

「論文の内容の要旨」

論文題目 「Volcano-stratigraphy and geochemistry of tephra deposits and its relevance for understanding the polygenetic inheritance and plumbing systems to maar-diatreme volcanoes: Clues for hazards prospective, A case study for the Barombi Mbo Maar, Cameroon, central Africa」

(テフラ堆積物の火山層序と地球化学に基づくマール・ダイアトリム火山の複成噴火特性とマグマ供給系への理解：災害予測の鍵，中央アフリカ，カメルーン共和国，バロンビンボマールにおける事例研究)

学位申請者 Chako Tchamabe Boris

キーワード：カメルーン，マール，バロンビンボ，火山噴火，マグマ，防災

Cameroon, Maar, Barombi Mbo, Volcanic eruption, magma, Hazard mitigation

Maar-diatremes are essentially phreatomagmatic-derived volcanoes. During the recent years, from various investigations on typical monogenetic maar-diatremes, the numerous processes and mechanism governing their formation have been revealed. Still, challenges remain in understanding their shallow plumbing system, their magmatic feeding system, their monogenetic/polygenetic nature, and even their resultant hazards. Polygenetic maar-diatremes have been identified at some volcanic fields around the world. However, rarely, detailed investigations have been made to reconstruct the mechanism of formation

and propose an aperçu on the shallow plumbing system of such volcanoes, where possible reactivation of eruptions provides implications for volcanic hazards assessment. Based on detailed tephrostratigraphy, grain size, componentry, ash morphoscopic and geochemical analyses of tephra deposits, the present study attempts to shed light on the polygenetic inheritance of maar-diatreme volcanoes.

The study was conducted at the Barombi Mbo Maar, located in the Kumba Volcanic Field, Cameroon Volcanic Line. Here, for the first time, the detailed volcano-stratigraphy, detailed geochemistry, and evolution of eruptions in relation to the diatreme growth during the formation of this ca. 2.5 km-large maar crater is described.

From the tephrostratigraphic examination, the maar's pyroclastic deposits, which is about 126 m-thick, was sub-divided into three stratigraphic units U_1 , U_2 and U_3 , separated each other by paleosoil beds. Alike other maars, the eruption styles were dominated by series of phreatomagmatic explosions, however, with intermittent strombolian and phreato-strombolian eruptive phases.

By coupling information from age dating and the presence of the paleosoils in the deposits, it was inferred that the maar formed through three eruptive episodes, demonstrating its polycyclic nature. The first eruptive episode occurred about 0.51 Ma B.P., the second about 0.22 Ma and the most recent there are almost 0.08 Ma.

Based on the juvenile and non-juvenile componentry analysis, a complex subsurface eruptive process, which originated within the uppermost part of the diatreme of the BMM, was revealed. It resulted that each eruptive

episode developed a small diatreme and produced a small-volume of tephra to construct the ejecta ring. A minimum bulk tephra volume of $\sim 0.226 \text{ km}^3$ corresponding to $\sim 0.070851 \text{ km}^3$ Dense Rock Equivalent were therefore estimated. Also, from the distribution of juveniles in the deposits, it resulted that the cratering and excavations during the growth of each of the small diatremes developed mainly from shallow-seated explosions, sometimes with lateral and vertical variations in the explosion loci, similarly to the model recently proposed by Valentine and White for maars-diatreme growth. A lateral variation in the eruptive vents was also depicted and might explain the large crater of the BMM.

From the geochemical characterisation, all erupted materials are mainly basalts. They present a similar HIMU-type Ocean Island Basalt (OIB) signature and originated all from a garnet mantle source. However, difference in Zr, Th, Ta, Lu and Nb contents suggested that they derived from different degrees of partial melting, suggesting the possibility of heterogeneous mantle beneath the BMM. The result also indicated that each eruptive episode involved a new feeder dyke, implying, in addition to the component examination, that the plumbing system beneath the BMM might consists of three amalgamated diatremes with three distinct feeder dykes.

For a hazard prospective, the polymagmatic evolution of the BMM suggests that it might erupt again in the future. The observed lateral variation of the past eruptive vents make it difficult to identify where the future eruption could take place, implying further investigations and hazards studies around the BMM.

Finally, although this investigation is likely a first attempt and concentrated on a single polygenetic maar, the approach is interesting, simple and can be applied to other maars to have an apercu on their shallow plumbing.