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Structural evolution of deep-water submarine intraplate volcanoes / Azores

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We present multibeam and high-resolution reflection seismic data which elucidate the architecture of three submarine intraplate volcanoes located in the southern Azores Archipelago. Data have been collected during RV Meteor cruise M113 in 2015. Four GI-Guns served as the seismic source. The digital streamer comprised 144 channels distributed over a length of 600 m.
The three cones are situated in a depth down to 2300 m with heights varying between 200 m and 243 m, an average diameter of 1360 m and an average slope angle of ca. 22°. All three circular cones are surrounded by a circular channel. These features, previously named “fried eggs” were previously interpreted as impact crater (Dias et al., 2009). A comparison with nearby submarine volcanoes close to São Miguel island (Weiß et al., 2015), however, strongly suggests a volcanic origin.
The seismic data indicate that the volcanic cones formed on top of a ca. 100 m thick pelagic succession covering the igneous basement. Magma ascent deformed the volcanic basement, displaced the pelagic sediments and a first eruption phase formed a small, seismically transparent volcanic cone. Further eruptions created a volcanic cone with rather transparent reflections within the inferior region changing to strong reflection amplitudes with a chaotic pattern in the superior area. Compared to the igneous basement internal reflection amplitudes are mainly weak. The seismic transparency and slope angle exclude the presence of effusive rocks, since lavas usually create strong impedance contrasts. A comparison of the seismic characteristics with those from submarine Kolumbo volcano (Hübscher et al., 2015) suggests volcaniclastic lithologies from explosive eruptions. The circular channel around the volcanic cone shows the characteristics of a moat channel created by bottom currents.

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