Temporal Trends in Nitrogen-Dioxide (NO_2) Flux from an African Grazed Savanna

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Abstract

South Africa is a well-known source of atmospheric NO_2, with a hotspot of tropospheric column concentrations that influence regional air quality. Ambient NO_2 concentrations are most often attributed to anthropogenic sources such as coal-power generation and industry. But also include natural sources such as soil emissions and biomass burning which are strongly influenced by climate and geography. The removal of NO_2 from the atmosphere, via wet and dry deposition, is dependent on rainfall and surface-level dynamics. The contribution of these factors to the emission and deposition of NO_2 vary, both temporally and spatially within the South African landscape. Here we performed the first-ever high-resolution micrometeorological measurements of NO_2 using a quantum cascade laser (QCL) instrument at a grazed African savannah landscape. NO_2 flux was measured for 2015-2020 and captured the '100-year drought' event of 2015 and the COVID-19 lockdown from an African perspective. Initial findings explored trends in NO_2 flux with notable change observed at both monthly- and diurnal-scale between years of highly variable climate. Deposition velocity showed the greatest variability at diurnal-scale when compared between seasons. These findings highlight the interdependence of NO_2 drivers with climate and human activity and contribute to our understanding of atmosphere-surface interactions in African landscapes with implications for modelling in the context of a changing climate.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

GEIA: Global Emissions Initiative, MAP-AQ: Monitoring, Analysis and Prediction of Air Quality, TOAR: Tropospheric Ozone Assessment Report

IGAC Regional Working Groups

ANGA: African Group on Atmospheric Sciences