Chapter

The Caldera of Mount Bambouto: Volcanological Characterization and Classification

Ghislain Zangmo Tefogoum, David Guimolaire Nkouathio, Armand Kagou Dongmo and Merlin Gountié Dedzo

Abstract

Mount Bambouto culminates at 2744 m (Meletan Mountain) where an elliptical caldera of 16 × 8 km is found. Although that caldera has been a subject of numerous scientific works, complementary studies were needed to bring out additional data used to classify it through the Caldera DataBase of Geyer and Marti (2008). It emerges that Bambouto Caldera codes are 2 and 203 because it is respectively located in Africa and Central Africa according to the numbering system developed in the Catalog of Active Volcanoes of the World. The collapse type of the caldera is piecemeal; this relies on the fact that the caldera floor is uneven. Several rocks crop out in the caldera; accordingly, its code is B, I, T, P, and Ig viz. basalts, intermediate rocks, trachytes, phonolites, and ignimbrites. Bambouto depression is the ignimbrite caldera because it is associated with thick ignimbrite sheer, that ruled its collapse. The chemical analysis of rocks reveals that the magmatic series of Bambouto Caldera is of alkaline type. It has been built through the continental rifting of extensional type (RC-EXT). The collapse process has been followed by post-caldera protrusion of trachytic and phonolitic domes; then, its codes are Type-S and type-MS.

Keywords: caldera, continental rifting, basalts, trachytes, phonolites, ignimbrites, Cameroon

1. Introduction and geological context

Internal geodynamics is manifested on the Earth's surface by volcanic phenomena. Most of these phenomena are controlled by volcanoes located in the tectonically and structurally weak areas of the globe, notably accretion zones, convergence zones, and intra-plate zones. Some of these volcanoes are characterized by a simple crater, while others have one or more complex craters (distinguished by the collapse events). These complex craters are defined by one or more calderas [1–4]. The term caldera derives from the depression called Taburiente (Canary Islands) and has been firstly used by [5]. The Caldera de Taburiente in fact, is the frequently quoted example of erosion caldera. Erosion calderas are volcanic depression erosionally formed on the summit or on the flanks of the volcano, which may be several kilometers in diameter [6–8]. However, geologically, calderas are volcanic depressions resulting from the collapse of the roof of the magma chamber due to the rapid retreat of the magma during an eruption [9, 10]. They can be elliptical, sub-circular or circular in map view. These shapes are induced by the shape of the underlying magma reservoir [11, 12]. In Refs. [9, 13], five types of collapse such as *piston, piecemeal, trapdoor, downsag,* and *funnel* have been defined to ease the comprehension of the caldera formation processes.

Nevertheless, insufficient work on the dynamics of caldera emplacement limits the understanding of the functioning and evolution of volcanic massifs worldwide. Some calderas deserve to be characterized according to the models of [9] and [13] in order to classify them according to the Collapse Caldera DataBase established by [14]. The Collapse Caldera DataBase makes it possible to better study the caldera formation processes and to classify them. The study of calderas for decades has been of paramount importance for the development of science; it allows us to understand the functioning of volcanic apparatus around the world and the environmental impact that can result from them. Since calderas constitute a natural heritage for the economic development of several countries and a laboratory for education and research [15–17], their classification will heighten their promotion and valorization.

Mount Bambouto, which was once a very active volcano, was truncated at their summit by a caldera like some volcanoes along the Cameroon Volcanic Line (**Figure 1**). It caldera was chosen for the present study because Mount Bambouto have been the subject of numerous studies focusing mainly on petrography, geochemistry, geochronology, geo-heritage, hazards and associated risks [18–29]. With the exception of [20, 21, 29], the studies on the caldera of Mount Bambouto are generally carried out in the specific areas [22, 30, 31]. Mount Bambouto is the third largest volcano (in volume) in the Cameroon Volcanic Line after Mount Cameroon and Mount Manengouba. It is located in the NE extension of Mount Manengouba from which it is separated by the Mbô plain. It is almost continuously contiguous to the NE with Mount Bamenda and covers an area of about 800 km^2. It is located between longitudes 09°55′ and 10°15′E and latitudes 05°25′ and 05°50′N. They straddle the Departments of Bamboutos in the East, Menoua in the South, Lebialem in the West and Mezam in the NW and, culminate at 2744 m at Meletan Mountain where they dominate the West Cameroon Highlands. Mount Bambouto is a huge shield volcano with a general SW-NE orientation [18]. This massif is characterized by the asymmetry of its slopes [32]. Its summit caldera is located between longitudes 09°57′ and 10°07′E and latitudes 05°37′ and 05°44′N. The Caldera of the Mount Bambouto has an elliptical map view (16 × 8 km) that opens in a horseshoe shape toward the west (**Figure 2**). Throughout the caldera, rocks (basalts, hawaiites, mugearites, phonolites, trachytes, and ignimbrites) are found in different forms: flows, domes, peaks, teeth and needles that characterize the interior, the external slopes and the floor of the caldera. Thus, the inside of the caldera is marked by a sinuous "s" line punctuated by trachytic and phonolitic peaks, necks, and domes [18, 20, 29]. Moreover, the crystalline basement made up of granite, is observed on the western side of the volcano [21, 22, 29]. The floor of the caldera has a structure of stairs decreasing from the east to the west of the massif. The caldera rims are sub-vertical to vertical. In addition, several steep valleys (in "v" shape) accidentally affect the topography of the whole caldera (about 78% of the slopes are susceptible to mass movements) [29].

Despite these previous studies, the dynamics of the establishment of the caldera of the Mount Bambouto remains poorly understood. Moreover, that caldera is not yet classified in the Caldera DataBase established by [10]. However, some data do exist on this caldera. These data need to be completed and this will allow us to characterize that caldera according to the model of [9]. This characterization will make it possible to obtain and organize the data in order to classify the caldera of the Mount Bambouto in the Caldera Database of [14]. This work is essential for

