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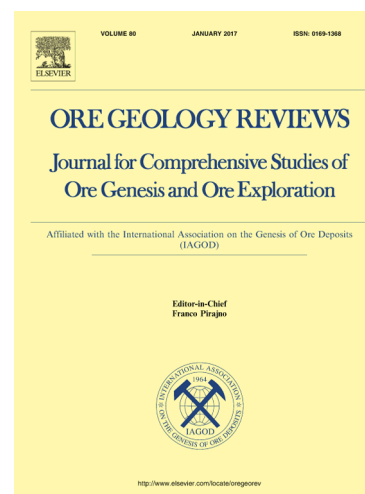
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Volcanic and hydrothermal processes in submarine calderas: the Kulo Lasi example (SW Pacific).

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Abstract

The study area is located at the transition between the northern end of the Tonga Trench and the North Fiji fracture zone, where tectonic movements are reputed to be the fastest in the world. To the southeast of Futuna Island, a broad area of volcanism occurs within a region characterized by a change in the tectonic fabric between a NE-SW oriented volcanic graben and the N-S oriented Alofi ridge. In 2010, the active volcano Kulo Lasi, which represents the most recent volcanic episode in the Futuna area, was discovered in the center of this extensive volcanic zone. Kulo Lasi is a 20 km diameter shield volcano that rises 400 m above the seafloor. It is composed of basaltic to trachy-andesitic lava with no obvious geochemical affinity with the Tonga subduction that occurs 500 km to the east. The central caldera is 5 km in diameter and 300 m deep and is located at a water depth of 1500 m. Diving operations with the submersible Nautilie and high-resolution AUV mapping, have revealed the presence of numerous active and inactive hydrothermal fields on the floor and the walls of the caldera. Four tectono-volcanic stages can be distinguished at Kulo Lasi caldera. In stage 1, the shield volcano is built. Annular reverse faults develop at the summit and control circulation of water/rock-dominated hydrothermal fluids and high-temperature alteration of rocks along the nascent normal faults. Mixing of hydrothermal fluids with seawater is favored along normal superficial faults, leading to the formation of low-temperature Fe/Mn mineralization at the summit of the volcano. During stage 2, the caldera collapse, gradually revealing outcrops of the altered and mineralized zones formed during

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