Dr. M. J. Le Bas
DEPT. GEOLOGY
THE UNIVERSITY
LEICESTER, LE1 7RH
ENGLAND.

OCEANIC CARBONATITES

M.J. Le Bas (Department of Geology, Leicester University, Leicester LE1 7RH, England)

Carbonatites are commonly believed to be restricted to continental crustal regions and particularly to cratonic areas. That belief is false: carbonatites abound on nearly all oceanic islands where strongly alkaline plutonic igneous rocks are exposed.

In the Cape Verde Islands in the Central Atlantic Ocean 500 km off the west coast of Africa, intrusive carbonatites occur on the 8 islands where intrusive 'basement' is seen. Likewise, carbonatitic intrusive complexes are known on the Canary Island of Fuerteventura which is the only island in the Canary group with extensive plutonics. In all cases, the carbonatites are associated with ijolitic intrusive complexes, the volumetric proportion of carbonatite to ijolite being very variable. On the main island of Santiago in the Cape Verdes, there are three separate carbonatitic complexes, one of them also showing extrusive carbonatites.

The geochemistries of oceanic and continental carbonatites appear to be similar. Both are rich in the incompatible elements, particularly Sr, Ba, Nb and REE. Oceanic and continental ijolites and nephelinites are likewise similar.

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The similarities indicate that the origin of these alkaline igneous rocks is independent of the presence of continental lithosphere, and that the source must lie deep in or below the asthenosphere.

However there is one criterion which distinguishes oceanic from continental carbonatites: the fenitization. Continental carbonatites at high levels in sub-volcanic intrusive complexes normally show intense potassium metasomatism with the development of much phlogopite and K-feldspar. The feldspathisation is normally accompanied by much brecciation. Oceanic carbonatites also show intense local phlogopitisation within the intrusive centre, but surrounding them is a wide zone in which albitisation takes place along fracture planes, dykes or other channelways through which fluids can migrate easily. X-ray and electron micro-probe studies show that, in both occurrences, the feldspars (commonly Or_{95} and Ab_{99}) were formed at low temperatures ($< 500^{o}C$) as appropriate to fluids emanating from carbonatite magma. Thus oceanic carbonatite magmas may be characterised by high Na/K ratios whereas continental ones have lower Na/K ratios.

A second possible distinction is the total absence of kimberlite from the oceans, whereas on the continents they are sometimes associated with carbonatites.