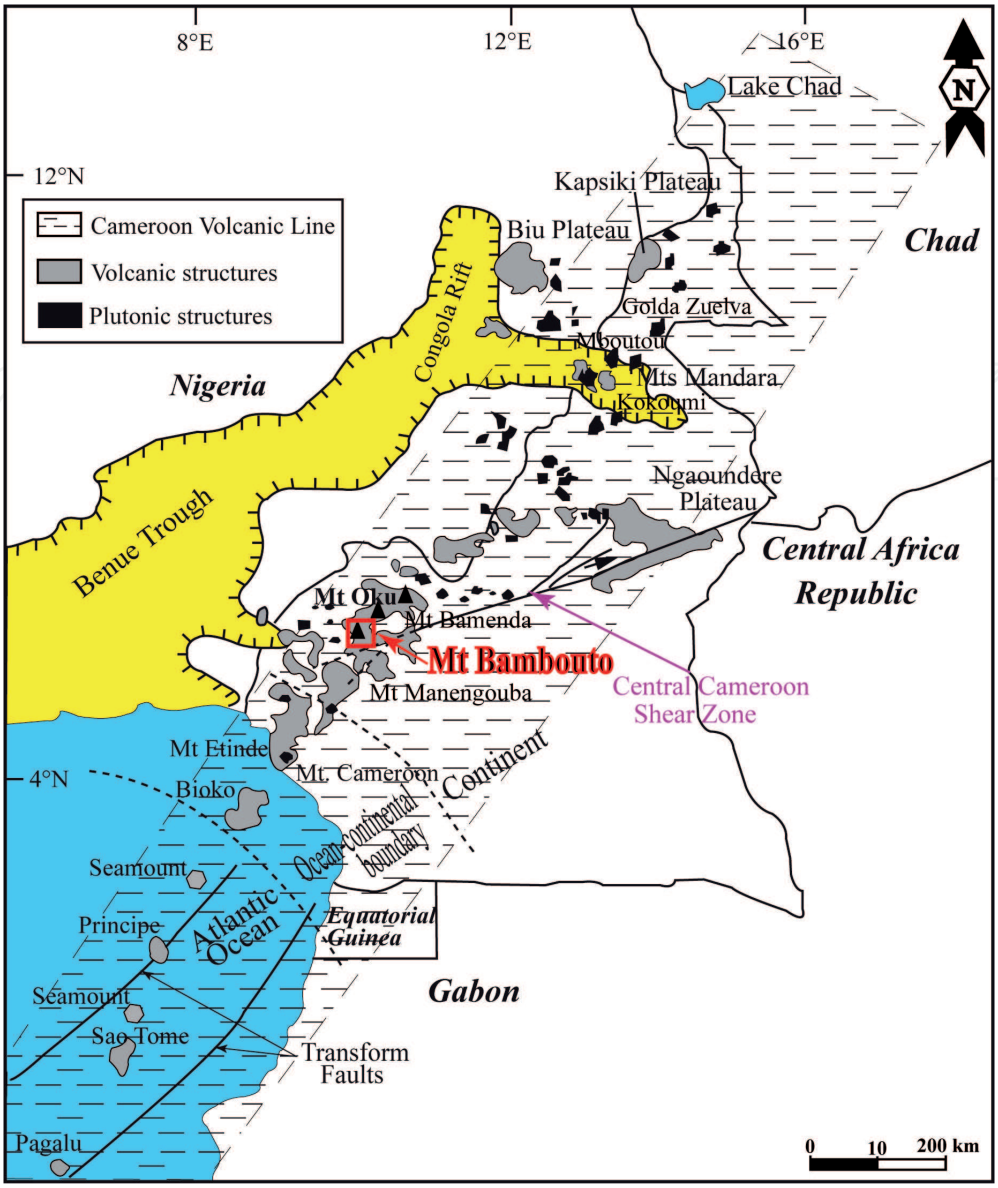

Figure 1.
The Cameroon volcanic line.

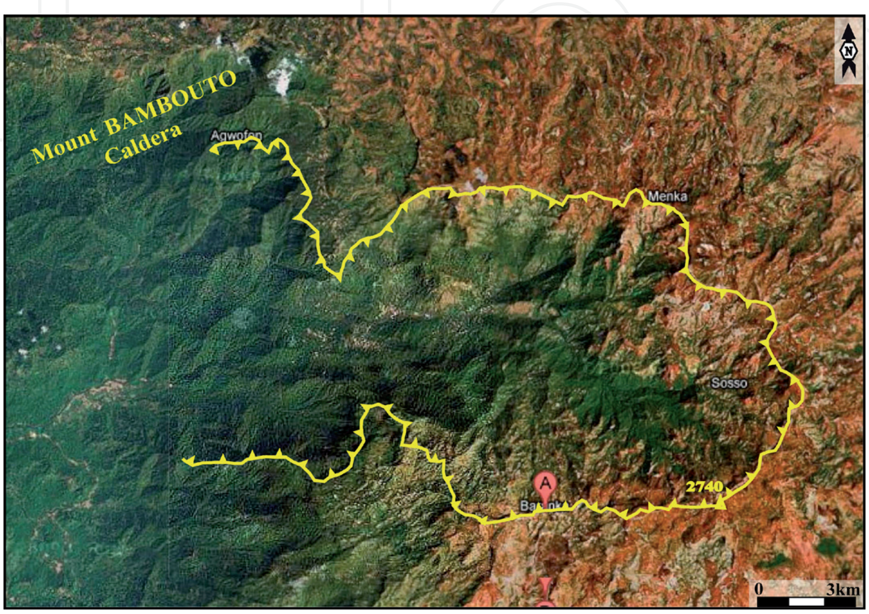

Figure 2.
Satellite image of the Mount Bambouto caldera.

understanding the functioning and evolution of the Mount Bambouto and, consequently, the dynamics of the Cameroon Volcanic Line, which remains a subject of discussion by many researchers nowadays.

2. Method of study

2.1 The volcanological study

2.1.1 The petrographic study

Several field trips were made. They made it possible to describe rock outcrops, take rock samples and take the coordinates of the various samples. These samples were then described and labeled. In the laboratory, the coordinates of the various rock sampling points were plotted on the topographic map of the study area. Through these different points and the macroscopic description of the samples, a geological map is produced [33]. In order to complete the macroscopic study of the rocks, thin sections of samples were taken at the University of Orleans and the University of Paris-Sud (Orsay Campus) in France. These thin sections were studied with the polarizing microscope of the Laboratory of Environmental Geology of the University of Dschang and at the Laboratory of Life and Earth Sciences of the University of Maroua. Some samples were analyzed with microprobe also at the University of Orleans and the University Paris-Sud (Orsay Campus) and in Nancy for the nomenclature of rock minerals and the determination of the nature of rocks. These microscopic and chemical studies have made it possible to refine the geological map of the caldera of the Mount Bambouto [33]. In addition, some complementary geochemical analyses were made to determine the chemical nature of different lavas.

2.1.2 The volcanological evolution of the caldera of the mount Bambouto

For the volcanological evolution of the caldera of the Mount Bambouto we have:

- carried out a cartographic study through the analysis of satellite images, about 70 aerial photos, digital elevation models, and topographic maps. This study allowed us to determine the exact boundaries and structure of the caldera.

- The geochronological data available in the literature made it possible to produce through DTM, the different stages of caldera formation according to the model of [9].

2.2 The classification of calderas

For the classification of the Caldera of the Mount Bambouto, we used the Caldera DataBase from [14]. To do so, we used the data obtained through volcanological studies and those existing in the literature.

3. Results

3.1 Field observations

In the Caldera of the Mount Bambouto the flows, mostly trachytic, have extensions ranging from 150 to 250 m; with an average height of between 10 and 30 m.

