

Joined Coordinating Committee Report (2013)

Theme: **UNDERSTANDING ERUPTIVE HISTORY OF VOLCANOES ALONG CAMEROON
VOLCANIC LINE (CVL)**

Subject: **Contribution to the understanding of eruptive history at the Barombi Mbo Maar**

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Introduction

Volcanic activities are one of the spectacular and tremendous events that can occur on the Earth, but they are very dangerous nevertheless. [McGuire \(1995\)](#) has estimated that at least 255,351 people have lost their lives as a result of volcanic eruptions only from 1701 to 1986. In Cameroon, the fatal outburst magmatic CO₂ at Lake Nyos in 1986 killing about 2000 people have permitted to classify this volcano as one of the killers of world volcanoes. Crater Lakes like Nyos represent one of the beautiful landscapes produce by volcanic activities. Georges Kling (1987), identified 39 along the CVL and many of them are qualified as **maars** (e.g. [Ngwa et al., 2010](#)). Maars form during *hydromagmatic eruptions*, and can be associated to pre- and post-hazards (Lorenz, 2007). Therefore, build on the previous disaster with Nyos Maar, and since there are just few volcanological settlements within other maars in the CVL, it is likely that some of them could present similar manifestation in the future ([Tuttle et al., 1987](#)). Hence, monitoring of all the Crater Lakes in the CVL and settling quantitative baselines information are necessary to preclude such a disaster, one of the important objectives of the SATREPS Project. [Tilling \(1995\)](#) and [Blong \(1996\)](#) pointed that forecasting volcanic events in modern volcanology requires (1) knowledge of the past and present behavior of a volcano (**eruptive history**) which furnishes the best clues to its possible future activity, and (2) observations of the eruptive processes and products at active volcanoes (**monitoring**) that provide a key to understanding the origin of volcanic deposit units preserved in the geologic record. Maars generally display such volcanic deposit units and to appraise magmatic processes sustaining their formation, tephrostratigraphic analysis and controlled laboratory experiments have been developed (e.g. [Wohletz, 1986](#); [Butter and Zimanowski, 1998](#); [Sheridan and Wohletz, 1983...](#)). Thus, to contribute to the understanding of eruptive history of volcanoes along the CVL, the **Barombi Mbo Maar (BMM)** in the Kumba plain has been choose. I have been studying this maar, located

(~60Km NE Mt Cameroon and ~ 3Km SE toward the Kumba Town) (Fig. 1) since the *master course*. Regarding its position along the CVL and the important number (~700,000) of inhabitants in its vicinity, it represents a good study area for volcanic hazard assessment involved in this Ph. D research program. The following is a summary of the 2012 activities.

Report of the activities from 2012 to now

Activities covering the first year (April 2012 to February 2013) concern the literature survey, participation in conferences and meeting, scientific achievement and the first Field expedition in Cameroon.

- **Literature review**

Basically as in every scientific study, we started this program by a literature survey.

Regarding our Ms.c results, quantitative information on the BMM such as detailed stratigraphy, petro-chemical, as well as geochronological data, remains unavailable to better understand its past behavior and evaluate its hazardous potentiality. Reviewing papers from April to October 2012 permitted to decide exactly what is suitable for the on-going research. At the end, we aim to:

(1) Continue to identify relationships between deposit features and eruptive dynamics at the BMM, (2) investigate the causes for and the nature of changes in eruptive styles during its formation; and (3) Evaluate its dangerousness and commence a discussion about risk assessment.

- **Scientific achievement**

During the period of April to December 2012, while reviewing the literature, I attended some scientific meetings and a manuscript from the Master results, made and submitted to a journal for publication is actually under review. The main idea in the paper consists of an initial tephrostratigraphic analysis of the ~ 100m thick pyroclastic deposits surrounding the Barombi Mbo Maar. An overview of the evolution of volcanic activity and the main eruptive style is then given accordingly to the deposit stratigraphy (Fig.2).

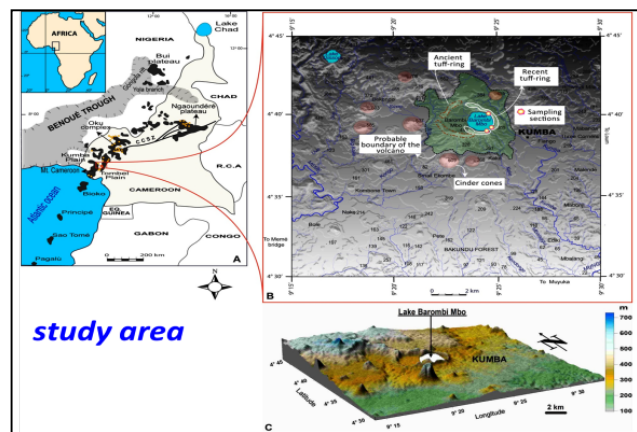


Fig.1. Localization of the study area.

