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Potential fields and seismicity at northern La Hispaniola Island: useful constraints to determine the crustal structure of an oblique convergence area

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The interpretation of aeromagnetic and gravity data together with petrophysical analysis allow characterize the tectonic domains and the determination of the crustal structure up to Moho levels. In order to compare the crustal structure deduced from the potential fields with the seismicity, a set of earthquakes events from the USGS database have been studied (hypocenters shallower than 40 km and magnitude greater than 3.5).

This study is focused on the northern part of the La Hispaniola Island, where an oblique subduction and strike-slip collision is taking place since the Mesozoic. The Septentrional Fault Zone (SFZ), an almost WNW-ESE directed strike slip fault, is bounded by a set of earthquakes up to 6 in magnitude whose hypocenter is located from 20 to 30 km in depth, with some deeper events (up to 40 km) in places. Northward of this fault zone, there is an area of mainly shallower hypocenters (up to 20 km) characterized by events of comparatively higher magnitude (up to 7) that deepen slightly again towards offshore where the range of depths is 0 to 30 km clustering around what is believed to be the subduction zone.

The Bouguer anomaly shows a sharp gradient that separates the Cibao Valley to the south, characterized by an elongated minimum, from the accretionary prism (Mamey group and Puerto Plata-Rio San Juan Complex) to the north, characterized by a set of relative maxima and minima of higher intensity. Moreover, the accretionary prism presents a well defined magnetic zonation over the Mamey Group and the igneous-metamorphic complexes of Puerto Plata and Rio San Juan. In this area, magnetic anomalies are an order of magnitude higher than in the Cibao Valley, where the magnetic fabric is rather uniform with the exception of three prominent anomalies that can be associated to igneous rocks emplaced to the northern border of La Hispaniola Fault Zone. The Camú Fault, that separates Mamey Group from Puerto Plata Complex, constitutes another clear magnetic boundary, whereas it is not so clear in terms of seismicity or gravity.

The potential field data together with the location of the epicentre and hypocenter of the earthquakes helps to define the upper boundary of the subducting slab at cortical levels and the geometry of the accretionary prism, specially the igneous-metamorphic complexes of Puerto Plata and Rio San Juan.