The influence of precipitation events on the temperature of the surface waters of lake Nokoué, Benin

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Lake is of immense economic value to the Southern part of Bénin as a source of food, income and because it provides the main transport route to Cotonou for its surrounding villages. The lake is a choked lagoon, has a surface of 150 km², a maximum depth of 4 m and is fed by several rivers and connected to the ocean and the lagoon of Porto-Novo by two canals. The connection with all those different water bodies makes it difficult to understand the temperature distribution of the lake and the main mechanisms that play a role in it. The effect of precipitation events on the overall temperature of the lake could gain in importance as the rainfall frequency is expected to change in view of climate change. It is not exactly clear how rainfall is expected to change, the climate change profile of Benin shows several models and site specific studies show different outcomes for the lake Nokoué area (Warner et al. 2019, Hounkpè et al. 2016).

This work presents the first experiences in collecting temperature data at high frequency time-intervals in lake Nokoué (Bénin) by means of a thermocouple and an arduino nano-board. This research took place in the frame of the CEBioS programme (www.biodiv.be/cebios2) that investigates the dispersal of commercial shrimp species and was sponsored by the Bio-Bridge Initiative of the Convention of Biological Diversity. During October 2019, the short wet season in West-Africa, three thermometers were placed on the lake. A lot of rainfall events took place during this period. One thermometer was placed in the center of the lake, one in the west and one in the canal connecting the lake to the ocean. One hour interval measurements were analysed during three days at the surface of the lake's water column.

The results revealed the temperature was mainly determined by the day-night cycle and ranged between 27 and 30 °C. Though the meteo-data reveiled many precipitation events, only the results of the station in the center showed an effect of rainfall on the temperature. The temperature dropped by half a degree. There was a very local influence in time and in space.

Future investigation combining measurements and analysis of a hydrodynamic model, should reveal if the impact of these precipitation events are indeed local or if they have an effect on the overall temperature of the lake. Ten stations will be installed on the lake and the precipitation events will be recorded by means of meteo-data available online. After analysis, the hydrodynamic model will be validated by means of these data. When the model replicates the precipitation events correctly, the effect of a changed precipitation frequency can be tested. Next to temperature, also the salinity distribution will be investigated.

References

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