They are generally roughly and irregularly priced and are observable at the level of the caldera ramparts, on certain escarpments, road embankments and riverbeds. On the other hand, mafic lava flows are poorly represented in the caldera and have extensions of just a few meters. The domes are generally circular to sub-circular in shape with a base slightly above the top. They are dominated by coarse prisms and sometimes numerous diaclases which favor the sporadic detachment of polygonal blocks generally observable at their base. Felsic and mafic flows are also observable in polygonal blocks accumulated near caldera ramparts and on stream beds (**Figure 3**). The lava texture is mostly microlitic porphyritic except for ignimbrites, which have a vitroclastic texture.

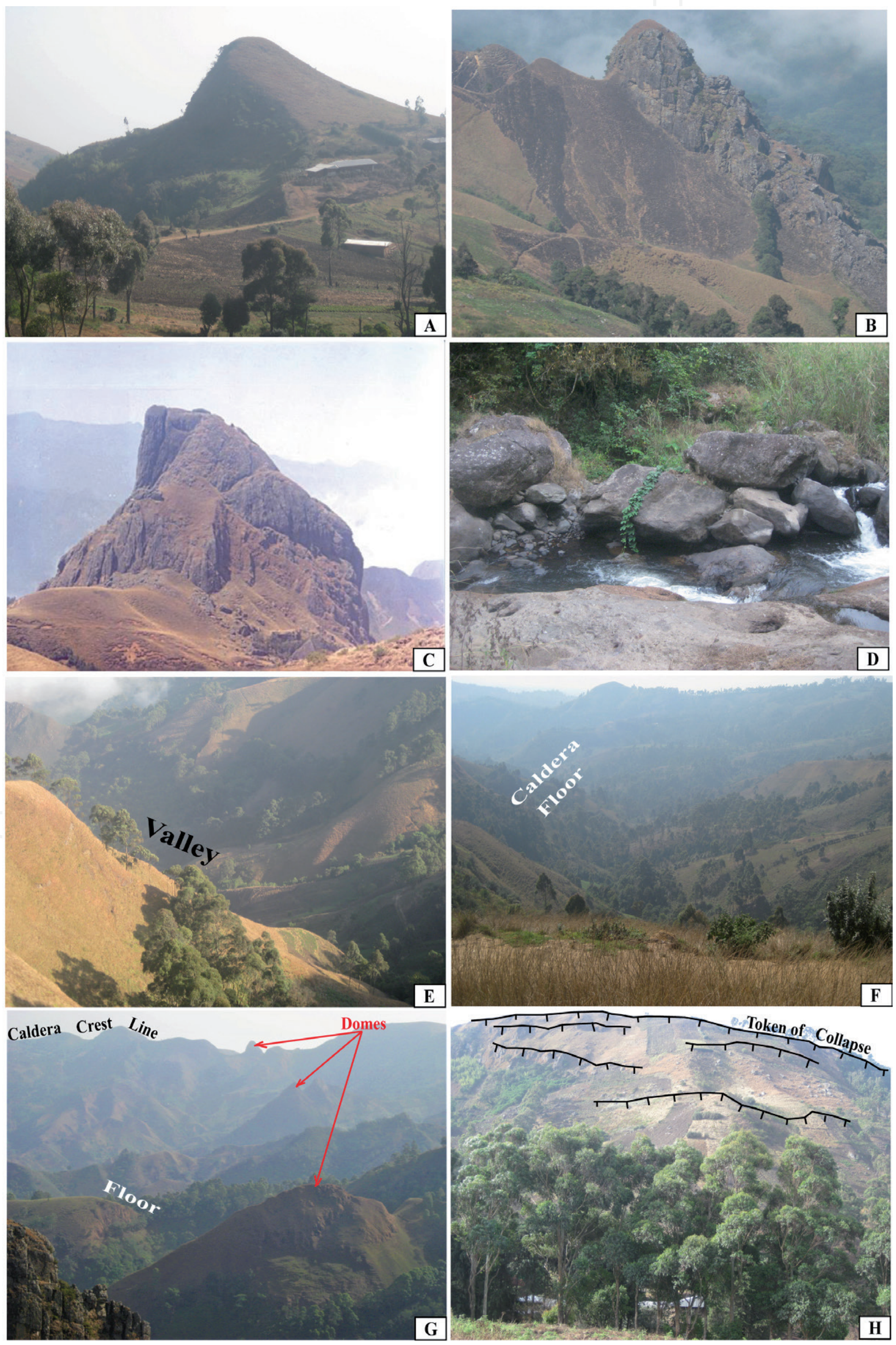

Figure 3.
Some geological features of the Mount Bambouto caldera: (A–C)—post-caldera protrusions. (D)—erratic boulders; (E–G)—caldera's floor structure; and (H)—caldera rim.

Basalts, hawaiites and trachytes all have a grayish alteration patina and are less than 3 mm thick. However, this patina has, in some places, crystals of automorphic alkaline feldspar of 4 mm or less in size. Ignimbrites have a strong patina of less than 3 mm thick and are gray to brown.

3.2 Microscopic petrography

Basalts (**Figures 4** and **5**) are characterized by a porphyritic microlitic texture in which pyroxene phenocrystals (10–25% of the rock), plagioclase (1–3% of the rock), olivine (2–7% of the rock) and opaque oxides (<3% of the rock) are embedded in a microlitic mesostase.

Hawaiites (**Figure 4**) are also characterized by a porphyritic microlitic texture in which pyroxene phenocrystals (2–5% of the rock), plagioclase (3–10% of the rock), olivine (15–35% of the rock) and opaque oxides (5–7% of the rock) are embedded in a microlitic mesostase.

Mugearites (**Figure 5**) are dominated by a subporphyritic microlitic texture materialized by amphibole (kaersutite), apatite and oxide phenocrystals. These phenocrystals constitute less than 10% of the rock. These rocks are kaersutite mugaearites.

Generally speaking, the *trachytes* (**Figure 4**) of the Mount Bambouto Caldera have a subporphyritic microlitic texture rich in phenocrystals of alkaline feldspar

