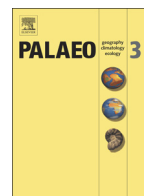




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First palynostratigraphical evidence for a Late Eocene to Early Miocene age of the volcano-sedimentary series of Dschang, western part of Cameroon and its implications for the interpretation of palaeoenvironment

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ABSTRACT

The volcano-sedimentary infill of the Dschang basin in the Western part of Cameroon is poorly known. The present study provides the first biostratigraphical data of the volcano-sedimentary sequence and allows constraining the age and the position of this basin within the regional context of Central Africa. The studied sequence is composed of three depositional units. The first unit is a fining-upwards sequence of coarse-grained sandstone that gets finer towards the top, passing to thick layers of fossiliferous claystone. The second unit is strongly affected by volcanic activity and consists of a volcano-sedimentary sequence. The third unit is marked by basaltic volcanism and covers the series. Diverse and well-preserved palynomorphs were recovered and are used to provide valuable information for age determination of the Dschang volcano-sedimentary sequence, namely to be of late Eocene–Early Miocene age. The recovered spores, pollen, green algae and fungal remains from the bottom of the sequence include *Bombacidites* spp., *Clavinaaperturites* cf. *clavatus*, *Crototricolpites* sp., *Perforitricolpites digitatus*, *Proteacidites* spp., *Psilastephanocolporites minor*, *Psilastephanocolporites* spp., *Retitrescolpites* spp., *Retitricolporites irregularis*, *Retitricolporites* spp., *Retitricolporites* sp., *Spirosyncolpites bruni* (probably synonymous to *Spirosyncolpites spiralis*), *Striatopollis bellus*, (considered synonymous to *Striatopollis catatumbus*), *Striatopollis* sp., *Tetracolporites quadratus*, *Tetracolporites* sp., *Verrutricolporites rotundiporis*, *Cyathidites* sp., *Laevigatosporites* spp., *Polypodiaceoisporites* spp., *Verrucatosporites usmensis*, *Verrucatosporites* spp., *Botryococcus* sp., *Tasmanites* sp., and fungal remains.

The samples are assigned to the *Verrucatosporites usmensis* Zone of Salar-d-Cheboldaëff (1979). The palynological assemblages are similar to those of other Late Eocene to Early Miocene palynological records from the West, Central and Northern African basins. Study of the organic matter by pyrolysis Rock-Eval 6 (Types I, II and III), the sedimentological setting, the palynofacies and the palynomorph assemblages show evidences of tidal influence (presence of the prasinophyte *Tasmanites*) in an active continental margin (semi-arid to humid lacustrine depositional environment). The Ngoua sedimentary sequence is fluvio-lacustrine, and believed to have witnessed some occasional marine incursions possibly during the opening of the Central Atlantic Ocean (CAO) and strongly disturbed later by intense volcanic activity.

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1. Introduction

The Cameroon Volcanic Line (CVL, Fig. 1) includes all volcanic zones located between the Gulf of Guinea and the Lake Chad and hosts several sedimentary basins. Volcanic events along this line have been studied previously and the oldest is dated by many authors as Cenozoic

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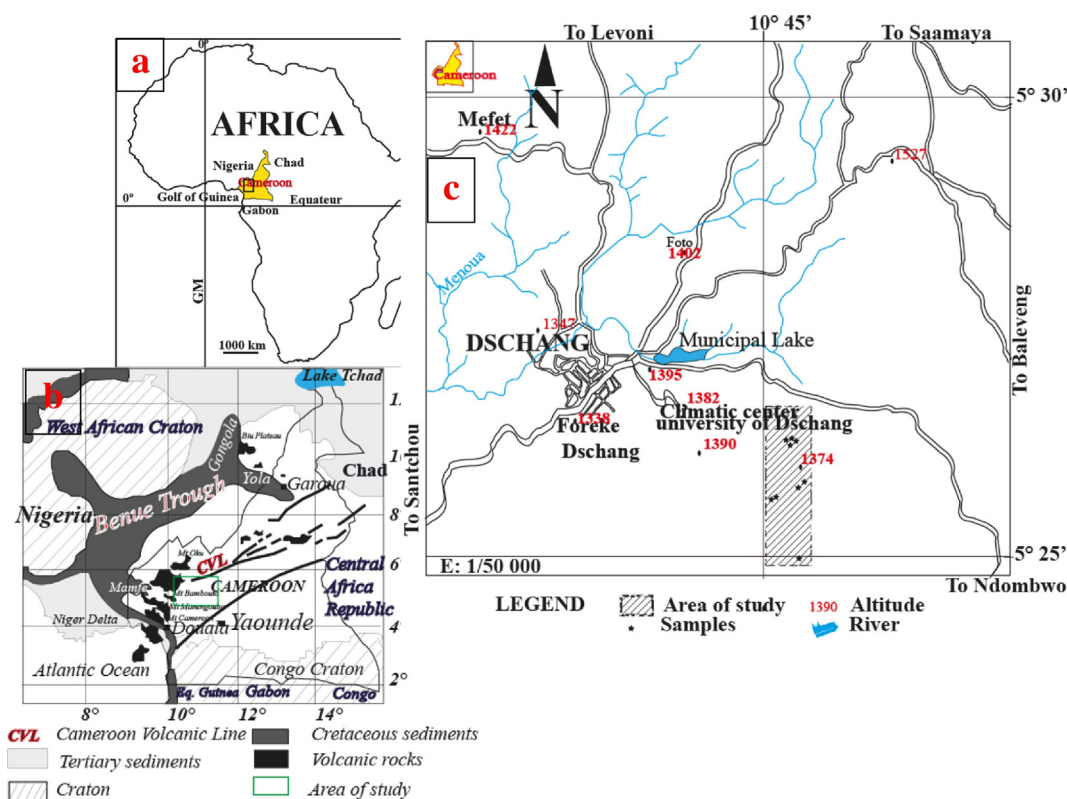


