INTERACTIVE POTENTIAL FIELD MODELING AND INTEGRATION OF CONSTRAINING DATA - AN EXAMPLE FROM THE CENTRAL ANDES

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3-D interactive modeling permits an integrated processing and interpretation of geoid, gravity and magnetic fields, yielding an improved geological interpretation. 3-D models are constructed by triangulated polyhedra with constant density and/or induced and remanent susceptibility. Interactiveness and visualization of calculated and measured fields enable the interpreter to design a realistic model. We describe the integration of constraining data into the modeling process to ensure quantitative comparison and adjustment. The definition of 'geo-objects', which link geoscientific vocabulary with geometrical model elements provides a comfort interpretational environment. The method is embedded in an Interoperable Geoinformation System (IOGIS) which uses a new object-oriented database. We present results from the Central Andes (20 to 30 degrees S). Both gravity and geoid were investigated with regard to the isostatic state, crustal density, structure and rigidity of the lithosphere. The gravity effect of the Nazca Plate was removed from isostatic residual anomalies and then correlated with mean topography to identify areas of disturbed isostatic equilibrium. Most of the morphological units appear close to isostasy. Differences remain in the Argentine Puna, the SE foreland and along a NW to SE striking zone crossing the volcanic arc. This structure can be linked to rift processes. 3D modeling of lithospheric rigidity (including surface and subsurface loads) was then applied. Lower values (10^22 to 10^23 Nm) were obtained for areas of mountainous basins and 10^23 to 5x10^23 Nm for the back arc (corresponding effective elastic thickness: 35 to 45 km). This coincides with electrical resistivity and analysis of surface waves.