INSTITUTE OF GEOLOGICAL AND MINING RESEARCH

PROJECT: SATREPS-IRGM

FIELD REPORT OF HYDROLOGY GROUP (16^{th} – 23^{rd} January 2013)

By

Fantong Wilson Yetoh

OUTLINE OF REPORT

-Team members

- Introduction and objectives

- Method

- Results

-Conclusions

Team members

Prof. Anazawa Katsuro, Dr. Fantong Wilson Yetoh,Mr. Tchakam Brice, Mr. Abanga Louis

Introduction

In order to attain the overall objective of the hydrology group that was set within the framework of SATREPS-IRGM in 2010, a fieldwork was carried out at Lake Nyos and its environs in January 2013. The specific objectives of the field work were as follows:

1) Sampling of selected springs/streams in and around the Lake Nyos hydrological catchment
2) Set up a temporal rain water collection system for subsequent establishment of a local meteoric water line.
3) Set up a continuous conductivity, temperature, and depth (CTD) sensor on the bed of one of the flowing springs.

Method of study

In addition to the Nyos surface sample, 18 sites of springs/streams were sampled (Fig. 1). At each sample site, on-site measurements of electrical conductivity (EC), water temperature, and oxidation-reduction-potential (ORP) were done. Moreover, alkalinity (Fig. 2), and dissolved iron were determined. When the EC and water temperature stabilized, representative water sample was collected for: 1) major ion in 100 ml polyethyne bottles, 2) water isotopes in 100 ml polyethyne bottles, 3) sulfur hexafluoride (SF_6) in 250 ml glass bottle, and 4) Chlorofluorocarbon (CFC) in 250 ml glass bottle. It is worthwhile to note that to avoid atmospheric contamination the SF_6 and CFC samples were collected in a manner that no air bubble occurred in the sample bottle.

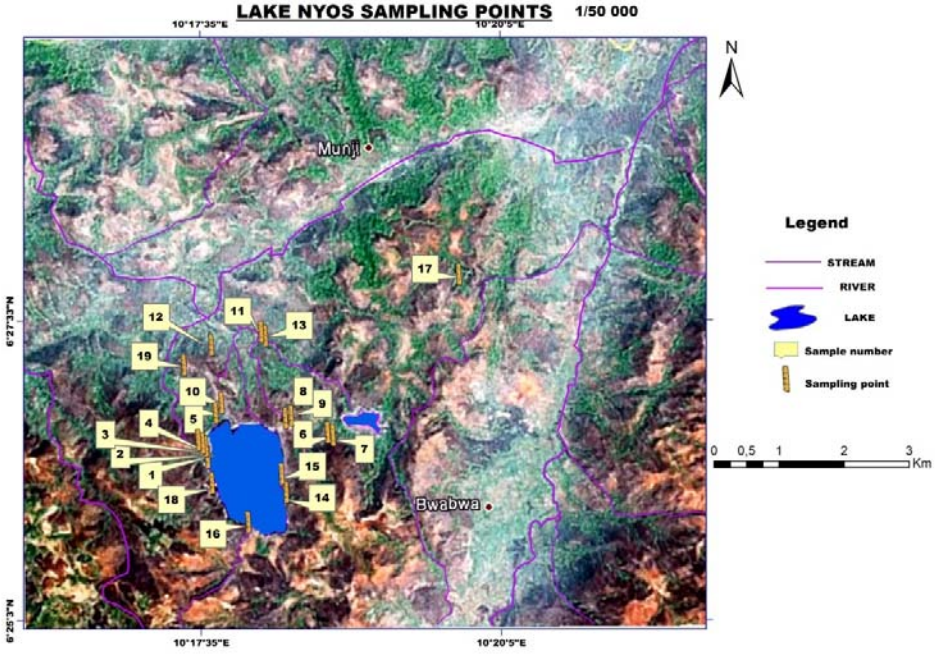


Fig. 1. Sample collection sites

Fig. 2. Onsite determination of alkalinity

Two sets of rainwater collection system were installed at Nyos village. One of the systems had a 5 liter collector, which is to be sampled monthly, and another system had a 250 ml collector, which is to be sampled weekly. The rainwater collection system is meant for continuous long term sampling for subsequent water isotope analyses, whose data shall be used to establish a local meteoric water line for Nyos and its environs. Mr Ousman of Nyos village was trained and designated for the temporal collection (Fig. 3).

