

MAGNETOTELLURIC INVESTIGATION OF THE SANTO DOMINGO BASIN, RIO GRANDE RIFT, NEW MEXICO

by

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Magnetotelluric (MT) investigations of the Santo Domingo Basin were made in 2000-2007 to assess the deep stratigraphy and tectonics of an intra rift basin. The studies were conducted during the SAGE (Summer of Applied Geophysical Experience) program to provide 'hands-on' learning experiences for students and to evaluate the local hydrologic regime. Most MT soundings were accomplished using Quantec Geoscience's Titan 24 MT system. The Titan system is a distributed array MT instrument that allows the collection of up to 24 MT soundings simultaneously with a station spacing of 100 m. Sixty-five Titan MT soundings were collected along a 6.4 km-long profile where a petroleum exploration seismic survey was recorded during the 1970's. The MT data were modeled using a smooth, two-dimensional (2-D) inversion code developed by Geosystem, Inc. Modeled resistivity values vary from 2-1000 ohm-m in the 2 - 4.5 km-thick sedimentary section. Resistivities exceed 1000 ohm-m in the basement interpreted to underlie the sediments. The sedimentary sequence indicates three distinct regimes: (1) an upper, unsaturated and freshwater saturated, basin-fill that ranges from 350 - 800 m-deep with resistivities of 8 - 85 ohm-m, (2) a deeper, mostly conductive region with higher brine and/or clay concentrations approximately 3 km thick with resistivities varying between 2 - 100 ohm-m and (3) a resistive sedimentary cover over the crystalline basement that ranges from 100 - 1000 ohm-m. Tectonic interpretations of the 2-D MT inversion profile indicate the locations of several buried, unmapped faults within the basin which agree with recent U. S. Geological Survey aeromagnetic interpretations. A geologic structure model for the area includes two grabens with the western graben down dropped with respect to the western graben.