Introduction

This collection of crustal reflection profiles has been created from the archives maintained by Geoscience Australia and includes all significant profiles for which the recording interval includes reflections from the whole crust. The objective is to provide access to an overview of crustal architecture across the continent, as a contribution to the delineation of the structure and evolution of the Australian continent. The reflection sections are presented as far as possible on the same horizontal and vertical scale and are accompanied by a geological strip map showing the configuration of the profile and its relation to other nearby lines.

The UNCOVER initiative launched by the then Minister for Resources and Energy, the Hon. Martin Ferguson, at the International Geological Congress in Brisbane in August 2012 identifies improved information on the subsurface as a prerequisite for extending exploration in Australia from regions of exposure into those with sedimentary cover. The seismic reflection profiles cover many different environments, and provide an insight into many areas with little surface rock.

The Bureau of Mineral Resources started experimental seismic reflection probing in the late 1950's with short lines, and this work was expanded through the 1960's to 1980's (Moss & Dooley, 1988), with major profiling undertaken in southern Queensland (Finlayson, 1990). Digital recording was introduced in 1976 and we present sections going back to the earliest phase of such recording. Until 1998 the reflection acquisition was undertaken using explosive sources in shotholes, using up to 120 channel acquisition systems yielding typically 6- or 12-fold data. In consequence the suppression of noise was limited, and although some sections have very good results, others are of lower quality.

In 1997 the Australian National Seismic Imaging Resource (ANSIR) was established as a Major National Research Facility, and purchased four 60,000lb vibrator trucks, which have subsequently been used in a wide range of geological environments. Recording spreads were expanded to 240 channels, and the much closer spacing of vibrator points meant that 60-fold cover could be achieved. Recently even more channels have been used, and 75-fold cover has been achieved. Terrex Seismic acted as manager of the reflection facility on behalf of ANSIR up to 2007, and since then as the primary contractor employed for deep crustal work.

The various reflection lines in this compilation have been undertaken by, or on behalf, of Geoscience Australia (and its predecessors) in association with State and Territory partners. A major boost came with the Australian Government's Onshore Energy Security Program in 2006-2011, with additional support in 2007-2011 from the AuScope research infrastructure program, that led to a further 6,500 km. Since 2012 investment from State Governments has enabled more than 4000 km of additional profiling. In all, over 16,000 km of reflection profiles penetrating the full crust have been collected under these programs.

All of the full-crustal reflection lines are included in this compilation, presented on uniform scales with accompanying geological strip map and representation of the geometry of the profile. As will be seen, there are substantial variations in crustal architecture and reflectivity, even along individual profiles. We have chosen to present the reflection sections without superimposed interpretation, so that such variations can be clearly seen and major features can be directly visualised. We provide references to the reports on the acquisition of the individual profiles and to the many papers that have been published on interpretations of particular reflection campaigns.

The crustal reflection sections have proved to be of considerable value in recent compilations of Moho structure in Australia (Kennett et al., 2011; Salmon et al., 2012), when used in combination with data from refraction and receiver function studies. The extensive geographic coverage provides valuable constraints on the thickness of the crust in many regions without other forms of control. The base of the crust is by no means smooth and reflection profiling has revealed a number of localised jumps in the depth to the Moho in different areas and geological environments.

References

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