Dominant contribution of nitrogen compounds in precipitation chemistry in the Lake Victoria catchment (East Africa)

8th GLOBAL NITROGEN CONFERENCE
30. MAY – 3. JUNE 2021 | BERLIN, GERMANY

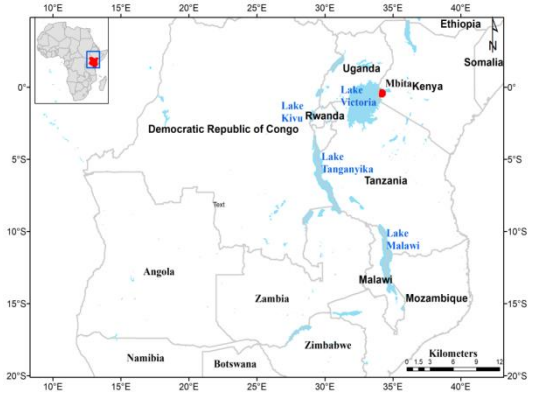
Objective

Characterize the rain chemistry in the Lake Victoria basin, focusing on nitrogen compounds, taking into account the Dissolved Organic Nitrogen (DON) part

Introduction

- In Africa, nitrogen (N) deposition to ecosystems will increase by 50% until 2100
- Taking into account the contribution of Dissolved Organic Nitrogen in wet deposition is a major challenge
- Eutrophication
- Lack of available long term measurements in Africa

Study site: Mbita, Kenya, Lake Victoria basin

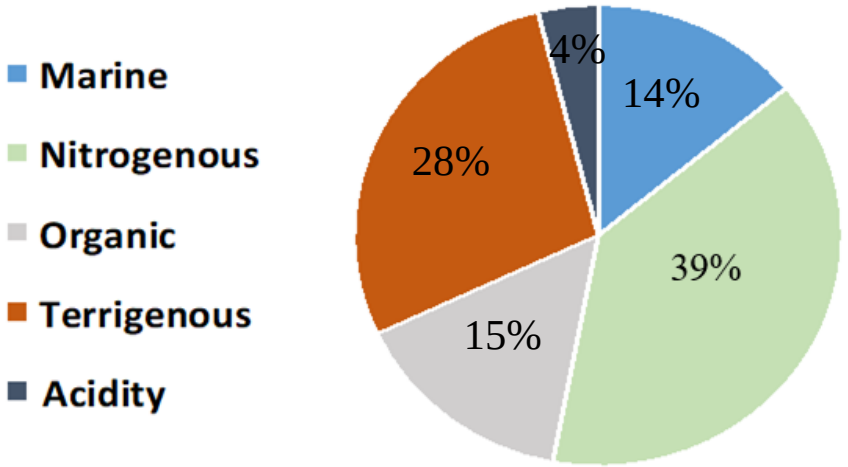


Methods

This work provides a complete chemical characterization of rains collected in the tropical rural site of Mbita (Kenya) on the shores of Lake Victoria (annual rainfall 1259.3 mm). We present a wet nitrogen deposition budget including inorganic and organic dissolved nitrogen in relation with atmospheric sources of gases and particles, precipitation rate and air mass transport. A unique 2 yr monitoring data set (2017–2019), providing 183 rain samples was collected and analyzed according to international standards (WMO/GAW).

Results

- Wet deposition is influenced by the variation in emission source strength, precipitation rate and the origin of air masses.
- The most important contribution with the predominance of NH_4^+ ion in precipitation due to local sources such as livestock and fertilizers, as well as regional and continental biomass burning and nearby agricultural fires.
- DON concentrations: 29±15% of Total Dissolved Nitrogen and DON Wet Deposition: 31% of total N wet deposition (WD)
- Total wet nitrogen deposition : 8.54 kgN ha^{-1} yr^{-1}.
- Total atmospheric deposition : 15 kgN ha^{-1} yr^{-1} (dry deposition representing 38%) = 58, 760 tN yr^{-1} into the lake
- Atmospheric deposition is above the 10 kgN ha^{-1} yr^{-1} threshold above which ecosystems may encounter a change in their biodiversity (Bobbink et al., 2010)
- 14, 400 tN yr^{-1} staying in the lake and contributing to eutrophication



Figure

Contributions to rain chemistry from marine (Indian ocean), terrigenous (south Sudan), organic (forest and biomass burning) and nitrogenous (agriculture and livestock) sources.

Nitrogen is the main contributor to rain chemistry on the shore of Lake Victoria (Kenya).

Further Reading: Bakayoko A, et al., 2021 Dominant contribution of nitrogen compounds in precipitation chemistry in the Lake Victoria catchment (East Africa) *Environ. Res. Lett.* Online: https://iopscience.iop.org/article/10.1088/1748-9326/abe25c

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