07/7

The Secular Variation of TiO_2 in the Volcanics of the Marquesas Archipelago (Spouth Central Pacific Ocean) and its possible implication on the Evolution of the Marquesas Hot Spot

LIOTARD,J.M. (CGG/USTL), H.G.BARSCZUS (on leave from ORSTOM at CGG/USTL), and C.DUPUY (CGG/USTL)

Centre Géologique et Géophysique, USTL, place Eugène Bataillon, 34060 MONTPELLIER Cedex (France)

During a study of results on petrography and geochemistry of samples from the small island of Fatu Huku, Marquesas Archipelago / French Polynesia (South Central Pacific Ocean), a comparison with a limited amount of similar data from the archipelago's other islands (twelve islands forming 3 distinct groups on the base of bathymetry and geochronology) was made. On this occasion it was observed that the average TiO_2-content for basaltic rocks with Differentiation Index DI=25-40 is increasing from North to South or with decreasing distance to the inferred hot spot, i.e. appears to be dependent from the age of the islands which are consistently younger from North to South: the mean for TiO_2 varies in the DI-range considered from ~3.3 % at Nuku Hiva (average age ~3.8 M.Y.) in the North to ~4.5 % at Fatu Hiva (average age ~1.4 M.Y.) in the South.

Ti is the only major element exhibiting such a regular evolution independently from degree of saturation (normative Ne or Hy). However such an evolution might be due to much or less early fractionation of of titaniferous oxydes during differentiation of the parent magmas. Thus in the Northern islands (Nuku Hiva for exemple) TiO_2 continuously decreases from oceanites towards trachytes, however in the Southern islands TiO_2 increases from oceanites towards hawaiites, then decreasing with progressing differentiation: from North to South, the maximum content of TiO_2 evolves first with increasing DI (DI=40-50 at Hiva Oa, Central group), and then with decreasing DI (from Hiva Oa towards Fatu Hiva).

This observation suggests that the early fractionation of titaniferous oxydes starts with oceanites in the North, shifting to hawaiites in the Central group, then shifting back to basalts in the South. This may reflect variable P_{O_2} conditions according to location and age of the islands in the frame of the Hot Spot hypothesis.