222

LATE NEOGENE CONTROLS ON SEDIMENTARY BASIN DEVELOPMENT BENEATH THE SOUTHERN MCMURDO ICE SHELF: NEW EVIDENCE FROM OVER-ICE MCS SURVEYS

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An 800 m thick sedimentary succession has been revealed beneath the Southern McMurdo Ice Shelf by 55 km of over-ice multi-channel seismic (MCS) data. The succession lies in ~500 m of water beneath the floating ice shelf which is in turn pinned between the southern volcanoes of the Ross Archipelago ~80 km east of the Transantarctic Mountain Front in southern Victoria Land. The surveys were carried out as a site investigation for a potential ANDRILL (Antarctic drilling) target.

The imaged succession is separated into two packages by an unconformity with up to ~200 m of relief. The overlying strata are relatively continuous and flat lying and reach thickness of ~600 m. Beneath the unconformity the strata are more deformed and have a faster p-wave velocity.

The unconformity is interpreted to mark the onset of volcanism and a shift from rifting to flexure as the primary control on sedimentary basin development. Local loading of the crust intensified between 7-3 Ma with the majority of Minna Bluff, Mount Discovery and Black and White islands being erupted.

The MCS surveys along with gravity data indicate a structural discontinuity at the eastern edge of the ice shelf, which is interpreted to correlate with the N-S trending tectonic fabric of the Terror Rift. Faulting predates deposition of the flat lying (flexural) succession. The strata are up-thrown to the east and show evidence of subsequent erosion. Several volcanic intrusions are also imaged in the seismic sections, which also appear to exploit the N-S trending rift fabric.

A flexural model was used to construct a synthetic stratigraphy, which provides an independent test for the hypothesis of a flexural origin for the upper sedimentary package.