



The Isotope Hydrology Of Selected Lake Tanganyika Watersheds

by Hudson Nkotagu

Background:

The isotope hydrology of selected Lake Tanganyika watershed areas is a component of the LTBP Sedimentation Special Study. Drs. Patterson and Nkotagu, along with other team members, selected two watersheds during a visit to the study area in September 1997. Both an impacted and unimpacted watershed were selected for comparative hydrological evaluation of the land use effects and their implications to the Lake's biodiversity.

The isotope techniques provide complimentary information to those of the classical methods. Information such as: sources of water, nutrients and the hydraulic interconnection between surface and groundwater can be obtained through the study of isotopes. In addition, the pollutant pathways into the lake and the quantification of stream flow into both base flow and surface runoff can be easily and more accurately achieved by use of environmental isotopes.

This work involves mainly water sampling from rainfall, stream flows, groundwater and the Lake. Furthermore, sediment sampling is also conducted in order to determine the current sedimentation rates.

Water sampling:

Water samples are collected from both the Mitumba and Ngonya streams flowing through the unimpacted and impacted watersheds respectively. A total of 160 duplicate water samples have so far been collected. Samples from both the high and low stream flows are targeted in order to observe the effects of both lithology and land use on the stream flows' chemical character as well as in the delineation of the major pollutant pathways. The same sampling points on the streams and the lake are maintained for proper monitoring of the chemical character of the water with season. Samples are likewise collected from rainfall.

Sediment sampling:

Sampling also includes sediment load from both the Ngonya and Mitumba streams.

Preliminary assessment shows, as expected, that Mitumba stream flowing across the unimpacted watershed area in the Gombe National Park carries lower sediment load than the Ngonya stream located in the heavily impacted watershed. The actual sediment load of the two streams is yet to be determined in the laboratory for proper evaluation of the recent sedimentation rates.

Stream flow measurements:

Stream flow measurements are recorded mainly for high flows. Both Mitumba and Ngonya streams are measured. Flow for the Ngonya stream varies from 0.093 to 0.733 M³/sec at gauge heights of 0.14 to 0.733 m respectively. The Mitumba stream flow is observed to vary from 0.031 to 0.190 M³/sec at gauge heights of 0.06 to 0.13m respectively. Because of the micro climate effect and/or shifting of the stream flow control factors resulting in increased channel width and reduced stream

flow velocity, stream flow measurements do not always correspond directly with the gauge height. Stream flow measurements for the shifting Ngonya stream were accomplished by use of surveying techniques. It is interesting to note that the data collected following this procedure and those obtained directly on the staff gauge, plot equally well on the rating curve for the stream.

Water samples analysis:

During fieldwork, analyses of water samples are limited to: the determinations of pH, NO₃, dissolved oxygen, electrical conductivity, temperature, Fe, Chloride, Phosphorous and alkalinity. However, laboratory work commences with the filtration of all the samples at the Kigoma LTBP wet laboratory and detailed chemical analyses for all major ions and other parameters are performed at the Tanzania Bureau of Standards (TBS) in Dar es Salaam.



Dr. Nkotagu and villagers collect water from the new collection chamber at Mwamgongo, Tanzania

Field equipment installation:

Two manual rain gauges were installed in the open air, one close to each of the Mitumba and Ngonya stream gauging stations. Due to the roughness of the Ngonya stream, a metallic gauze was installed in order to protect the gauge plate from being knocked down by rolling boulders and cobbles brought about during flash floods.

Interesting news:

Interesting news is that one of the seepage sampling points identified during this work has been developed into a water supply source for the Mwamgongo village. After our explanations to the village leaders on how to solve their acute problems of a clean and safe drinking water supply, a collection chamber was constructed. Collective efforts by all the villagers resulted in this wonderful potentially long-term solution.

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