The Kerguelen islands archipelago (6500 Km²) is the third largest oceanic island in the world, after Island and Hawai. It is located upon the Kerguelen plateau, which is the second Large Igneous Province (LIP) after Ontong-Java. This oceanic plateau consist of an accumulation of flood basalts, related to the long-lived ~119 Ma Kerguelen plume. The flood basalts (~29-24 Ma; Nicolaysen et al., 2000) represent 85% of the rocks of Kerguelen. The Rallier-du-Baty (R.d.B.) peninsula, which forms the southwestern part of the Kerguelen archipelago, is mostly made of alkaline rocks constituting two well-defined ring-complexes. The northern ring-complex consists of a succession of seven discrete syenitic ring-dykes, one later caldera volcano and a more recent volcanic complex. The volcanism is bimodal with trachy-basalts and trachy-andesites, with true scarce basalts constituting the mafic lavas and trachytes and rhyolites constituting the felsic lavas. The felsic magmas were erupted as abundant pyroclastic deposits and lava flows.

The mineralogy of those volcanic rocks is typical of an alcaline series, with the presence of K-feldspars (sandines) in the most differentiated volcanic rocks. The evolution from trachyte to rhyolite seems to be controlled by crystal fractionation, with some trace element distribution and Sr isotopic ratios largely disturbed by open-system processes such as assimilation of hydrothermally altered crust and interaction with seawater. The studies of the oxygen isotopes confirm this hypothesis. Indeed, the high values of δ¹⁸O for the rhyolites (δ¹⁸O= 10.3 and 12.4) could be interpreted by an alteration by fluids at low temperatures. The Nd isotopic ratio are typical of mantellic values, with no significant variations.

Whereas some units of the northern R.d.B. plutonic complex yield a narrow range of K/Ar ages on bulk rocks, from 6.2 ± 0.2 Ma to 4.9 ± 0.2 Ma (Dosso and al., 1979), the formation of a discrete caldera centered on the “Table de l’Institut” is more recent. ⁴⁰Ar/³⁹Ar dating on a trachyte of this caldera yields upper pleistocene ages of 449 ± 7 Ka. Some extracalderic formations like basaltic trachy-andesites and trachybasalts yield some Ar/Ar ages from 279 ± 3 Ka to 219 ± 3 Ka. A trachytic pumice sample of the “Vallée du Telluromètre” (northern limit of the “Dôme Carva” volcano-complex) is much younger with an Ar/Ar age of 26 ± 3 ka (Gagnevin and al., 2003). Another datation on a trachyte of this volcano-complex yields very young Ar/Ar ages around 10 Ka. The large volume of the erupted products expelled through highly explosive eruptions (huge amounts of pumice deposits) could have affected the quaternary climate in the austral hemisphere.