From Texas to Tibet: 40 years of Systematic Crustal Exploration with Reflection Seismology

Larry D. Brown [1]

[1]Department of Earth and Atmospheric Sciences, Cornell University, Ithaca, NY 14853, ldb7@cornell.edu

The application of multichannel reflection seismology to the study of crustal structure was pioneered in the 1960's by a number of individual scientists, most notably from Australia, German and Canada. Building upon that foundation, the COCORP initiative in the US demonstrated that such techniques could be effectively applied to the systematic exploration of the continental crust by adapting oil industry resources. Following COCORP's initial crustal survey in northern Texas in 1975, other national programs based on deep reflection profiling were established around the world. Many of these introduced fresh aspects to such work. BIRPS (UK) demonstrated how marine seismic profiling could probe not only the crust but the underlying mantle. DEKORP (Germany) focused on integration of reflection results with crustal refraction observation, and ECORS (France) stressed the relevance of crustal reflection work to petroleum exploration. LITHOPROBE (Canada) perhaps best exemplified the integration of the new seismic profiles with other geophysical observations and surface geological mapping. SINOPROBE has taking such interdisciplinary integration to perhaps its ultimate limit, while stressing the importance of such work to our understanding natural resources. Meanwhile, Geoscience Australia expanded its work to span virtually an entire continent, onshore and offshore, which it recently summarized in perhaps the world's best database of crustal imagery, now freely available over the internet. Various European groups formed international cooperative programs, such as ECORS-CROP, to expand coverage across political borders, and multinational consortia such as INDEPTH have tackled the most challenging of targets from a global perspective. Even a brief summary of the most compelling results from even a few of these programs would challenge the limits of any abstract. Moreover, debate still rages over the proper interpretation of even some of the foundational surveys. Suffice it to say here that our concept of crustal heterogeneity has been profoundly transformed by these results. The original vision of a global network of seismic reflection profiles remains incomplete, and persistent issues, such as 3D, remain to be properly address. Yet new technologies offer fresh opportunities to address remaining questions, whether old or new.