Fig. 3. Installation of rainwater collector

At the site (N 6.27168: E 10.17554) of the spring, which has been named “end of lava flow spring”, a CTD sensor (Fig.4), was installed on the bed of the spring to record changes in electrical conductivity, temperature, and depth of water with time.

Fig. 4. A CTD diver that was placed on the spring bed

Preliminary Results

Table 1, shows the values of the in-situ measurements.

Spl No	Point Name	Latitude	Longitude	Altitude	EC (ms/cm)	pH	ORP
1	20130118 01 Surface Water of Nyos Lake	6.26431	10.17397	1106	20.2	7.8	214
2	20130118 02 Nyos Cliff Lake Nyos	6.26441	10.1738	1072	19.43	8.09	149
3	20130118 03 Nyos Cliff Spring Ferrous_Lake Nyos	6.26446	10.17376	1163	19.85	8.03	189
4	20130118 04 East Nyos Cliff Spring	6.26459	10.17383	1083	16.23	8.07	-3.5
5	20130118 05 End of Lava Flow a	6.27167	10.17557	978	22.6	6.36	117
6	20130119 01 Koim Stream	6.26372	10.18258	1037	2.18	6.82	228
7	20130119 02 Soseh Stream	6.26375	10.18248	1036	15.6	8.13	220
8	20130119 03 Soda Spring A (Fulani spring)	6.27001	10.18202	1014	19.84	5.34	260
9	20130119 04 Soda Spring B (Fulani spring)	6.27002	10.18202	1013	53.5	5.72	73
10	20130119 05 Fukum Spring	6.27023	10.17524	1055	15.76	7.52	219
11	20130119 06 Ngongzang Stream	6.28001	10.17405	892	22.5	8.28	211
12	20130119 07 Nkwatsung River	6.28145	10.18155	882	14.57	7.41	183
13	20130119 08 Overflow of Lake Njupi	6.28122	10.18159	883	5.1	6.92	113
14	20130120 01 Atchaf Spring	6.25492	10.18148	1103	1.83	6.4	132
15	20130120 02 Albero Spring	6.2607	10.18177	1149	2.32	6.89	209
16	20130120 03 Lake Recharge River	6.25474	10.18	1109	3.44	7	59
17	20130120 04 Lava & Basement Contact River	6.29054	10.21044	824	12.46	7.2	82
18	20130120 05 Drinking Water Spring	6.26254	10.17322	1120			
19	Alieu stream	6.27151	10.16231		11.99	8.08	209

Variation of field EC, pH, and ORP in the observed samples is shown in figure 5.

