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# Landform surface analysis of Schirmacher Oasis, East Antarctica as an indicator of geomorphological evolution

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Landforms are the results of erosion and other geomorphological processes occurring at the surface of Earth's crust and have a significant control on the evolution of the terrain. This control is either direct or indirect. The direct control is influenced by geomorphometric variables or geomorphological processes. The indirect control is manifested by the influence of landforms on other environment conditions that has a role in reshaping the Earth surface by slope and aspect on surrounding meteorological conditions.

The Polar Regions of the Earth are marked by the wide spread presence of cold-dry type glaciers, polythermal glaciers and Polar ice sheets. The deglaciated terrain in these regions exhibit landforms that are generally hyper-arid and cold-polar desert type. Schirmacher Oasis having a maximum width of 3.35 km, a length of 19.55 km and oriented approximately in east-west direction with an area of approximately 34 sq. km. is an ice-free area in central Dronning Maud Land, East Antarctica located between Nivlisen Ice shelf to its north and Polar Ice sheet to its south with maximum elevation of 245 m above mean sea level.

The geological units of this area includes high-grade metamorphic suite of rocks represented by banded-gneiss, garnet-biotite gneiss, calc-gneiss, khondalite, augen-gneiss and streaky-gneiss as the dominant lithologies. In this study we compared landforms and bedrock properties of quartzofeldspathic gneisses, Garnet biotite gneiss and metapelites. Erosional landforms features of roche moutonnees produced out of these features were studied. Profiles of the landforms are distinct in each case and the normalized curve between the landforms indicate that quartzofeldspathic gneiss produce more angular features while that of the garnet biotite gneiss and metapelites tend to produce smooth landforms. The landform surface analysis also suggests that the radius of curvature in case of quartzofeldspathic gneiss is smaller for the similar height of landform of garnet biotite gneiss and metapelites. The change in area profile and the length profile is also smaller in the former rock unit than the later rock units.

Throughout the oasis, glacial striations of different orientations showing cross cutting relationship at places and the development of valleys of different dimensions with varying orientations indicate more than one episode of Polar ice sheet advancement. The spread of moraine deposits throughout the oasis and presence of erratics over the highest points also indicate a thick ice cover which might have undergone one or more phases of recession. The presence of angular blocks of large boulders indicating cold-based glacier advancement and the smooth bedrock surface showing glacier striations suggesting warm-based glacier advancement also support the multiple phases of glacier advancement and recession. The analysis of glacial striations and groovings visible today at one of the highest parts (212 m) of the oasis situated about 1.8 Km inland from the ice shelf margin indicate the ice thickness to be

around 225 m over it, which in theoretical Nye ice sheet profiles suggest to lie at a distance of 8.7 Km from the Paleo ice sheet margin. Similar analysis at a number of places indicates the Paleo ice sheet margin to be further away towards Nivlisen ice shelf. All these landform surface analysis thus help in reconstruction of geomorphological evolution of the Schirmacher Oasis of East Antarctica.