Tectonic evolution of the Caribbean Plate: Insights from Cretaceous volcanic rocks in Jamaica.

ALAN R. HASTIE[1], ANDREW C. KERR[1], JULIAN PEARCE[1] AND SIMON F. MITCHELL[2].

1. School of Earth Ocean and Planetary Sciences, Cardiff University, Park Place, Cardiff, CF10 3YE, U.K.
2. Department of Geography and Geology, University of the West Indies, Mona, Kingston 7, Jamaica, W.I.

Plate tectonic models of Caribbean plate evolution are widely debated, and this study on the Cretaceous-Tertiary igneous rocks of Jamaica aims to clarify the existing models.

There is a lack of geochemical and geochronological data available for igneous rocks on Jamaica. Some of the volcanics have been identified stratigraphically, but their mode of formation and petrogenesis are relatively unclear. The identification of post-Jurassic arc and plateau rocks in Jamaica as part of this study has helped to constrain the tectonic evolution of the Caribbean plate by identifying when, where and how the different volcanic rocks formed. This research therefore not only evaluates the existing models of Caribbean plate evolution, it also presents for the first time, a detailed geochemical and geochronolgical analysis of the igneous rocks on Jamaica.

Cretaceous igneous rocks were collected from the Blue Mountains, Central, Above Rocks and Benbow Cretaceous Inliers and the Tertiary Wagwater belt in Jamaica. Major and trace element data and Sr, Nd, Pb and Hf isotope analysis has confirmed the presence of a Cretaceous oceanic plateau section within the Blue Mountains inlier and a number of primitive and evolved Cretaceous island arc sequences in the remaining inliers. Rare high-Nb adakites have been discovered in the Wagwater belt, and their tectonic significance will be discussed

Due to intense tropical weathering many elements have been mobilised, and so the tectonic setting and petrogenesis of most of the analysed samples were interpreted using immobile trace elements. The study of these altered Jamaican volcanics has resulted in the development of a Co-Th discrimination diagram. This diagram, along with other diagrams, has been used to classify the Jamaican volcanic arc rocks and thus identify their extent of fractionation and incompatible trace element enrichment. The Jamaican arc lavas range in composition from basalts to rhyolites and show a clear island arc tholeiite to calcalkaline transition as the arc matures.

These new findings together with the stratigraphic information and temporal location of the Jamaican igneous rocks support the “Pacific” model of Caribbean plate evolution.