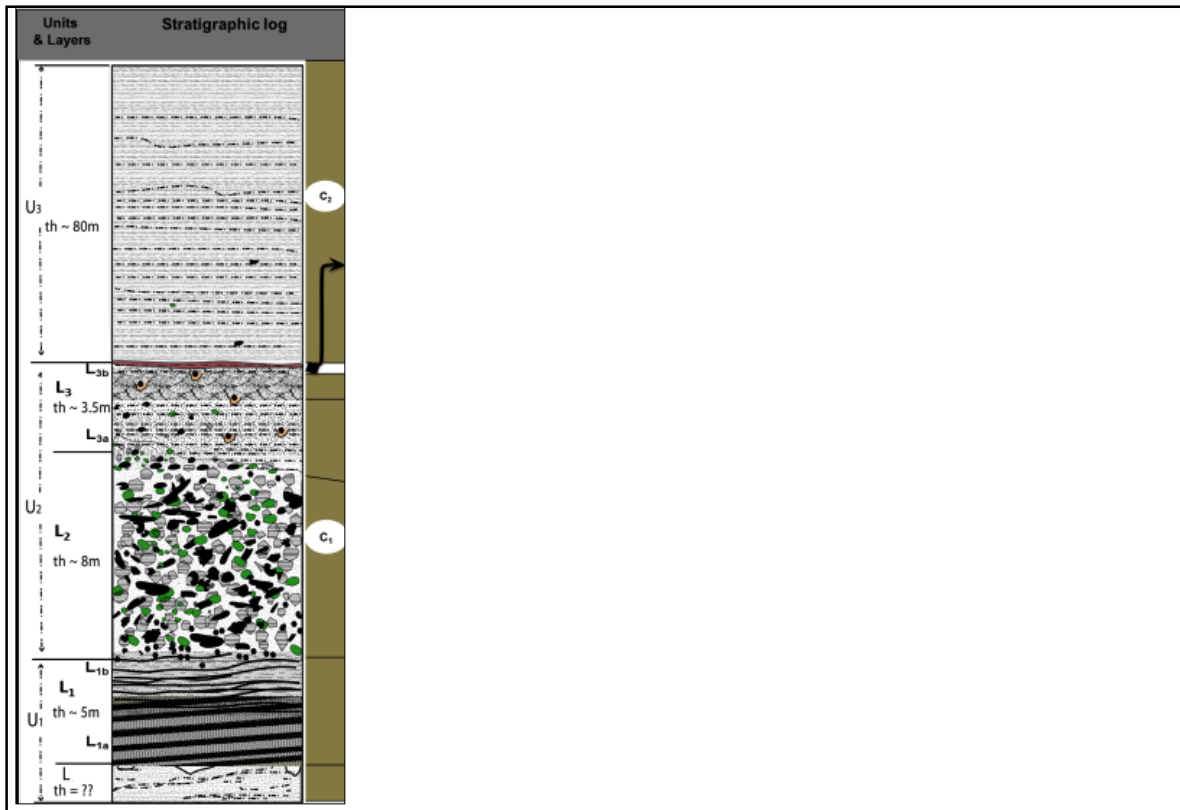


Fig.2. Summary of preliminary result: global stratigraphy and the eruptive activities

On the 20th - 25th May 2012, at the JpGU Annual Meeting 2012 in Makuhari Messe (Chiba, Japan), while accompanying our Laboratory team, I assisted without presentation to the conference but learned many things by observing and discussing with Oral/Poster exhibitors.

On the 18th - 19th September 2012, during the Scientific Meeting of the SATREPS-Cameroon Project held in Tokai University, an oral presentation relative to my Ph. D research proposal was done. Then again, a Poster presentation was prepared for the Graduate School Meeting at Tokai University that took place **on December 15th 2012**. Unfortunately, I couldn't present the poster by myself because I was already on the field in Cameroon. For abstract and other manuscript submitted to attend conferences or to be published, a list of scientific achievement is given below. As a member of the Local Organizing Committee of the 8th Workshop of the IAVCEI- Commission of Volcanic Lakes (CVL), that will be held in Japan in 2013 from the 25th to 28th July for workshop, and 29th to 31th July for optional tour, I am planning to draft an abstract that will be submitted by the 24th of April 2013.

