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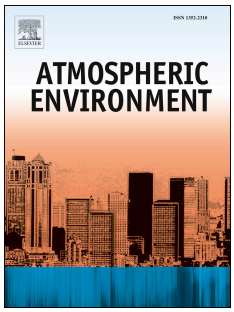

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Impacts of enhanced fertilizer applications on tropospheric ozone and crop damage over sub-Saharan Africa

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Abstract. Fertilizer-induced nitrogen oxides (NO_x) emissions in sub-Saharan Africa are expected to increase substantially in the coming decades, driven by increasing application of fertilizers to increase crop yields in an effort to attain food security across the continent. In many parts of sub-Saharan Africa, surface ozone (O_3) is sensitive to increasing atmospheric concentrations of NO_x. In this study, we employ the GEOS-Chem chemical transport model to conduct a preliminary investigation of the impacts on O_3 air quality and the consequential crop damage associated with increasing fertilizer-induced NO_x emissions in sub-Saharan Africa. Our simulation results, constrained by field NO flux measurements for the years 2011 and 2012 in response to a variety of fertilizer application rates in western Kenya, show that the enhancements in NO flux with fertilizer application rate of 150 kg N ha^{-1} can increase surface NO_x and O_3 concentrations by up to 0.36 and 2.8 ppbv respectively during the growing season. At the same time, accumulated O_3 exposure during the crop growing season (expressed as AOT40 values)