

Petrologic, geodynamic and geochemical studies of Tertiary and Quaternary lavas of western Senegal

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The volcanic formations of the western province of Senegal are located in the extreme west of the Senegalo-Mauritanian Basin. They are constituted by a Tertiary volcanism spread around the Cape-Verde Peninsula and the Thiès Plateau and a Quaternary volcanism found in the northwest point of the Cape Verde Peninsula (Crevola et al., 1994). A main phase of lateritic weathering separates both these volcanic activities. The aim of this study is to determine the petrographic, geodynamic and geochemical features of these Tertiary and Quaternary lavas.

The petrographic studies revealed that the Tertiary lavas are sodic mafic rocks, alkaline types, strongly sub-saturated and not differentiated. The description of the thin sections indicates microlithic porphyric and doleritic intersertal textures. The rocks are generally constituted of olivines, clinopyroxenes, plagioclases, opaque minerals, mesostase and sometimes of nephelines. The facies, which constitute the Tertiary lavas, are basalts, basanites and nephelinites; and those of the Quaternary lavas are basalts and hawaiites (dolerites).

The Cape Verde Peninsula is tectonically unstable because of the disturbances connected to the brittle tectonics, which occurred after the Atlantic rifting. The latter is at the origin of the separation of the African and American plates during the Jurassic era. This zone is made of a connection of normal submeridian faults bounding horsts (Ndiass, Dakar) and grabens (Rufisque) accompanied by several magmatic activities.

The geochemical studies of major trace and rare earth elements dating from the Tertiary and Quaternary lavas allowed us to emit the following hypotheses (Yatte, 2017):

- The Tertiary and Quaternary lavas could be from a source with low rate of partial melting (high Nb/Zr ratios) : lower mantle ;
- The Quaternary lavas could undergo a phenomenon of contamination by the crust during the ascent of magma towards the surface of the earth (high SiO₂ and ID values, rich values of normative hypersthènes) ;
- The Tertiary and Quaternary lavas are genetically linked with positive anomaly in Eu, Nd and Ta and negative in K, Rb and Pb, showing a character of OIB with low degree of partial melting ;
- The Tertiary and Quaternary lavas are alkaline basalts from OIB of intraplate type from the lower mantle (the E-MORB, N-MORB and OIB are less concentrated in trace elements than the Tertiary and Quaternary lavas).

Keywords : Argon, Tertiary, Quaternary, rare gases, Cape Verde Peninsula, Senegal.

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