Abstract: We mapped glacial geologic features in the Schmidt and Williams Hills, ranges of nunataks adjacent to Foundation Ice Stream (FIS). FIS, which flows past the western flanks of the Pensacola Mountains in West Antarctica, drains ice from the central EAIS into the WAIS, and discharges into the Weddell Sea Embayment. Our maps allow us to identify past changes in ice thickness, which improve our understanding of ice sheet response to climate change. Glacial erratics with distinct extents of weathering reveal at least two periods of glaciation. Evidence indicates that during a glacial maximum local ice thickness exceeded current ice thickness by 700 m, and was thick enough to flow obliquely over the hills, toward FIS. During subsequent deglaciation, ice flow became topographically constrained and only ice stream-parallel flow is recorded. In addition, the preservation of erratics perched on patterned ground and frost-shattered bedrock represent at least two glaciations, and suggest the presence of thin, cold-based ice cover. This interpretation is supported by sparse evidence of glacial erosion. Future work will use surface-exposure dating to determine the timing of glacial advance and retreat.

Results: GEOMORPHIC TRENDS ON EXPOSED NUNATAKS

Thin bedrock ridges lead to steep frost-heaved slopes. Downhill from frost-heaved slopes, elevation gradients lessen as patterned ground appears. Patterned ground is most developed at higher elevations; ice margins show little to no development of patterned ground.

FOUR SETS OF STRIATIONS ON FOUNDATION ICE STREAM

At an elevation of 230 m above the present ice surface, a set of striations were found on Mt. Nervo, transverse to the hills. No Name Nunatak had two sets of striations in a crosscutting relationship. One set was oriented at 307°, the other crosscutting at 240°. Striations were also found on the northern portion of Point 500, oriented at 230°.

TWO SETS OF STRIATIONS FOUND IN WILLIAMS HILLS

One set was located on Tenny Rock, oriented at 280-290°. The other set was located on Pillow Knob, oriented at 305-310°. TALLEST PEAK HAS A SCoured SURFACE

562 m above present day ice, Mt. Hobbs, has a scoured and rounded peak. GLACIAL ERRATICS WITH VARIOUS WEATHERING EXTENTS

Many nunataks had glacial erratics with varying extents of surficial weathering. Notably, Mt. Hobbs’ peak was scattered with highly weathered erratics; less weathered erratics were found ~100 m below.

Background: Data concerning deglaciation within the Weddell Sea Sector following the last glacial maximum is sparse and unconstrained. Ice elevation extents for the last glacial maximum are still widely varied, ranging from 200 m (Fogwill et al., 2004) to 800 m (Hoffle et al., 1995) above present day ice surfaces and the rate at which ice retreated is unknown. Published last glacial maximum exposure ages range from 6,500 (Bentley, 1998) years ago to 1.2 million years ago (Frogill et al., 2004), with little to no data concerning subsequent deglaciation rates.

The Schmidt and Williams Hills, located in the western Pensacola Mountains are adjacent to the Foundation Ice Stream (FIS). The close proximity of the hills to FIS allows for a thorough study of FIS elevation changes through geomorphic remains.

Interpretations

MULTIPLE PERIODS OF GLACIATION

The presence of glacial erratics with varying weathering extents indicates multiple glaciations. Perched erratics on patterned ground and frost-heaved surfaces indicate cold-based glaciers preserved landforms (Bjork et al., 2002). ALL NUNATAKS WERE OVERRUN AT LEAST ONCE

Glacial erratics found on scoured peaks show that ice eroded peaks during a maximum and exposed deposited erratics during retreat. The erosive power needed to scour peaks to this extent would require a warm-based glacier (Robinson, 1984).

ERRATICS FOUND WITH VARIOUS WEATHERING EXTENTS

Adjacent erratics with different amounts of weathering indicate cold-based ice cover and weakly erosive conditions. Relatively weathered erratics in close proximity to unworn weathered erratics on Mt. Hobbs records either a thermal regime boundary or a recent glaciation depositing erratics next to erratics deposited during an earlier glaciation.

SURFACE DEPOSITS REFLECT LONG-TERM PERIGLACIATION

Down slope geomorphic trends result from prolonged periods of exposure within periglacial regimes. Prolonged exposure leads to shucking material from bedrock ridges onto slopes. Down slope movement continues until lower elevation gradients are reached, allowing in situ sorting (Brook, 1972).

STRIATIONS RECORD CHANGING FLOW DIRECTION

Crosscutting striations on the Schmidt Hills indicate local changes in ice thickness and flow direction. Crosscutting striations indicate a change from ice stream-parallel flow to frost heaved ice surfaces with oblique flow.

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