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Floating stones off El Hierro, Canary Islands: fossil bearing high-silica xenoliths of pre-island sedimentary origin

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A submarine eruption started off the south coast of El Hierro, Canary Islands, on 10 October 2011 and lasted until early March 2012. In the first days of the eruption, peculiar products were found floating on the sea surface, drifting for long distances from the eruption site. These specimens, which have been termed “restingolites” (after the close-by village of La Restinga), appeared as black volcanic “bombs” that exhibited cores of white to grey, porous and pumice-like material. The brief appearance of these peculiar “floating stones” has been vigorously debated amongst scientists, with important implications for the interpretation of the hazard potential of the eruption. The “restingolites” have been proposed to be either (i) juvenile high-silica magma (e.g. rhyolite), (ii) remelted magmatic material (trachyte), (iii) altered volcanic rock, or (iv) reheated hyaloclastites or zeolite from the submarine slopes of El Hierro. Here we provide evidence that supports neither of these conclusions, but underlines a sedimentary origin for the “restingolites” [3]. We have analysed the textures and compositions of representative “restingolites” and compared the results to previous work on similar rocks found in the Canary Islands [1,2]. Based on (a) their high-silica glass content (up to 90 wt%), (b) the dissimilar incompatible trace element concentrations compared to trachyte and rhyolite (e.g. lower Zr and Nb contents by factor 2-4), (c) the complete absence of igneous mineral traces in XRD spectra (ie. no olivine, pyroxene, amphibole, feldspar), (d) the presence of remnant quartz crystals, jasper fragments and carbonate as well as wollastonite (derived from thermal overprint of carbonate), (e) their high oxygen isotope values (9,1 – 11,6 ‰, and (f) the presence of Cretaceous and Pliocene calcerous nannofossils (Coccolithophores), we conclude that the “restingolites” are dominantly xenoliths from pre-island sedimentary layers. These were picked up and heated by the ascending magma, causing them to partially melt and vesiculate on decompression. As they closely resemble pumice in appearance but are essentially xenolithic in origin, we refer to these rocks as “xeno-pumice”. Notably, the poorly preserved fossil remains show a dominantly Cretaceous record, but species as young as Neogene occur as well. This may imply onset and growth of the island itself commenced as early as the late Neogene ($\geq$ 2,5 Ma), covering the pre-island sediments with volcanic products to interrupt the fossil record preserved in the El Hierro xeno-pumices. The xeno-pumices hence represent messengers from depth that help us to better understand the history of the island and the interaction between ascending magma and crustal lithologies beneath the Canaries, an aspect likely relevant in similar Atlantic Ocean islands that also rest on sediment-covered ocean crust (e.g. Cape Verdes, Azores).

References:
[1] Hoernle, K. (1989). Journal of Petrology, 5, 859-880
[2] Hansteen, T., Troll, V.R. (2003), Chemical Geology, 193, 181-193
[3] Troll V.R. et al. (2012), Solid Earth, 3, 97-110