3.119 Analysis of trends and seasonal variations of nitrogen dioxide, nitric acid and ammonia concentrations measured at six rural sites in Africa from 1998 to 2015..

Early Career Scientist

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Abstract:

This work is part of the INDAAF (International Network to study Deposition and Atmospheric chemistry in Africa) programme. INDAAF is a long term monitoring measurement network since 1995 to document atmospheric chemistry and deposition fluxes in Africa. This programme is part of the IGAC/DEBITS (Deposition of Biogeochemically Important Trace Species) activity and a contributing network to the GAW/WMO programme. Data collected within the framework of INDAAF constitutes a unique long-term database in the major African ecosystems for gases concentrations, aerosols composition and rain chemistry.

We present for the first time an assessment of trends, on a monthly basis, of atmospheric concentrations of NO_2, NH_3 and HNO_3 over the period 1998-2015. The various time series have been obtained at 6 monitoring stations geographically spread to represent the major African ecosystems in west and central Africa (dry savanna - wet savanna - forest). Two statistical techniques are used (1) to relate nitrogen gas concentrations to their potential emission sources and (2) to estimate trends of these gases over 18 years. Principal component analysis allowed us to analyse the data sets,

highlighting the influence of physical parameters on nitrogen gases concentrations. We found in the sahelian region (Niger, Mali) a well marked seasonal cycle with a maximum of NO_2 concentration at the beginning of the wet season (May) correlated to maxima of air temperature, soil temperature, NH_3 and HNO_3 concentrations, showing that soil biogenic emission is the main driver of nitrogen gases at the sahelian sites. Mann-Kendall tests are applied to determine monotonic trends of the gases concentrations data. This study allows to statistically highlight the physical parameters which influence the atmospheric gases concentrations and the seasonal variations, and to analyze for the first time gases concentrations trends in relation with of the major sources of nitrogen gases in western and central Africa.