_x$) are central to the oxidation and removal of other emitted trace gases and the production of secondary atmospheric pollutants. While anthropogenic activities are the dominant source of NO_x, increasingly stringent air quality policy has resulted in decreasing NO_x emissions for many parts of the world, as a result, global ambient NO_x levels are expected to decline in the next century. To understand the implications of this for climate change and air quality, atmospheric chemistry models need to be able to accurately represent low-NO_x chemical regimes. The limited studies available suggest that models perform poorly in these environments, a phenomenon which has been in part attributed to the high uncertainty in natural NO_x sources. Unfortunately, most existing instrumentation is not sufficiently sensitive to resolve fluxes from these sources, which has resulted in a sparsity of measurements. This work aims to address the issue by demonstrating a NO laser-induced fluorescence (NO-LIF) instrument, combined with the eddy covariance (EC) method, as a viable option to provide high-precision flux measurements. Here we present a deployment of this newly built NO-LIF at a well characterized urban flux site (BT Tower, London, UK) and a comparison of the NO-LIF with a standard reference chemiluminescence technique.

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YES, I am an early career scientist.

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