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A Late Ordovician ice sheet in South America: Evidence from the Cancañiri tillites, southern Bolivia

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ABSTRACT

Detailed mapping and facies analysis of a thick succession of diamictites of the Upper Ordovician Cancañiri Formation in southern Bolivia has revealed a glacioterrestrial origin for these sediments. The Cancañiri diamictites were deposited during three advances of a temperate, grounded ice sheet. They contain subglacial, englacial, and proglacial outwash sediments that increase in abundance from southeast to northwest. Clast fabrics and deformation features indicate SSE to NNW motion of the ice masses. Components of the diamictites usually display abrasion features such as facets and glacial striae. Provenance studies indicate that the pebbles comprise ~35% of siliciclastic sediments, mainly from the underlying shallow marine Ordovician rocks, 27% of slightly metamorphosed sediments that in part can be attributed to the Precambrian–Cambrian Puncoviscana Formation of northwestern Argentina, and a crystalline basement suite of metamorphic rocks (18%) and magmatic (mainly plutonic) rocks (20%). Due to the absence of typical lithologies, the Brazilian Shield, the Paraguay belt, and the southern Arequipa-Antofalla block could be excluded as possible source areas. The crystalline and metasedimentary clasts display strong affinities with the Pampean basement in central Argentina. All data consistently suggest that the Cancañiri tillites of southern Bolivia were deposited by a regional, low-latitude ice sheet that was independent of the main inland ice mass of Gondwana and centered SSE of the study area, in a Neoproterozoic to Cambrian orogenic belt in the area of the present Argentinean Chaco.

Keywords: Cancañiri diamictites, southern Bolivia, glacioterrestrial environment, Pampean provenance, South American ice sheet, Late Ordovician

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