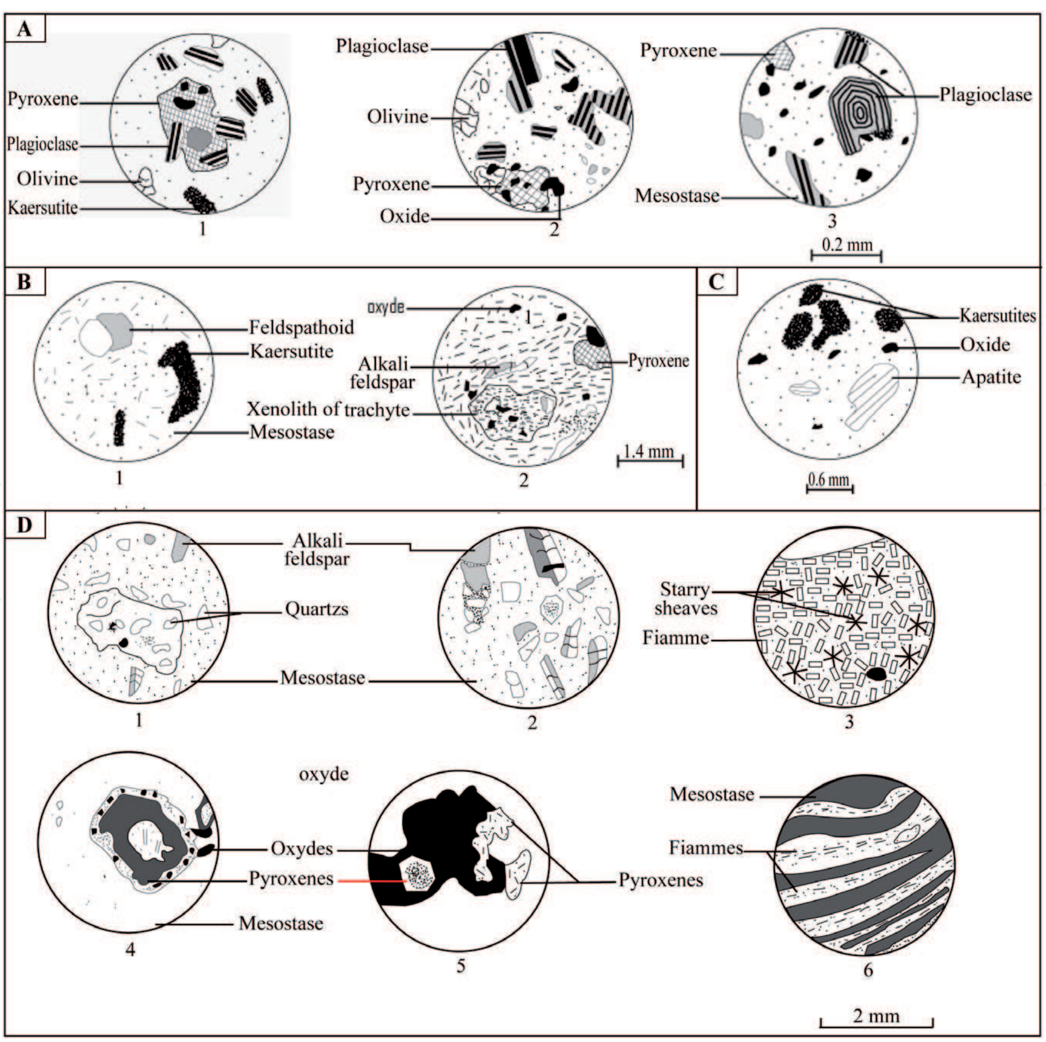

Figure 4.
Drawings of some thin sections of rocks in the Mount Bambouto caldera: (A)—basalts; (B)—phonolites; (C)—kaersutite-mugearite; and (D)—ignimbrites.

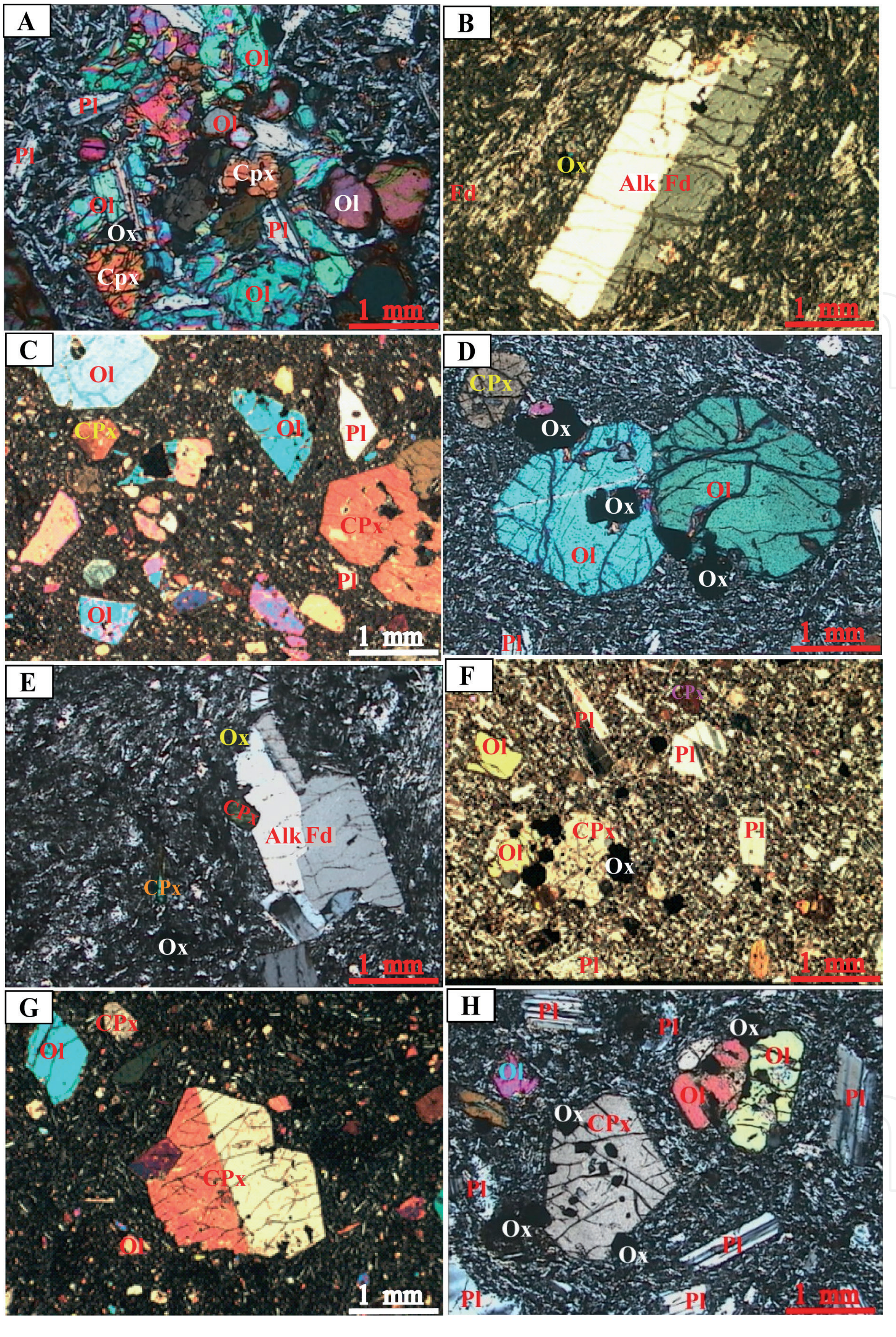

Figure 5.
Photographs of thin sections of rocks in the Mount Bambouto caldera: (A, D, and H)—hawaiites; (B)—phonolites; (C, F, and G)—Basalts; (E)—trachytes.

(30% of the rock), plagioclase, pyroxene (<4% of the rock), amphibole (<1% of the rock), oxide (5% of the rock) and apatite.

