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A Near Vertical Seismic Reflection Profile Across the Beattie Magnetic Anomaly, South Africa

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Under the Inkaba yeAfrica German/South African research collaboration, controlled source Near Vertical Reflection (NVR) Seismic data were acquired along a ca.100km profile, that traversed the Beattie Magnetic Anomaly (BMA). The purpose of the experiment was to image the crust and to gain an understanding of the source of the BMA. First results show a highly reflective crust with three distinct regions: the upper, middle and lower crust. In the upper crust, a series of flat lying reflectors at a depth of 2-8km, geologically represents the bedding of the Phanerozoic Karoo and Cape Supergroups. An apparent decollement seperates the Whitehill Formation near the base of the Karoo basin from the underlying Cape Supergroup. A seismically defined unconformity separates these sequences from a well defined ca. 20km thick mid-crustal layer that hosts the BMA. The mid-crustal layer is probably a subsurface continuation of the 1.0-2.0 Ga Namaqua-Natal Orogenic Belt amphibolite facies Bushmanland subprovince, which was subjected to amalgamation around 1.2Ga and extension around 1.0 Ga. The internal seismic fabric of the mid-crust dips north, in contrast with previous geological models that postulate a tectonic dip to the south. The probable source of the BMA appears as a narrow feature (10-20km wide) ranging from 8-28km in depth and confined to a structurally complex cryptic suture zone. The 5-25km thick lower crust displays a seismic fabric that dips south and may represent the granulite grade Namaqua. A possible lowermost layer, less than 5 km thick and parallel to the Moho, may represent mafic material that underplated the Namaqua Orogen during extensional tectonics at 1.0 Ga. The undulating Moho occurs at a depth of ca 42km and deepens to ca 45 km under the Cape Fold Belt in the south. Integration of the NVR data with tomography and magnetotelluric data along the same transect is in progress.