Fig. 1. Location of the study area (Ngoua village).

(Tchoua, 1974; Youmen, 1994; Marzoli et al., 2000; Ngountié, 2003 and Nono et al., 2004). However, origin of the sediments in this region, especially in the Ngoua area, remains a challenge to many researchers, especially the nature, extent and age of the infilling sedimentary sequence. Some authors have linked this formation to the event of the CVL. Kenfack et al. (2011) considered this series to be directly associated with volcanism and suggest a Miocene age. Their interpretations were based on lithostratigraphic, petrographic, mineralogical, morphological and morphometric analyses, but lack any biostratigraphical data. These authors described two phases in sedimentation: the first consisting of conglomeratic sandstone, sandstone and claystone and a second composed of conglomerate and arkosic sandstone and they assign a fluvial origin. A volcano sedimentary series where the sandstone and conglomerate beds are intercalated with volcanic layers was also reported (Kenfack et al., 2011). Many questions remain unanswered about the age of this series. Besides, the position of the basin within the local geodynamic context marked by the opening of the Central Atlantic Ocean (CAO, Cinthia Labails et al., 2010), especially the chronology of geological events between the intense volcanic activity dated Cenozoic (Marzoli et al., 2000) that belongs to the CVL and the sedimentary deposits is poorly constrained. Field data show that the thick sedimentary pile is in contact with the basement-rock (granite), remains well preserved and undisturbed and, thus, cannot postdate volcanism. The opening of the Atlantic played an important role in the establishment of some coastal and continental basins in Cameroon, which include the Rio Del Rey basin (Njoh, 2007) and the Douala basin (Ngos and Mbesse, 2006; Mbesse et al., 2012; Mbesse, 2013; Ngon Ngon et al., 2016). The continental part including the Mamfe basin (Eyong, 2003), the Benue Trough (Bessong, 2012; Bessong et al., 2011, 2015), the Hamakoussou basin (Ntsama Atangana, 2013; Ntsama Atangana et al., 2014), the Mayo Rey basin (Nolla et al., 2015), the Mayo Oulo-léré basin (Brunet et al., 1988; Ntsama Atangana, 2013), the Babouri Figuil basin (Ndjeng, 1992) and the Logone Birni (Allix et al., 1981; Allix and

Popoff, 1983; Ntep et al., 2000) have been well studied. Studies on palynology across all the basins, however are very limited (Brunet et al., 1988; Dupéron, 1991), hence, making it difficult to attempt correlations and the link to the opening of the CAO. The Palynological study of lignite from Mpu Formation in the Abakaliki basin in Nigeria has been made (Umeji, 2002) and has revealed an upper Eocene-lower Miocene age. Sediments of the similar age according to the fossil assemblage are known in West Africa: Ogwashi-Ashaba formation (upper Eocene) (Jan du Chene et al., 1978), Kwakwa bore of coastal basin of Cameroon (palaeocene-lower Miocene) (Salard-Cheboldaef, 1978), Gandu Formation of Sokoto Basin (Kogbe and Sowunmi, 1975). The goal of this work is to clarify the age and palaeoenvironment of the sedimentary sequence of the Ngoua Formation and interpret the position of this group in the local geological context controlled by the opening of the CAO. The palynostratigraphical investigations of the Ngoua sedimentary rocks presented in this paper will enable for the first time to determinate the age of this formation in order to better understand the relationship between sedimentary and volcanic events and the palaeoenvironment setting of the study site.

2. Study site

The Ngoua sedimentary formation is situated on the southern flank of the Bambouto volcano in the West Cameroon region (Dschang locality) along the CVL (Fig. 1) which is a 100 km wide geological lineament, oriented N30E. These structures are characterized by an alignment of oceanic volcanoes, volcanic massifs and continental volcanoes extending from the Gulf of Guinea to the interior of the African continent over 1600 km (Marzoli et al., 2000). After Mount Cameroon and Manengouba, Mount Bambouto is the third largest volcano of the CVL (Kagou et al., 2001). The Ngoua formation is the most important sedimentary rocks outcrop in this region. Sedimentary rocks (conglomerate, sandstone and claystone) are interlayered within the volcanic rocks

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