Glacial Geomorphology of the Pensacola Mountains, Weddell Sea Sector, Antarctica

Matthew Hegland, Michael Vermeulen, Claire Todd, Greg Balco, Kathleen Huybers, Seth Campbell, Howard Conway, Chris Simmons

We mapped glacial geologic features in the Thomas, Schmidt, and Williams Hills in the western Pensacola Mountains. The three nunatak ranges are adjacent to the Foundation Ice Stream (FIS), which drains ice from the East and West Antarctic Ice Sheets (EAIS and WAIS), into the Filchner-Ronne Ice Shelf. Glacial deposits in the Pensacola Mountains record changes in the ice thickness of the FIS and provide insight into ice sheet history. Glacial scour on Mount Hobbs, Williams Hills suggests maximum ice thickness was at least 562 m greater than today and striations atop Martin Peak, Thomas Hills suggest ice here was at least 675 m thicker. Glacial striations oriented transverse to topography indicate that ice was thick enough to flow unconstrained over topography and suggest increased contribution from the EAIS. In the Schmidt and Williams Hills, depositional landforms are sparse with occasional highly weathered erratics found over 100 m above the modern ice surface and relatively unweathered erratics deposited beside them below 100 m, suggesting preservation of older erratics in a cold-based environment. Upstream in the Thomas Hills, a highly-weathered till is present at all elevations; this deposit (a) contains lots of clay, indicating wet-based ice, (b) has a highly-oxidized surface layer, and (c) includes highly-weathered surface boulders, indicating long-past thick ice cover. This till is sparsely covered at a range of elevations by erratics with different degrees of weathering. At low elevations, greater depositional volume is observed in preserved moraines and relatively unweathered till that indicate multiple ice surfaces 20 - 100 m higher than today; these features likely post-date the last glacial maximum. Preliminary numerical modeling of ice surfaces in the Thomas Hills suggest elevation changes could be attributed to local variations in ablation in addition to surface elevation changes in the FIS.