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Modelling Seasonal River Export of Nutrients to Lake Tana, Upper Blue Nile

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Abstract

Lake Tana is a source of Blue Nile and other Rivers in the Tana basin. Rivers in Lake Tana basin flowing into Lake Tana have been exporting excess nitrogen (N) to the Lake leading to seasonal eutrophication. Eutrophication has negative consequences on public and ecosystem health and various sectors of the economy. The design and implementation of effective management options of eutrophication is very difficult in the absence of sub-basin, seasonal, and source-specific N concentration data. Therefore, this study aims to quantify the seasonal river export of Dissolved Inorganic Nitrogen (DIN) to Lake Tana, and identify DIN sources in different seasons and sub-basins by developing a new model that considers seasonality in human activities (crop planting, harvesting) and climate change. An existing modelling approach and local information were used. River export of DIN demonstrated clear seasonality and the model performed well in capturing the observed seasonality in DIN load and Yield. DIN load of 0.27 ton in dry and 1947 ton in rainy seasons were noted. Animal manure (63%) was identified as a major source of DIN to Lake Tana. G/Abay, Gumara, Rib, Dirma, and Gelda sub-basins in total contribute 70 % of the annual DIN load (9082 ton). The results will help to set critical thresholds of nitrogen (N) for active and proactive measures of water quality management since the new model helps to identify which season and source contributes how much.

Keywords: Nutrient modelling, Export, Eutrophication, Watershed management

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