



A multiple-center glaciation in the Late Ordovician? Tillites from southern Bolivia suggest an independent, temperate ice shield in South America.

F. Schönián

Museum of Natural History, Humboldt-University of Berlin, Invalidenstrasse 43, D-10115
Berlin, Germany.

Reconstructions of the Late Ordovician glaciation commonly display a single ice sheet that covers most of the Gondwanan continent. Better understanding of its actual extent or evidence for several independent ice shields would significantly improve our models applied to explain a sudden glaciation within a greenhouse period. A detailed facies analysis of a thick succession of diamictites of the Cancañiri Formation in southern Bolivia has revealed a glacial origin for these sediments. The diamictites rest disconformably upon shallow marine sediments of middle Arenigian age and are overlain by ferriferous sandstones of the basal Llandoveryan. The formation is composed of three units of massive diamictites with little variability. They contain subglacial, englacial, and proglacial outwash sediments that increase in abundance from SE to NW. Clast fabrics and deformation features indicate a transport direction from SSE to NNW. Components usually display glacial abrasion features. Provenance studies indicate that the pebbles comprise about 35% of siliciclastic sediments from the underlying, shallow marine Ordovician rocks, 27% of slightly metamorphosed sediments that can be attributed to the Precambrian-Cambrian Puncoviscana Formation of NW Argentina, as well as a crystalline basement suite of metamorphic (18%) and magmatic (mainly plutonic) rocks (20%). The Brazilian Shield, the Paraguay Belt and the Arequipa-Antofalla Block could be excluded as source areas. The crystalline clasts show strong affinities with the basement of the Pampean Massif of central Argentina. The Cancañiri diamictites of southern Bolivia can be correlated with the Late Ordovician glacial deposits of NW and W Argentina and were deposited in a glacioterrestrial environment during three advances of a regional, low-latitude ice shield centered in a Neoproterozoic to Cambrian orogenic belt SSE of the study area.