



## Insights into the structure of Socorro island, Mexico, from high-resolution aeromagnetic data

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The Island of Socorro is located 700 km off the western coastline of Mexico on the northern Mathematicians Ridge, an abandoned mid-ocean ridge spreading centre. Together with three other islands and numerous seamounts, the Revillagigedo archipelago represents the product of post-abandonment alkaline magmatism. The last volcanic event in the area of Socorro took place in 1993 AD, when a submarine basaltic eruption occurred off the SW coast. Up to now, due to the remote location of the island, little knowledge has been available concerning the subsurface structure of the volcanic edifice.

Thus, a high-resolution airborne survey was conducted by the Geological Survey of Austria in February 2009. The survey included magnetic, electromagnetic and gamma-ray measurements, in order to have an overall view of the main structural/lithological features of the island. The survey covered an area of 200 square kilometres, with E-W flight lines, an average line spacing of 100 m and an average clearance from rough terrain of the island of about 100 m.

The aeromagnetic map of Socorro is characterized by a dipolar anomaly of about 2000 nT amplitude whose maximum-minimum orientation is non-aligned with the direction of the local current Earth's magnetic field (inclination  $44^\circ$  and declination  $9^\circ$ ). In order to locate the position of the magnetic sources of the anomalies of the island, we computed pole-reduced data by accounting for the presence of sources with a component of remanent magnetization (inclination  $40^\circ$  and declination  $357^\circ$ ). The so-obtained pole-reduced map shows a large negative anomaly in the central part of the island. This may be connected to: a high temperature region (above the Curie temperature) in the deeper part of the volcano due to magma ascent, and/or low total remanent magnetization of pyroclastic caldera-filling sediments due to non-aligned sedimentation, and/or the influence of hydrothermal alteration. The computation of the horizontal gradient (hg) of the draped data highlights a rather good match between the maxima of the hg data and the caldera wall, and suggests the possible presence of a nested caldera structure. The analytic signal map shows correlation between its maxima and some of the scoria cones, such as the Lomas Coloradas cones in the SE area of the island.

The study of the deeper magnetic structures of the island was performed by analyzing data after upward continuation to 1200 m a.s.l.. The analytic signal (as) map of the upward continued data is characterized by maxima both in the northern and southern sectors of the island, highlighting the presence of two deep and wide sources. A depth analysis of this as data, performed through the use of the "Depth from Extreme Points" (DEXP) method, pointed out the existence of two large sources located at about 5 km depth. This important result requires further investigation to establish its relevance in the evaluation of future hazards.