- **First field trip in Cameroon**

From November 15th 2012 to January 17th 2013, I had an expedition in Cameroon for field study. Field work initially planned took place in very good condition and at least all the major expecting points were covered. Indeed, it would have been a little beat difficult, but the presence of Dr.

Dieudonné YOUMEN (*University of Douala*) and Dr. Festus Tongwa AKA (*IRGM-Yaoundé*) helped a lot. Several samples were collected from pyroclastic deposits of the BMM rampart and in around the plain. I am now proceeding to their treatment in the laboratory.

List of scientific achievements in 2012-2013

Boris Chako Tchamabe, Dieudonné Youmen, Sébastien Owona, Moussa Nsangou Ngapna, Issa, Elvis A., Asobo Nkengmatia, Festus Tongwa Aka, Takeshi Ohba, Georges E., Ekodeck (2012) Stratigraphic reconstruction and eruptive history of phreatomagmatic deposits at Barombi Mbo Maar (BMM), Kumba Plain, Cameroon Volcanic Line (Central AFRICA) *Journal of applied Volcanology (under review)*.

Boris Chako Tchamabe, Takeshi Ohba, Issa, Gregory Tanyileke, Joseph V. Hell (2013) Water control on variation in eruptive style during the first eruptive episode of the Barombi Mbo Maar, Cameroon. *Abstract submitted to the JpGU International Symposium 2013, May 19th-24th, Makuhari Messe, Chiba, Japan.*

Boris Chako Tchamabe, Ohba T., Issa, Youmen D. Owona S. Aka F.T., Tanyiléké G., Hell J.V. (2013) Eruptive history of the Barombi Mbo Maar, Southwest Cameroon, Central Africa: constraints from tephrostratigraphic analysis of phreatomagmatic deposits. *Abstract submitted to the IAVCEI General Assembly 2013, 20-24th July, Kagoshima, Japan.*

Boris Chako Tchamabe (2012) Volcanic history and evaluation of potential hazards at Barombi Mbo Maar (BMM), Cameroon Volcanic Line (CVL): constraints from Tephrostratigraphy and Fluid Inclusions analysis. *Poster presentation for Graduate School meeting, 15th December 2012, Tokai University, Hiratsuka, Japan.*

Asobo N.E. Asaah, Tetsuya Yokoyama, Festus T. Aka, Tomohiro Usui, Mengnjo J. Wirmvem, **Boris Chako Tchamabe**, Takeshi Ohba, Gregory Tanyileke, and J.V. Hell (2013) Geochemical characterization of lavas from the Oku Volcanic Group, Cameroon Volcanic Line, West Africa. *Abstract submitted to the JpGU International Symposium 2013, May 19th-24th, Makuhari Messe, Chiba, Japan*

Issa, Ohba Takeshi, Fantong Wilson, Fouepe Alain, **Chako Tchamabe Boris**, Yoshida Yutaka, Kusakabe Minoru, Sigha Nkamdjou, Tsunogai Urumu, Oginuma Yu, Tanyileke Gregory, Satake Hiroshi and Hell, J., V. (2013) Contribution of Methane to Total Gas Pressure in Deep Waters at lakes Nyos and Monoun (*Cameroon, West Africa*) *Accepted for publication in Geochemical Journal.*

Issa, Ohba T., Fantong W., Yoshida Y., Fouepe A., Kusakabe M., **Chako T. B.**, Sighomnoun D., Sigha Nkamdjou, Akira U., Tanyileke G., Hell J. V. and ²Ntonga J. C. (2013) Variability and control mechanisms of Water isotopes ($\delta^{18}\text{O}$ and δD) in some lakes along the Cameroon Volcanic Line (CVL) Cameroon (West-Africa) *Abstract submitted to the IAVCEI General Assembly 2013, 20-24th July, Kagoshima, Japan.*

Issa, Ohba T., Aka F. T., Fantong W., Yoshida Y., Kusakabe M., **Chako T. B.**, Sighomnoun D., Sigha Nkamdjou, Tanyileke G., Hell J. V., Nnange, J. M. (2013) Diffuse CO_2 emission from crater lakes located on the Cameroon Volcanic Line (CVL): A contribution to global carbon cycle budget and assessment of CO_2 -related hazard in Cameroon. *Abstract submitted to the IAVCEI-CVL workshop 2013, 24 to 31 July, Kagoshima, Japan.*