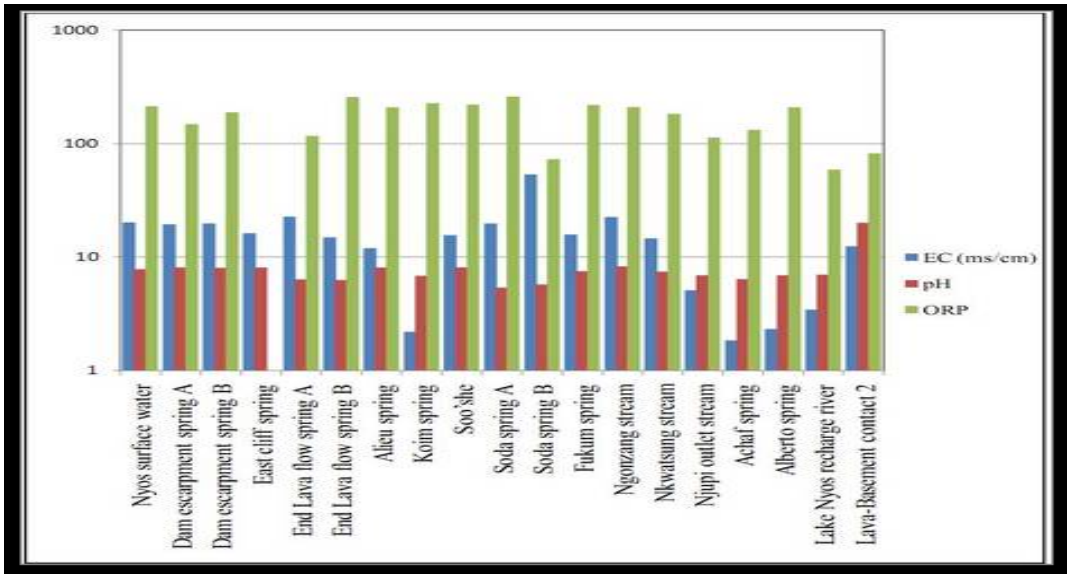


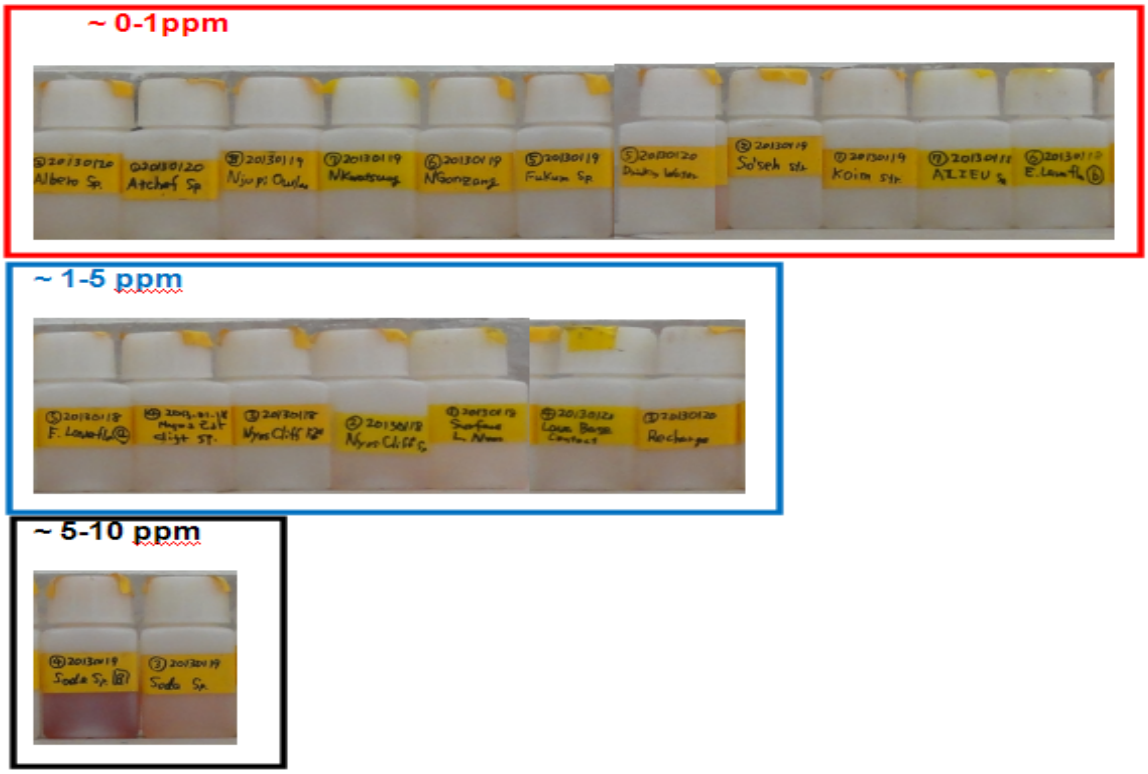
Fig. 5. Variation of EC, pH, and ORP in samples

A combined use of the observed field parameters and topo-sheet suggest as follows:

- The Lake Nyos water, dam escarpment springs, end of lava flow springs, Alieu spring, Fukum spring, Ngonzang stream, Soo'she stream, Nkwatsung stream, and Lava basement contact 2 stream may be hydrochemically related.
- Other hydrochemical sub-catchments are those 1) East cliff spring, 2) Koim spring 3) Achaf spring 4) and 5) Alberto spring, and 6) the Njupi outlet stream
- The soda springs (Fulani springs) constitute another independent hydrochemical system

Variation of dissolved Fe^{2+} in the observed samples

With respect to estimated dissolved iron, the samples could be grouped into 3 as shown below.



Conclusions

- Eight hydrochemical sub systems may be present in the study area.
- The soda springs (Fulani springs) may not be leaking from Lake Nyos.