

The INDEPTH Transect: Looking Back from Golmud to Yadong

Larry D. Brown¹, Wenjin Zhao², Project INDEPTH Team

¹ Institute for the Study of the Continents, Cornell University, Ithaca, NY 14853, U.S.A., ldb7@cornell.edu

² Chinese Academy of Geological Sciences, Beijing, People's Republic of China

In the summer of 2010, Project INDEPTH will essentially achieve its original vision of a modern geological and geophysical transect across of the Tibetan Plateau. INDEPTH IV, a suite of surveys focussed on the northeastern boundary of the Tibetan Plateau, represents the culmination of an initiative that began in 1992 with a simple multichannel reflection profile in the Himalayas, augmented by a modest wide-angle piggyback experiment (Zhao, Nelson and others, 1993). By the time INDEPTH reached the Qaidam basin, both the techniques for probing, and concepts put forward to explain, the Himalaya-Tibet collision zone had undergone a dramatic evolution. The INDEPTH profiles now stand as but one of a number of major seismic experiments that have probed key aspects of lithospheric structure and process.

Originally intended to focus primarily on the application of the then relatively novel multichannel seismic reflection technique to detail crustal structure, INDEPTH quickly evolved to integrate active (reflection, refraction) and passive (receiver function, tomographic inversion of earthquake recordings) seismology, and to link the seismic results with magnetotelluric observations in a particularly compelling manner. This combination proved critical to the interpretation of crustal melting at the southern margin of the plateau (Nelson and others, 1996). INDEPTH IV, for example, choreographed reflection (P wave), refraction (P and S wave), receiver function and magnetotelluric profiles across the Kunlun Mountains (Zhao and others, 2008), with a regional 2D seismic array (ASCENT) to probe mantle structure from central Tibet to the Qilian Shan northeast of the Qaidam Basin.

INDEPTH's targets have also shifted in response to the evolution of tectonic models emerging to explain the uplift of the plateau, from detailing the geometry of underthrusting of the Indian plate (Zhao, Nelson and others 1993), to the significance of channel flow in plateau uplift (Klemperer, 2006), to defining the mantle suture beneath central Tibet (Tillman and others, 2003) to searching for evidence of southward underthrusting of Asia along the northern boundary of the plateau (Kind and others, 2002). Beyond their initial interpretations, INDEPTH results have served as important components in joint analysis with observations from other major seismic experiments in Tibet (e.g. Li and others, 2008). The latest results from INDEPTH IV and the complementary ASCENT project are the focus of other presentations at this meeting. Here we take this opportunity to look back over the key findings of the INDEPTH traverse with the perspectives provided by subsequent geophysical surveys that have also confronted issues that were the focus of the INDEPTH effort (e.g. Nabelek and others, 2009).

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