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## 69-10 - REVISITING EXCEPTIONALLY PRESERVED S-FORMS, STRIAE, AND FRACTURES FROM LATE PALEOZOIC SUBGLACIAL SURFACES IN PALEOFJORDS, NW NAMIBIA



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### Abstract

Determining the ice dynamics of deep-time glaciations is limited by the scarcity of well-preserved subglacial erosional features and their irregular distribution. In particular, small-scale erosional features known as s-forms that are subglacially sculpted in bedrock by water and/or ice are rarely preserved from the pre-Cenozoic record. A detailed re-examination of two late Paleozoic (late Carboniferous – early Permian) glacially-polished, surfaces within paleofjords located in the Kaokoveld region of NW Namibia reveals a diverse range of erosional features that includes: complex, multi-directional striae that crosscut each other and ornament s-forms, crescentic markings, chattermark trails, rat tails, Nye channels, linear and sinuous furrows, transverse troughs, comma forms, sichelwannen, muschelbrüche, cavettos, and a pothole. The first study location consists of s-forms, striae, and fractures on a polished granite bedrock surface located on the paleovalley floor. Striae, crescentic markings, and chattermark trails indicate ice movement to the NW (mean azimuth of  $\sim 280^\circ$ ). The second location is located on a multi-storied, resistant, quartzite bedrock ridge or sill close to or on the valley wall. This location contains numerous s-forms, Nye channels, striae, rat-tails, and fractures, as well as onlapping glaciogenic sediments and diamictite that has been plastered within a pothole. Some of these features are superimposed on a whaleback. These erosional features were likely formed by a combination of pressurized subglacial meltwater and glacial abrasion underneath a glacier as it flowed over and around a resistant bedrock escarpment. Orientations of striae and chattermark trails indicate a primary direction of ice movement to the NW (modal azimuth of  $\sim 275^\circ$ ), a very minor secondary movement to the SW ( $\sim 220^\circ$ ), and abundant third-order striae indicating ice flow around bedrock obstacles. The complex relationships between striae, fractures, and s-forms at this location suggests that a combination of pressure melting, abundant subglacial meltwater, debris-rich basal ice, and variable ice flow paths around resistant obstacles was required to form these features. These combined results imply the study locations were overridden by relatively thick ( $>210$  m) warm-based to polythermal glaciers that were confined to a network of fjords as ice receded and stagnated. The glaciers flowed northwest into present-day Brazil during the late Paleozoic and may have overtopped the paleovalley walls during times of ice maxima.

Geological Society of America Abstracts with Programs. Vol. 54, No. 5, 2022  
doi: 10.1130/abs/2022AM-377393

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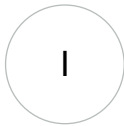
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