Phonolites (**Figures 4** and **5**) show a light brown alteration patina of almost 3 mm thick. The fresh, greenish gray to greenish gray sample shows large crystals of alkaline feldspar (30% of the rock); 0.5 to 5 mm in size and some pyroxene granules. Microscopically, the rock has a subaphyric to porphyritic microlitic texture containing phenocrystals and microcrystals of alkali feldspars, pyroxene, feldspathoid, amphiboles and oxides.

Ignimbrites (**Figures 4** and **5**) have a vitroclastic texture dominated by a facies-dominated matrix and whole or broken sections of alkali feldspar, quartz, pyroxene, and rock enclaves (trachytes and basement) in the form of rounded balls or subangular fragments.

3.3 Nomenclatures of some rock minerals

3.3.1 Olivines

In the caldera of the Mount Bambouto, olivine is present in the basalts with an average size of 0.5 × 3 mm. It is automorphic to subautomorphic. Their section is traversed by numerous cracks along which one notes the beginning of iddingsitization and serpentinization. Some sections have a core and borders corroded by mesostase. The olivine in the caldera of the Mount Bambouto is globally magnesian with forsterite contents between Fo57 and Fo75 (**Figure 6**).

3.3.2 Oxides

The lava oxides in the study area are represented by titanomagnetite and ilmenite (**Figure 7**). These two minerals coexist in some lava, notably dolerite mugaearites. They are sometimes automorphic with various shapes (square, rectangular and rod-shaped), with sizes ranging from 0.2 to 1 mm. They occur as phenocrystals and microcrystals either embedded in minerals such as olivine, clinopyroxene and feldspars; or embedded in mesostase. Furthermore, titanomagnetite appears as the most abundant oxide in basalts, mugaearites and trachyes.

3.3.3 Apatite

Apatite is observed in almost all the lavas of the caldera of the Mount Bambouto. It occurs as elongated crystals, xenomorphic to sub-automorphic and sometimes with transverse breaks in the intermediate lavas. Their size is between 0.2 and 0.8 mm and is observable as inclusions in olivine, oxides, and alkaline feldspars.

3.3.4 Clinopyroxenes

In the caldera of Mount Bambouto, clinopyroxenes in lavas are found in most sub-automorphic to automorphic crystal rocks with an average size of 0.5 × 1 mm. They show two directions of cleavage in some sections. They show gulfs of corrosion

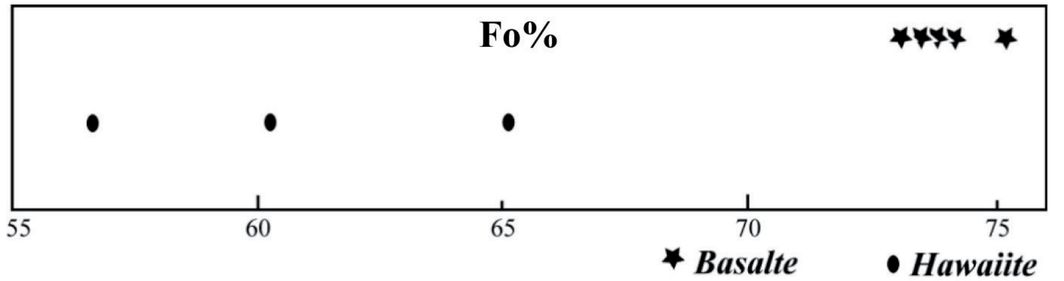

Figure 6.
Evolution of the forsterite content in lavas in the Mount Bambouto caldera.

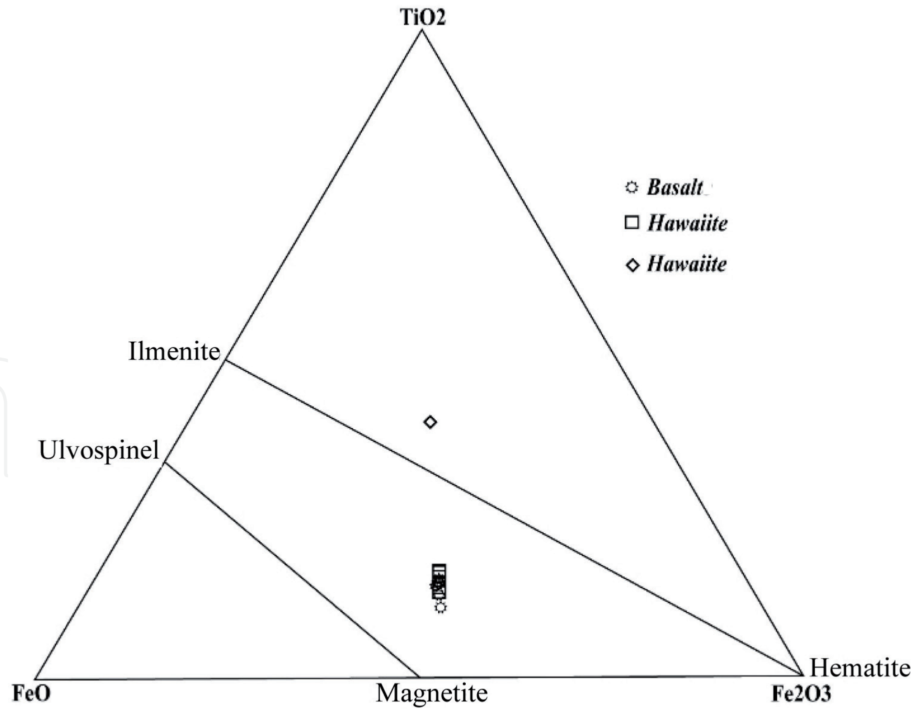

Figure 7.
Position of oxides of lavas of the Mount Bambouto caldera in the FeO-TiO$_2$-Fe$_2$O$_3$ diagram.

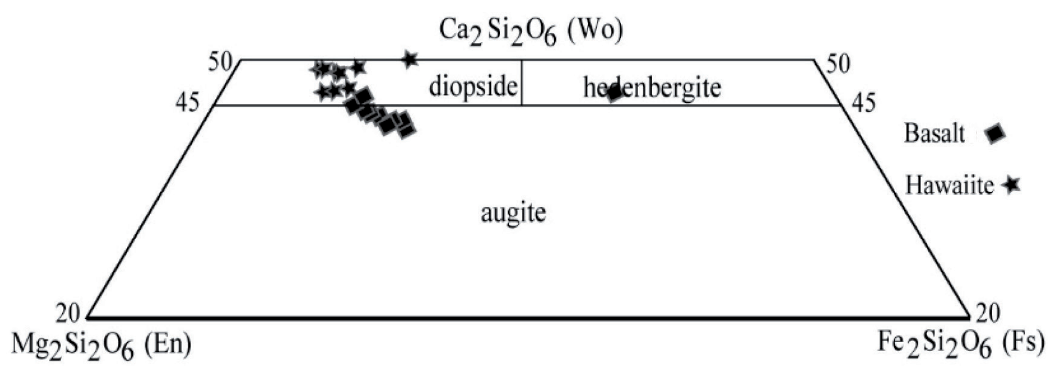

Figure 8.
Classification of clinopyroxènes of lavas of the mount Bambouto caldera in the en-Wo-Fs diagram.

in some sections. They are cracked in the trachytes and show a macle h^1 in the basalts. The classification of [34] has made it possible to identify three types of clinopyroxene in the lavas of the caldera of Mount Bambouto (**Figure 8**); diopside, augite and hedenbergite.

