Journal of Volcanology and Geothermal Research, 42 (1990): 397–400
Elsevier Science Publishers B.V., Amsterdam—Printed in The Netherlands

Letter

Lake Bambuluwé (Cameroon): building-up the same scenario as Lake Nyos?

M. POURCHET[a,b], J.F. PINGLOT[a], J. MALEY[b], M.A. MÉLIÈRES[c] and A. ZOGNING[d]

[a]*Laboratoire de Glaciologie et Géophysique de l'Environnement, CNRS, Grenoble, France*
[b]*Laboratoire de Palynologie, ORSTOM, UR-A3, USTL Montpellier, France*
[c]*Laboratoire de Spectrométrie Physique, USTMG Grenoble, France*
[d]*Centre géographique national, MESIRES, Yaoundé, (Cameroon)*

(Received and accepted April 23, 1990)

Sir,

A great number of lakes from Cameroon are crater-lakes. In the recent past, some of them suddenly emitted great quantities of gas, mostly CO_2:

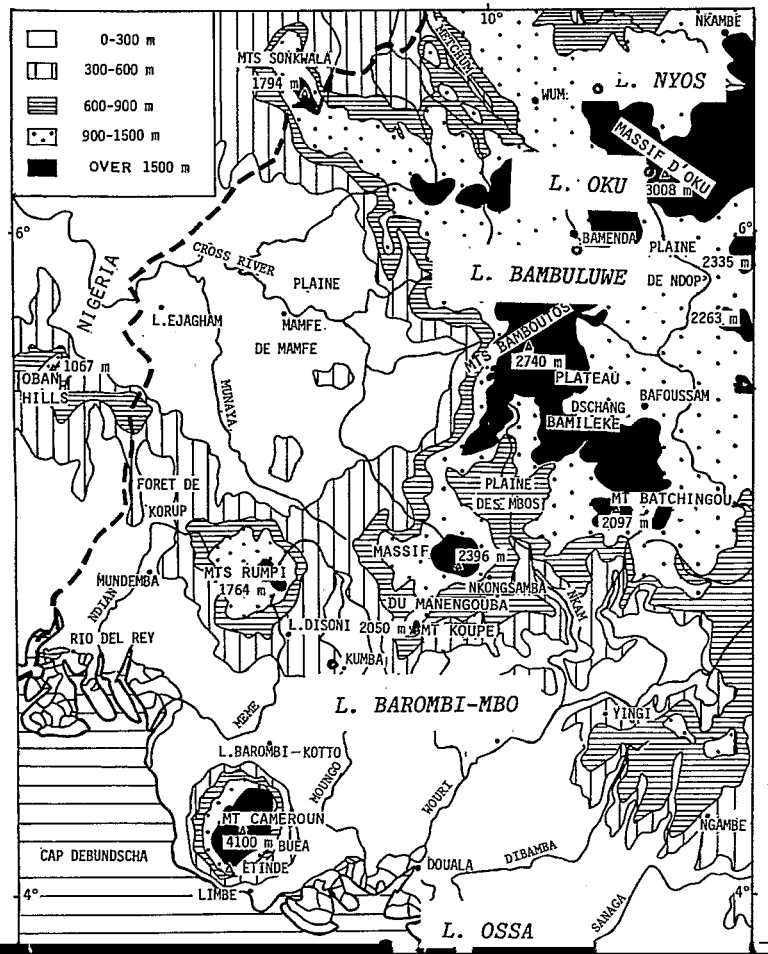
– On the 15th August 1984, 37 humans were killed by the Lake Monoun gas burst,

– On the 21st August 1986, the same phenomena appeared at Lake Nyos, killing about 1700 people.

Local trades and legends let us to think that many other lakes of this part of Africa showed [redacted] of Fe^{2+} leads to the red colouring.

In February 1987, as part of a Cameroon paleoclimatic and paleoenvironmental program (Maley et al., 1990), we sampled sediment cores from the bottom of 5 lakes, respectively from South to North: Ossa, Barombi-Mbo, Bambuluwé, Oku and Nyos (Fig. 1).

The measurement of the ^{210}Pb profile along each core allows the determination of the sedimentation rate (about one century period) for three of these lakes. Concerning Lake Nyos, the observed anomalies in the natural and artificial radio-isotope profiles of the cores [redacted]



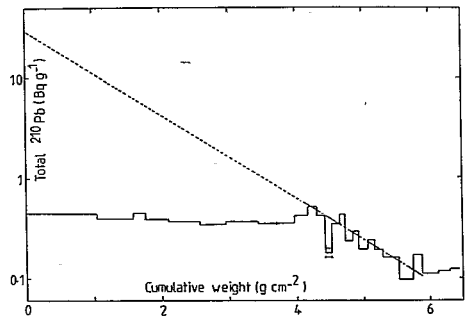


Fig. 2. Total ^{210}Pb in Bambuluwé lake sediments versus depth (expressed in cumulative weight of dry sediment).

lived parents present in the sediment (^{238}U family). The activity of this fraction is respectively 53 and 96 Bq kg^{-1} for Nyos and Ossa lake sediments.

