

**GRAN CAMPO NEVADO,
CHILE 1:65,000**

(Aerial Photogrammetric Map and Glacier Inventory)

C. Schneider¹, M. Schnirch¹, C. Casassa², C. Acuña² and R. Kilian³

¹ Institut für Physische Geographie, Universität Freiburg, DE

² Centro de Estudios Científicos, Valdivia, CL

³ Fachbereich Geowissenschaften, Universität Trier, DE

The Gran Campo Nevado is a small ice cap of 200 km² at 53° S, 73.5° W in Chile's XII. region 'Magallanes'. The Gran Campo Nevado forms the only major ice body between the southern tip of the Southern Patagonian Ice Field and the Strait of Magellan. It is located on the southern part of Península Muñoz Gamero to the southwest of Seno Skyring. Besides the ice cap of the Gran Campo Nevado itself there are a number of small valley and cirque glaciers on Península Muñoz Gamero with a total area of 53 km². In 2002 this ice cap, its outlet glaciers and the surrounding small bodies of ice have been inventoried for the first time. 81 individual glaciers were delineated and numbered in accordance with WGMS standards.

The aerial photogrammetric map was produced using a series of aerial photographs of the Instituto Geográfico Militar de Chile from 1998. Pre-processing of the data and aerial triangulation were performed at the Department of Geography at the University of Düsseldorf, Germany. A basic digital elevation model (DEM) was derived from digitised contour lines from the topographic map 'Península Muñoz Gamero' at the scale 1:100,000 of the Instituto Geográfico Militar de Chile. This map is based on a series of aerial photographs from 1984. The raw DEM was improved by individual photogrammetric point measurements on summits and along ridges within the aerial photographs from 1998. All DEM data were incorporated into a Geographic Information System for post-processing, interpolation and gridding of elevation data. The aerial photographs were ortho-rectified according to the DEM employing the LISA software which was kindly provided by the Department of Geography, University of Düsseldorf, Germany.

Due to the limited resolution of the underlying map information, absolute horizontal accuracy is ± 100 m. Relative distances within the map are accurate to ± 10 m. Error estimation of the vertical information of the DEM yields an estimate of ± 35 m. However, since the elevation data is based on aerial photographs from 1984 and the actual aerial photographs used are dating from 1998, much larger errors on ice surfaces must be considered. On the ice cap itself there are wide areas where, due to low contrast or cloud coverage, precise measurements of elevation could not be derived. In these areas the location of the contour lines are only estimated visually and are therefore stippled in the ortho-photogrammetric map.

A time series of aerial photographs and satellite imagery was used to calculate the area change of individual outlet glaciers of the Gran Campo Nevado Ice Cap. All of the nine

outlet glaciers that were investigated in detail showed considerable retreat between 1942 and 2002 with a mean value of 2.4% of area loss per glacier per decade. This amounts to a total loss of surface within the nine individual drainage basins of between 8% and 26% since 1942.