3.3.5 Feldspars

Feldspars are the minerals most represented in the lava of the caldera of the Mount Bambouto. Their edges are corroded in certain sections of the phonolites. However, they are sub-automorphic to automorphic, cracked and elongated depending on the flow. They are found in microlites and phenocrystals with sizes ranging from 0.1 × 0.3 to 0.5 × 0.8 mm for plagioclases and from 0.1 × 0.4 to 1 × 2 mm for alkaline feldspars. The latter have a Carlsbad twin, unlike plagioclases with a polysynthetic twin. The most frequent plagioclases (An30-60) in lava are andesine and labrador. In phonolites, the alkaline feldspars are anorthose (Or17 and Or37) and sanidine (Or37 and Or44) (**Figure 9**). However, anorthoses are in the

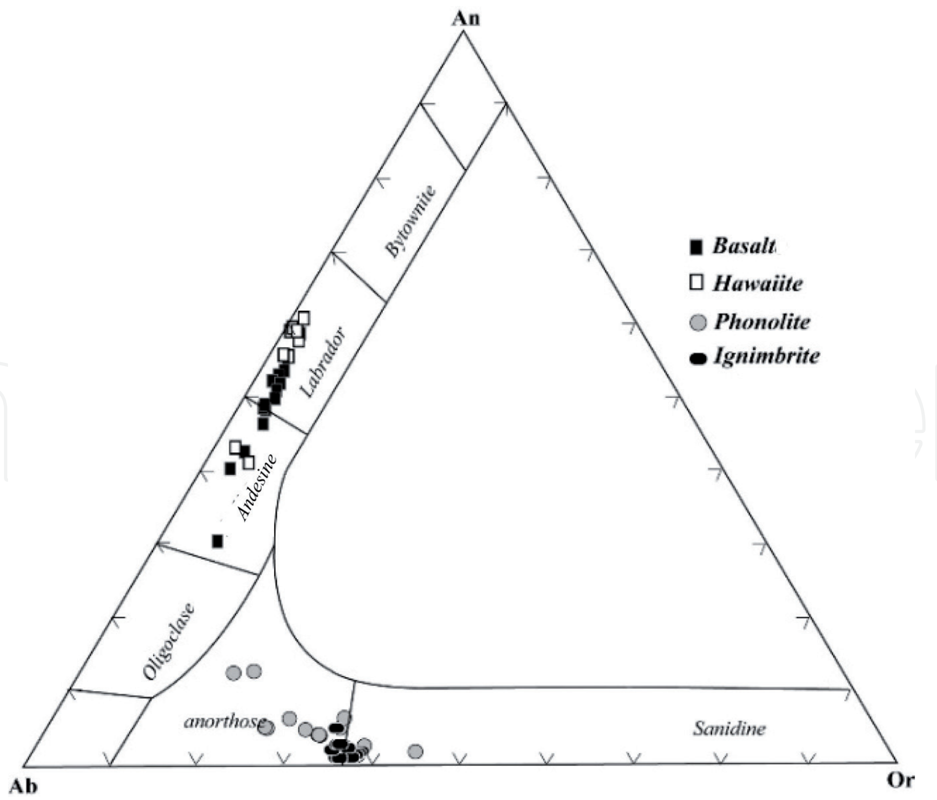

Figure 9.
Evolution of the anorthite content in lavas of the Mount Bambouto caldera.

majority. In ignimbrites, the composition of alkali feldspars is between Or33 and Or37 and are therefore exclusively anorthoses.

3.4 Classification of lava in the study areas

The lavas in the caldera of Mount Bambouto are alkaline in nature as shown in the following diagrams in **Figure 10**. The data used to make these diagrams have been supplemented by the data in [20, 22].

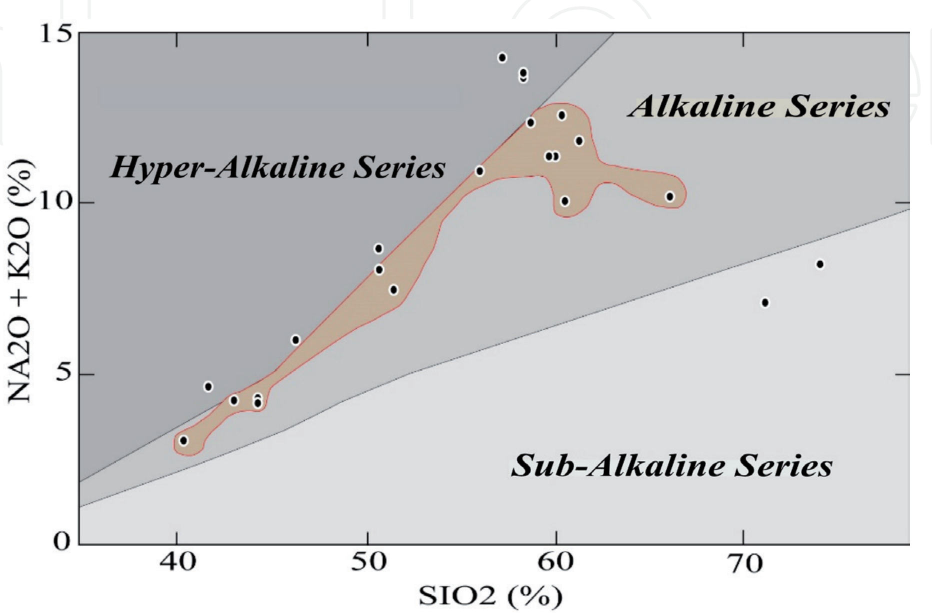

Figure 10.
Chemical nature of lavas in the Mount Bambouto caldera.

3.5 The volcanological evolution of the caldera of mount Bambouto

Mount Bambouto is a Hawaiian shield volcano [18]. Its history has been ruled by volcanic and tectonic events that led to the formation of a huge caldera on the Pan-African granitoid basement [35–37]. The Mount Bambouto Caldera formation (**Figure 11**) included three main stages [38] as follow:

The *Precaldera Stage* (Over 19 Ma) is characterized by the tumescence of the volcanic shield due to magma injection giving rise to several annular fissures observed in the whole volcano.

The *Syncaldera stage* (18–15.28 Ma) is materialized by two features: firstly, explosive eruptions are responsible for scoria, ignimbrites, trachytes and rhyolites; secondly, piecemeal intravolcanic collapse of the magmatic chamber roof is followed by the protrusion of trachytic domes and some basaltic supplies.

The *Postcaldera stage* (15–0.5 Ma) is typified by some trachytic and basaltic supplies and the protrusion of phonolitic domes. Activity ends with the explosive eruptions on the northeastern flank of the volcano where is built the multiple scoria cones.