Between those 2 constant levels (4.7 and 5.5 g cm^{-2}) the decrease shows a regular pattern in the same way as a normal decrease of ^{210}Pb activity. A preliminary interpretation of the whole set of ^{210}Pb measurements of this lake could let us think that we are faced with a simple profile, but with an uppermost part which had been previously and erronnously mixed during drilling or sampling. However, this interpretation is unlikely. In fact, the extrapolation up to the origin depth surface of the decreasing part of the curve (between 4.7 and 5.5 g cm^{-2}), supposed not to be mixed, leads to a surface activity of about 3000 Bq kg^{-1}. 5 its removal from the bottom leads to the conclusion that the bubble pattern at the precise sample time may be responsible of the mixing, but for only 2.0 g cm^{-2} or less. The mixing of the sediment between 2.0 and 4.7 g cm^{-2} corresponds to former degassing. Two other locations of this same lake were sampled in 1985: the two small cores were free of gas bubbles (Maley et al., 1990). Did the gas accumulated in the sediment between those two dates (1985 and 1987)? It is not presently possible to confirm this because in different locations of one lake (Barombi-Mbo) areas with gas-bubbles have been observed at different depths.

Concerning Lake Bambuluwé, all our ^{210}Pb determinations have been conducted by alpha spectrometry of ^{210}Po making use of Hasanen method (1977). We clearly indicated elsewhere (Piboule et al., 1990) the limits of this method which makes the hypothesis of radioactive equilibrium between ^{210}Pb and ^{210}Po and which fails to give an indication of the relative contributions of the different members of the ^{238}U family.

In spite of these extra comments in sampling measurements strategies, it clearly appears possible that Lake Bambuluwé follows the same pattern as Lake Nyos, that is an increase of radon flux through the lake sediments. Will this flux, as in Nyos, lead to a large CO_2 release? Our presently available measurements do not allow us to confirm this absolutely. It should be very valuable to complete these first determinations and to verify by a new

Quaternary lacustrine deposits from Barombi Mbo (West Cameroon): preliminary results. In: F. Le Guern and G.E. Sigvaldason (Editors), The Lake Nyos Event and Natural CO_2 Degassing, II. J. Volcanol. Geotherm. Res., 42: 319–335.

Piboule, M., Pourchet, M., Bouchez, R., Amosse, J., Brenac, P., Maley, J., Pinglot, J.F. and Vincent, C., 1990. Radiometric studies of Lake Nyos (Cameroon) sediments: evidence of strong mixing and excess ^{210}Pb. In: F. Le Guern and G.E. Sigvaldason (Editors), The Lake Nyos Event and Natural CO_2 Degassing, II. J. Volcanol. Geotherm. Res., 42: 363–372.

Pourchet, M., Pinglot, J.F., Maley, J. and Mélières, M.A., 1988. Another gas burst in a Cameroon lake? Nature, 3334: 655.

Shanklin, E., 1989. Exploding lakes and maleficent water in Grassfields legends and myth. In: F. Le Guern and G.E. Sigvaldason (Editors), The Lake Nyos Event and Natural CO_2 Degassing, I. J. Volcanol. Geotherm. Res., 39: 233–246.

Sigurdsson, H., Devine, J.D., Tchoua, F.M., Presser, T.S., Pringle, M.K.W. and Evans, W.C., 1987. Origin of the lethal gas burst from lake Monoun, Cameroon. J. Volcanol. Geotherm. Res., 31: 1–6.

Journal of Volcanology and Geothermal Research, 42 (1990) 401
Elsevier science Publishers B.V., Amsterdam—Printed in the Netherlands

Letter

Dear Sir,

Thanks to a scientific correspondence (Nature, Vol. 334, 25 August 1988), we have been able to rapidly inform the scientific community about our radiochemical measurements conducted on sediment samples from Lake Bambuluwe.

In a letter to the Journal of Volcanology and Geothermal Research (this issue) we gave all details about these measurements. In both correspondences, we pointed out, with great care, the excess of ^{210}Pb in the sediments of this lake, and the analogy with the measurements of Lake Nyos sediments, already published (J. Volcanol. Geotherm. Res., 42: 397–400).

In order to explain the Nyos accident, the scientific community proposed two hypotheses: a limnological and a volcanological one.

In his letter to the editor, Dr S.J. Freeth prevails the former hypothesis. In that case, the potential risks of Lake Bambuluwe are small. But if the volcanological hypothesis is true, the risks may be quite different: in that case, the quantity of CO_2 possibly released in the atmosphere does not depend only on the volume of the lake water. Concerning our team, we are not able to say what hypothesis is right. However, the radiochemical measurements give rise to some answers or reflexions which must be taken into account by the different scientific communities.

In February 1989, thanks to a contract with the Ministry of Environment (Délégation aux Risques Majeurs), the ORSTOM and the Cameroon authorities we conducted a second campaign of sediment sampling of a large number of Cameroon lakes, including Lake Bambuluwe.

The radiochemical measurements are actually in progress and the results will be submitted for publication, when completed. However, the first results presently available demonstrate:

(1) The ^{210}Pb anomaly, already determined in the previous 1987 sediment core, is confirmed two years later.

(2) This anomaly did not evolve since that time: it still concerns the 15 first centimeters of sediment.

(3) We are in presence of unsupported ^{210}Pb (by long-lived parents from the ^{238}U family), much like in Nyos sediments.

(4) During field work, we were able to check that the origin of the excess ^{210}Pb cannot "correspond to the recently built access road around the lake" as suggested by Dr G.W. Kling (Nature, Vol. 337, 19 january 1989). Anyway, the materials removed from the road construction had no access to the lake.

(5) The sediment cores sampled in 1989 showed small gas concentrations, mainly methane.

These first indications may suggest that at the precise time of the Lake Nyos accident, a stronger volcanic activity prevailed in the area and induced an excess of radon.

M. POURCHET, J.F. PINGLOT, J. MALEY, M.A. MÉLIÈRES, A. ZOGNING

0377-0273/90/$03.50