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Relationship between tectonics and magmatism on Faial island (Azores, Portugal)

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The Azores Islands are located on the triple junction involving Eurasian, Nubian and North American plates. Faial is the nearest island to the Atlantic Ridge and one of the most active, with the 1957-58 Capelinhos eruption and the 1998 earthquake. Faial consists of three main structural features: a well exposed graben structure (eastern sector), a stratovolcano with a summit caldera (central part) and a fissure zone peninsula (western part). To analyse the relationships between magmatic and tectonic activity at Faial we use a multidisciplinary approach based on: 1) remote sensing analysis (DEM and aerial photographs); 2) geological field survey and 3) paleomagnetic analysis.
The age of volcanism in Faial is not well constrained. Our paleomagnetic results show that the oldest rocks of the island have a reverse polarity, implying that they are older than 780 ka (Brunhes-Matuyama polarity transition).
The structural data indicate that the main fault system, including the graben structure, is WNW-ESE oriented and shows a general transtensive kinematics with a dextral component and a NE-SW oriented extension direction of the island. Most of the dikes, volcanic vent alignments and extensional fractures are sub-parallel to the main fault system (WNW-ESE). A secondary system of fractures and dikes is NNE-SSW oriented.
Inside the graben, the bedding attitude is parallel to the direction of the axis of the graben and dipping outward. This attitude suggests an outward tilt of the blocks between the faults and that the graben consists of two oppositely verging-dominoes. We have estimated the stretching factor (β=1,35) and the minimum extensional rate (2,54 $\pm$ 0.08 mm/a) of the graben. The obtained direction and rate of the extension within the Faial graben are similar to those of the nearby Terceira Rift. The absence of a clear westward continuity of the latter suggests that the Faial – Pico magmatic segment could be the SW continuation of the segmented Terceira Rift, above the current hot spot.