3.6 Classification of calderas

3.6.1 Location

To assign the code of a given caldera, one must use the numbering system developed in the Catalog of Active Volcanoes of the World. In fact, the world is divided in 19 main regions that are subdivided, in turn, in several subregions. Hence, the study area is located in the African Region with the corresponding database code 2. In addition, these calderas are located in the Central African Sub-Region with the corresponding database code 203.

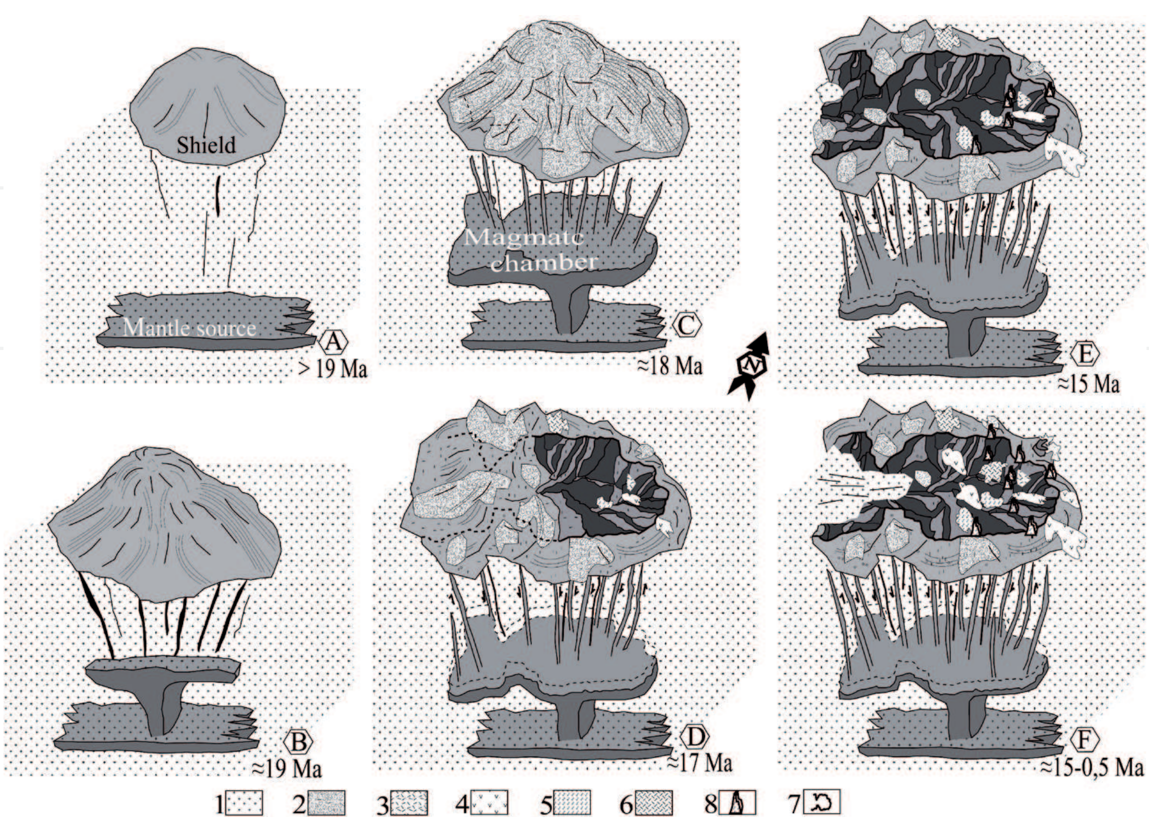

Figure 11.
Sketch highlighting the stages of the formation of the Mount Bambouto caldera.

3.6.2 Ramparts and type/geometry of collapse

In the caldera ramparts are almost vertical at some levels (**Figure 3**); but on the whole these ramparts seem to merge with the floor.

At the level of the Mount Bambouto, the floor of the caldera is very dissected and presents in places a stepped structure (**Figure 3**), which indicates a piecemeal collapse.

3.6.3 Petrographic types

Several petrographic types are observed in the study area. These petrographic types are dominated by basalts, intermediate rocks, trachytes, phonolites and ignimbrites. Thus, the caldera of the Mount Bambouto is assigned the code B, I, T, P and Ig.

3.6.4 Magmatic series

The study area is characterized by an alkaline magmatic series as they are dominated by mafic, intermediate, and felsic terms. They are assigned the codes ALKAf (Alkaline felsic), ALKAi (Alkaline intermediate) and ALKAm (Alkaline mafic).

3.6.5 Crust type and tectonic setting

Mount Bambouto rests on a granito-gneissic bedrock with a thickness (hc) of about 35.5 km [39]. According to the Database [14], these crustal thicknesses in the study areas are greater than the 30–35 km interval; hence the code is C.

From the internal geodynamic point of view, the Mount Bambouto Caldera is located in the Cameroon Volcanic Line which originates, according to some authors [40–43], from a Continental Rift; Its code is be RC. This nascent rift [44, 45], at the origin of the Cameroon Volcanic Line in general and of Mount Bambouto and its respective caldera system in particular, is of the extensional type and their code is EXT.

3.6.6 Pre-caldera volcanism

A Pre-caldera regional dome occurred through a tumescence that created numerous concentric faults. These fissures favored a pre-caldera magmatic activity that further contributed to the building of the Bambouto stratovolcano. Its code is therefore STR.

3.6.7 Caldera collapse period and post-caldera volcanic activity

The collapse of the Caldera of Mount Bambouto occurred at the beginning of the sequence of eruptions that contributed to their formation. Their code is A.

In the Mount Bambouto, this volcanic activity is dominated by the presence of several eruptive vents, notably on the ramparts, the eastern floor of the caldera and the NE slope of the volcano. Thus, the Mount Bambouto is classified as Type-S and Type-MS.

3.6.8 Preservation of the caldera

On the other hand, the ramparts of the Mount Bambouto Caldera are threatened by growing urbanization and agro-pastoral activity, particularly to the south and east of the caldera. Its boundaries are therefore slightly destroyed. Its code is PD.

The overall results have been used to fill the CCDB table (**Table 1**).

Collapse caldera database	Criteria	Data
	Latitude	05°37′–05°44′N
	Longitude	09°57′–10°07′E
	Region	2
	Subregion	203
	Age (Ma)	15
	Maximum Caldera diameter	Not Applicable
	Minimum Caldera diameter	Not Applicable
	Surface (km^2)	155.1
	Subsidence	—
	Caldera volume (km^3)	—
	Type of collapse	Piecemeal
	Name linked to the deposits	Ignimbritic
	Thickness of deposits	—
	Volume of deposits (km^3)	—
	Total volume of lavas (km^3)	—
	Petrographic types	B, I, T, P
	Magmatic series	ALKAm, ALKAi, ALKAf
	Magmatic chamber depth (km)	35.5
	Ratio depth/width of magmatic chamber	—
	Plate tectonic setting (PTS)	RC
	Crustal type (CT)	C
	Type of tectonic faulting (TF)	Ext
	Periods of pre-caldera doming (PCD)	Over 19 Ma
	Type of pre-caldera volcanism (PCV)	STR
	Timing of caldera onset (TCO)	A
	Post-caldera volcanic activity (PCVA)	S, MS
	Post-caldera resurgence (PCR)	Absence
	Caldera preservation (CPR)	PD

Table 1.
Classification of the Mount Bambouto caldera in the CCDB of [10].

