

Geological evidence of a post shield stage at the Juan Fernandez Ridge, Nazca Plate

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The Juan Fernandez Ridge (Eastern Pacific, Nazca Plate) is thought to be a classic hot spot trail because of the apparent age progression observed in K-Ar data. However, geological evidence and some thermochronological data suggest a more complex pattern with a rejuvenation stage in Robinson Crusoe Island, the most eroded of the Juan Fernandez Archipelago. In fact, a sharp unconformity separates the underlying shield-related pile from the post-erosional volcanic association. The latter is formed by partially collapsed scoria cones and small shield volcanoes together with a fissure-type complex. Ash fallout and tuffs at the base of the sequence describe an explosive behavior followed by a Hawaiian-style eruptive cycle. At least six vents can be recognized, roughly organized in a tangential pattern. The present volume of the erupted products is ca. 1 km³, which would be close to a half of the total erupted volume.

New ⁴⁰Ar/³⁹Ar data indicate ages ranging from 900 to 700 ka for the last eruptive event, which is more than 3 Ma younger than the shield stage in Robinson Crusoe Island. In addition, petrological data of the post-shield basanites indicate that erupted magmas are mostly alkaline (Ba/Yb=236.58; La/Yb=22.32; Ba/Zr=2.26; Nb/Zr=0.26) in contrast with the previous shield stage where tholeiitic to transitional magmas dominate.

Post-shield, post-erosional or rejuvenated volcanism is an outstanding feature of a number of oceanic islands and several processes have been invoked to explain such a feature. Here we hypothesize that a variation to a metasomatised HIMU type source are a plausible model for post-shield volcanism at Robinson Crusoe, although magma ascent and eruption triggering still deserve more research.

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