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TITLE: 3D Lithospheric Density Structure of the Central American Subduction Zone from Gravity Data

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ABSTRACT BODY: Data from the EGM2008 Combined Geopotential Model has been interpreted to construct a comprehensive three-dimensional model of the lithospheric density structure along the Central American Isthmus. This is the first time that integration of all geophysical information available for the isthmus has been undertaken. The density model is constrained by seismic velocity models, magnetotelluric cross-sections, receiver functions,and hypocenter data from local seismic networks acquired along the Middle American Subduction Zone by different institutes and projects during the last three decades.
The segmentation of the crustal basement of the Caribbean Plate was modeled with separate units for the Chortis Block (2.77 Mg/m^3), the Mesquito Composite Oceanic Terrane / SiunaTerrane (3 Mg/m^3), and the Caribbean Large Igneous Province (2.90 Mg/m^3). Furthermore, first order boundary layers such as the Moho and the Cocos-Caribbean plate interface were modeled and extracted for correlation with tectonic features and dynamic processes.
The Costa Rican segment has been the most widely studied along the Central American margin. Here, it is possible to review the slab geometry based on the three-dimensional density model against seismological information from local networks in greater detail. By integrating probabilistic relocated hypocenters with the density model by means of 3D visualization, a joint interpretation of the distribution of seismicity with the density units in the subducted slab was carried out.A change in the depth of intra-plate seismicity is observed reaching 220 km for the northwestern part and becoming shallower toward the southeast where it reaches a maximum depth of 75 km. The changes in the maximum depth registered for the seismicity, correlate with changes in the density structure of the subducted slab which were modeled based on the gravity response of the model. The crust of the oceanic plate was assigned an initial density of 2.80 Mg/m3, deeper than this the density changes within the slab were modeled based on published petrological calculations constrained by thermal and lithostatic pressure conditions and considering metamorphic reactions. In consequence, the initial density for the Cocos Plate crust increases to 3.15 Mg/m^3 corresponding to the downdip extent of the Wadati-Benioff seismicity and then to 3.30 Mg/m^3 for the deepest, aseismic sections of the slab where the subducted crust is interpreted as being anhydrous. The increase in density varies in depth along the subduction zone and its correlation with the terminal depth of intraslab seismicity supports the hypothesis that differences in the state of initial hydration of the oceanic lithosphere affect the depth reached by dehydration reactions.

KEYWORDS: 7240 SEISMOLOGY Subduction zones, 1200 GEODESY AND GRAVITY.

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