4. Discussion

Through the mode of outcropping of different rocks in the caldera of Mount Bambouto, all types of dynamism (extrusive, effusive, explosive) exist in the caldera. These are therefore polygenic volcanoes marked by long periods of activity and varied dynamisms, resting and erosion phases during different tectonic episodes [46]. In addition, the diversity of rocks is indicative of the high degree of magma differentiation induced here by the fractional crystallization process [21, 47, 48]. The presence of the trachytes in ignimbrites of the study area is an indicator of a relative chronology of the rocks. Indeed, there was an ante-ignimbritic trachytic volcanic phase. This means that there has been in the course of the evolution of the Bambouto volcano, the eruption of trachytic rocks before that of ignimbritic materials [49, 50].

The caldera of Mount Bambouto was formed at a well-defined time. The stages of formation of these calderas correspond globally to the model of [9]: a regional tumescence, a volcanic eruption, a collapse of the caldera, volcanism on the annular fractures and sedimentation. The present structure of the caldera floor shows that the roof of the magma chamber collapsed piecemeal during its formation. The border faults generally observed on calderas in certain volcanic environments in Cameroon, which are evidence of the different phases of caldera collapse, are difficult to observe in the caldera of Mount Bambouto. These faults, when identifiable on certain ramparts, present a some stages of collapse (**Figure 3**). In this caldera, the ramparts are often confused with the floor. The latter constitutes the most dissected floor of all the caldera units studied along the Cameroon Volcanic Line and their arrangement in decreasing steps from west to east, would testify to the multiple collapses that marked its formation [51, 52]. On the other hand, in the Eboga and Lefo calderas, where the ramparts are clearly visible from the caldera floor, there are boundary faults marked by about 2–4 stages of collapse [29]. Post-caldera volcanism has manifested itself on the Mount Bambouto. This has been observed in other caldera environments on the Cameroon Volcanic Line, notably the Santa-Mbu and Lefo caldera in the Bamenda Mountains, the Eboga and Elengoum calderas in Mount Manengouba and the Bangou caldera in Mount Bangou. It is at the origin of numerous doleritic, phonolitic and trachytic protrusions and, cones and maars found on the floor and external slopes of these calderas [33, 51–54]. These post-caldera geomorphological units give the caldera of Mount Bambouto the S and MS types according to [14]. Mount Bambouto constitutes a stratovolcano [20, 33]. The shape of this caldera is comparable to the elliptical shape of the calderas of Suswa, Kenya [55] and Chã das of Fogo Island in Cape Verde [56] and the calderas of the basaltic shields described by [9, 57]. This shape results from the geometry of the magma chamber which is the main factor controlling the final morphology of the calderas [58]. The presence of ignimbrites, tuffs, trachytes and rhyolites in the caldera of the Mount Bambouto qualifies it as an ignimbrite caldera. Ignimbrite calderas are usually over 10 km in diameter and over 1 km in depth, formed after the voluminous deposition of silicic ignimbrites [9, 11, 59]. We can list the example of Batur Caldera in Bali, New Zealand [60]. However, the term ignimbrite caldera is clearly used by (2015) [61] to qualify the calderas of the Southern Rocky Mountain Volcanic Field in Colorado (USA) notably Bonanza, Bachelor, Cochetopa Park, Creede, and Platoro calderas. Their presence in Mount Bambouto is explained by the fact that, considering the ages, this massif is sufficiently old compared to the other massifs, especially Mount Manengouba, because these acid magmas, according to [62], require a significant period of time for their formation to be elaborated.

Calderas are places where several natural hazards occur, including volcanic eruptions and mass movements [63, 64]. According to [65], calderas are destructive volcanic forms because they cause pre-existing reliefs to collapse, unlike post-caldera cones and domes, which are constructive because pre-existing reliefs are put in place. Moreover, the volcanic formations that cover them favor the formation of fertile soils and the development of a plant cover of various species conducive to an agropastoral activity [16]. These are environments where hydrothermal activities and mineralization processes generally occur [57, 66, 67]. In this respect, it is clear that calderas have a strong educational value as they allow us to understand the complexity of certain craters in volcanic environments around the world. As such, they allow us to understand the degree of fracturing of the ante-caldera substratum, the superposition of eruptive products and the slices of the flows at the ramparts and the post-eruptive geological processes. For this reason, calderas have been the subject of several studies in the field of geological heritage, notably the Mount Teide caldera in Spain, Aso caldera in Japan; Santorini caldera in Greece; Erta Alé and Fentale caldera in Ethiopia; Cha Das caldera in Cape Verde; Eboga, Santa Mbu, Lefo and Bambouto caldera in Cameroon [17, 68–72]. Thus, calderas are often the seat of later volcanic activities that leave exceptional geomorphological units with several values suitable for geotourism [33, 51, 52, 56, 73–75].

5. Conclusion

The Caldera of Mount Bambouto is a volcanic unit that formed at a period between 18.68 and 22 Ma. Its emplacement model is comparable to that of Cole et al. 2005. Its formation and evolution gave it a rather varied petography and a characteristic structure. Its classification according to the Caldeira DataBase of Geyer and Marti (2008) allows us to conclude that its type of collapse is piecemeal. Chemically, the caldera is alkaline with codes ALKAf, ALKAi, and ALKAm. Furthermore, this caldera was formed through a continental rifting of extensional type, and their postcaldera protrusions give them Type-S and Type-MS. Moreover, it is a well-preserved caldera because its ridge lines are well observable.

The classification of the caldera of Mount Bambouto made within the framework of this work makes it possible to understand the similarities of this caldera with other calderas around the world on the one hand and to understand part of the global dynamics of the functioning of the Cameroon Volcanic Line on the other hand. Furthermore, this study contributes to elucidate the origin of the Cameroon Volcanic Line, which is still a subject of discussion among Cameroonian and foreign researchers today. Moreover, through this work, the Mount Bambouto Caldera is promoted next to the world scientific community that is still ignoring his existence.

Author details

Ghislain Zangmo Tefogoum[1]*, David Guimolaire Nkouathio[2],
Armand Kagou Dongmo[2] and Merlin Gountié Dedzo[3]

1 Department of Earth Sciences, University of Maroua, Maroua, Cameroon

2 Department of Earth Sciences, Faculty of Sciences, University of Dschang, Dschang, Cameroon

3 Department of Life and Earth Science, High Teacher Training College, University of Maroua, Maroua, Cameroon

*Address all correspondence to: zangmotefogoum@gmail.com

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