

Hydrogen isotopic analysis of sediment and suspended particulate matter using online equilibration systems

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This study investigates the current biogeochemistry of Congo River (Democratic Republic of Congo) and Lake Edward (Uganda) watershed, assessing carbon (C) and nutrient budgets and the drivers of spatial and temporal changes. The main goal is to quantify to which extent these aquatic systems depend on autochthonous (aquatic) and allochthonous (terrestrial) primary production as well as the contribution of methane (CH₄)-derived C by using stable hydrogen isotopes. We sampled three sediment cores in Lakes Edward and George (October 2016) as a 'vertical' proxy of historical changes in organic matter inputs into these lakes. Suspended particulate matter (SPM) was collected in the rivers of the watershed of Lake Edward and along the Congo River, from Kisangani to Kinshasa (~1700 km), during two field campaigns (2013 and 2014).

Due to the heterogeneous composition of the samples and the lack of calibrated in-house standards for this type of sample, SPM and sediments were evacuated online, dried and flushed with He in a Uni-Prep carousel before equilibration with two waters of known isotopic composition to control H exchangeability. Later, samples were again evacuated and dried before hydrogen isotope analysis. Capsules were reduced in ceramic reactor that was filled with chromium powder using a modified single-oven Flash HT-EA 1112 elemental analyzer. Measurements of ²H were performed on the resulting H₂ gases using continuous-flow isotope-ratio mass spectrometry (Delta V Advantage, Thermo Scientific).

The fraction of exchangeable H was on average 2.2 ± 0.2 % for sediment samples and varied between 2-6 % for SPM filter samples. These preliminary results of non-exchangeable ²H values ($\delta^2\text{H} = +27.7 \pm 1.8$ ‰) had a higher contribution of *in-situ* phytoplankton production relative to terrestrial inputs than ²H in rivers ($\delta^2\text{H} = +1.1 \pm 5.1$ ‰). This contribution of aquatic production sources was relatively shallow eutrophic lake connected to Lake Edward through the Kazinga Channel) compared to pelagic suggested contributions of methane-derived C to the SPM in tributaries in the middle section of the study area.