The Geometry of the Main Himalayan Thrust along the Satluj river valley, Northwest Himalaya, India retrieved from Magnetotelluric studies.

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Abstract

The magnetotelluric (MT) data collected along the Nahan- Kourick-Chango transact in the Satluj river valley in the northwest Himalaya have been analysed to obtain subsurface resistivity structure. The objective is to study tectonics and the geometry of the major fault systems in the region. Dimensionality analysis of robustly estimated transfer functions indicates the distribution of electrical conductivity in the study area is complex specifically at low frequencies, whereas at middle and higher frequencies majority of MT responses are two-dimensional (2-D). Dimensionality and decomposition analysis recovers geoelectrical strike NE-SW striking with an angle of ~45° for the majority of responses. The geoelectrical strike coincides with the general trend of the major geological ruptures in the study area. The Non-Linear Conjugate Gradient (NLCG) algorithm was utilized to obtain the 2-D resistivity model of the study area. Near-surface resistivity distribution favours known geological findings of the medium to highly metamorphosed crystalline rocks of the Lesser Himalaya and Higher Himalaya. Shallow surface high conducting layer mapped throughout the profile, is characterized by the presence of trapped water/fluids expelled from the underthrusting sedimentary rocks. The Intra-Crustal Low Resistive Layer (IC-LRL) of the Himalayan wedge with a thickness of ~9 km marked with very low resistivity throughout the profile. The resistivity transition between the Indian basement and the base of the IC-LRL of the Himalayan wedge making the detachment or Main Himalayan Thrust (MHT) with a dipping angle of 3.5° in the Sub Himalaya, 6° in the Lesser Himalaya, and ramping with 21° to the south of the Munsiari Thrust and further dipping north-easterly with 5° at the north of the South Tibetan Detachment. Despite of some undulation in the scale, the observed geometry of the MHT with ramp structure in the present study is well reliable with the geometry of the MHT discovered by previous balanced geologic cross-sections in the study area and the adjacent Garhwal and Kumaun region.