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Geomorphology of subglacial ribbed-Rogen moraines of Early Pleistocene age, southernmost Patagonia, Argentina

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A wide variety of glacial sedimentary deposits and glacial landforms are found in southernmost Patagonia. These units were generated along the southeastern margin of the Patagonian Ice Sheet in the province of Santa Cruz (Argentina) and the Magallanes region of Chile (latitude 52° S and longitude 71° W).

The more extensive glaciation in this area was the Great Patagonian Glaciation (GPG, Mercer 1976), of Early Pleistocene age, probably developed during the Marine Isotope Stages (MIS) 30 and 32. The younger glaciations were defined as piedmont glaciations, developed during the Early and Middle Pleistocene.

In most cases, these ice flows displayed a piedmont lobe morphology, with wet-based glaciers, which generated a large variety of sub-glacial linear landforms. Other landforms occur as irregular crests, perpendicular to the direction of ice flow, with adjacent depressions, located in the higher portions of the ice lobes.

This work is centred in the geomorphological studies of elongated sub-glacial features such as drumlins, flutes and megaflutes, but also of other landforms, much less frequent in Patagonia, as ribbed/Rögen moraines and eskers.

These ribbed/Rögen moraines present an average separation between crests of 400 m and a width of hundreds of m. The observed lengths vary between hundreds of m to km. The elevations vary from 5 to 20 m, from the highest to the lowest points of the adjacent depression. These features are similar to the ribbed/Rögen moraines described by Lundqvist (1989).

The ribbed/Rögen moraines are located in relict terrains, corresponding to the oldest glaciations of this area. They are part of a basal moraine of Early Pleistocene age. These features are rarely preserved because younger melt waters destroyed or buried the pre-existing landforms. In this case, the Rogen moraines have been preserved only in the highest portion of the basal moraines. Interference of the ice flow directions would have forced lower ice velocities and the possibility of cold-based glaciers development, which formed the ribbed/Rogen moraines found in the highest portions of the valley.

Consequently, a low basal velocity of the ice would have permitted the possibility of creating cold-based ice. The presence of scarce or absent melt water at the base of the ice could be explained because ice was far from the pressure melting point. Thus, this ice lobe would have been, at least partially a cold-based glacier, or even a polythermal glacier, that would have been replaced later on by a wet-based ice flow. Other aligned subglacial landforms are younger than the glaciation that

formed the ribbed moraines. This paper shows that these linear landforms of sub-glacial origin are superimposed to an even older glacial landscape, characterized by ribbed/Rogen moraines.