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BASIN DEVELOPMENT BENEATH THE SOUTHERN MCMURDO ICE SHELF (SMIS) – COMBINED GEOPHYSICAL AND GLACIAL GEOLOGICAL EVIDENCE FOR A POTENTIAL PALEOGENE DRILLING TARGET FOR ANDRILL.

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An in-situ record of the transition from a greenhouse to glaciated Antarctica has thus far remained elusive despite many years of geophysical investigations and drilling programmes around the Antarctic margin. Until such a record is available our understanding of the early glaciation of Antarctica will rely on the interpretation of deep sea proxy records and climate models. Both of these approaches will be strengthened by validation from direct records of climate, vegetation, and glaciation from the Antarctic craton.

Here we present the combined results of several years of geophysical (aeromagnetic, gravity, seismic, flexure modelling) and glacial geological (moraine & ice shelf mapping) investigations of the Southern McMurdo Ice Shelf (SMIS) region. Gravity and seismic data indicate a shallow (<300m) flexural basin beneath the SMIS resulting from the combined loads of Mts. Morning & Discovery, Minna Bluff and Black & White Islands. Ages from the various volcanic loads suggest that loading began in the early Neogene but was complete by 2-3 Ma. An underlying N-S tectonic fabric is also imaged by the aeromagnetic survey along with a N-S structural high between Minna Bluff and White Island which separates the flexural basin from the Ross Sea and is also observed in seismic and gravity data.

The structural high between Minna Bluff and White Island has uplifted pre-flexure strata into the path of Plio-Pleistocene W and NW flowing grounded marine ice sheets, which have in turn distributed sediment and glacial erratics around the margin of the SMIS including pre-glacial Eocene erratics found on the flanks of Minna Bluff and Mount Discovery as well as on the ice shelf surface between Black Island and Brown Peninsula.

It is these pre-flexure strata that are now proposed as a potential target for the next phase of drilling under the ANDRILL programme.