

## A GIS-BASED GLACIER INVENTORY FOR THE ANTARCTIC PENINSULA AND THE SOUTH SHETLAND ISLANDS —A FIRST CASE STUDY ON KING GEORGE ISLAND

Matthias Braun  
F.Rau  
Jefferson Cardia Sines

**Abstract:** The aim of the international project "Global Land Ice Measurements from Space (GLIMS)" headed by the US Geological Survey is to establish a world wide glacier inventory based on satellite imagery. This data set will form a first digital baseline study for future glacier monitoring. The presented GIS-based glacier inventory for King George Island is a case study for the area of the Antarctic Peninsula. In the database of the glacier inventory topographic information, specific glaciological parameters as well as metadata will be included. The topographic data consists of drainage basin limits, basin areas, altitudinal ranges, perimeters and mean lengths. Glaciological data sets should comprise information on glacier retreat in different periods, glacier velocities, ice thickness and bedrock topography as well as derived parameters. Modelled and measured mass balance parameters could be included as additional data layers. In particular, these metadata records must comprise background information on data accuracy and data sources and should be compatible with a future data model for the King George Island GIS (KGIS). Three examples illustrate that the GLIMS database will not only contain information valuable for glaciological applications, but also other environmental studies on the island will benefit from this standardised remote sensing data sets. Therefore, a very close link between the data models of KGIS and GLIMS has to be established to enable these synergisms. Finally, better access to historic aerial photography would enable a continuous record of glacier retreat from the beginning of the 1950's onward

**Keywords** □ WORDS King George Island; South Shetland Islands; geographic information system; glacier inventory; glacier retreat; glacier parameters

**作者简介:** Matthias Braun, Institut für Physische Geographie, Albert-Ludwigs-Universität Freiburg, Werderring 4, D-79085 Freiburg, Germany

### 参考文献:

[35] Braun M, Rau F. Using a multi-year data archive of ERS SAR imagery for the monitoring of firn line positions and ablation patterns on the King George Island ice cap (Antarctica). The Workshop of EARSeL Special Interest Group: Remote Sensing of Land Ice and Snow. Dresden, 2000 (published on CD\_Rom in 2001)

[36] Rau F, Braun M, Friedrich M, et al. Radar glacier zones and its boundaries as indicators of glacier mass balance and climatic variability. The Workshop of EARSeL Special Interest Group: Remote Sensing of Land Ice and Snow. Dresden, 2000 (published on CD\_Rom in 2001)

- [ 1 ] Bahr D B.Global distribution of glacier properties:A stochastic scaling paradigm.Water Resource Research,1997,33(7):1 669~1 679
- [ 2 ] Bahr D B,Meier M F.Snow patch and glacier size distributions.Water Resource Research,2000,36(2): 495~501
- [ 3 ] Braun M,Schneider C.Characteristics of summer energy balance on the west coast of the Antarctic Peninsula.Annals of Glaciology,2000,31:179~183
- [ 4 ] Braun M,Rau F,Saurer H,et al.The development of radar glacier zones on the King George Island Ice Cap (Antarctica) during the Austral summer 1996~1997 as observed in ERS\_2 SAR data.Annals of Glaciology,2000,31: 357~363
- [ 5 ] Calvet J,Corbera J,Furada G.Variacion del frente glaciar en Bahía Sur y Punta Siddons entre 1956 y 1991,Isla Livingston,Islands Shetland del Sur.In: López\_Martínez,J.: Geología de la Antártida Occidental.III Congreso Geológico de España y VIII Congreso Latinoamericano de Geología,Salamanca,España,1992.283~292
- [ 6 ] Doake C S M,Vaughan D G.Rapid disintegration of the Wordie Ice Shelf in response to atmospheric warming.Nature,1991,350(6 316):328~330
- [ 7 ] Doake C S M,Corr H F J,Rott H,et al.Break\_up and conditions for stability of the northern Larsen Ice Shelf,Antarctica.Nature,1998,391:778~780
- [ 8 ] Fox A J,Cooper A P R.Climate\_change indicators from archival aerial photography of the Antarctic Peninsula.Annals of Glaciology,1998,27:636~642
- [ 9 ] Harangozo S A,Colwell S R,King J C.An analysis of a 34\_year air temperature record from Fossil Bluff (71° S,68° W),Antarctica.Antarctic Science,1997,9(3):355~363
- [ 10 ] Hulbe C L.Recent changes to Antarctic Peninsula ice shelves: what lessons have been learned? Natural Science,1997,1(6)
- [ 11 ] Jones P D.Antarctic temperatures over the present century—a study of the early expedition record.Journal of Climate,1990,3:1 193~1 203
- [ 12 ] Kieffer H and 41 others.New eyes from the sky measure glaciers and ice sheets.EOS,2000,81(24):265,270~271
- [ 13 ] King J C.Recent climate variability in the vicinity of the Antarctic Peninsula.International Journal of Climatology,1994,14:357~369
- [ 14 ] King J C,Harangozo S A.Climate change in the western Antarctic Peninsula since 1945: observations and possible causes.Annals of Glaciology,1998,27:571~575
- [ 15 ] Klser H,Arntz W E.RASCAL (RESEARCH on Antarctic Shallow Coastal and Litoral systems).Untersuchungen zur Struktur und Dynamik eines antarktischen Küsten\_josystems.Polarforschung,1994,64(1):27~41
- [ 16 ] Klser H,Ferreyra G,Schloss I,et al.Hydrography of Potter Cove,a small fjord\_like inlet in King George Island,South Shetlands.Estuarine,Coastal and Shelf Science,1994,38: 523~537
- [ 17 ] Lucchitta B K,Rosanova C E.Retreat of northern margins of George VI and Wilkins Ice Shelves,Antarctic Peninsula.Annals of Glaciology,1998,27: 41~46
- [ 18 ] Morris E M.Surface ablation rates on Moraine Corrie Glacier,Antarctica.Global and Planetary Change,1999,22: 221~231
- [ 19 ] Park B K,Chang S K,Yoon H I,et al.Recent retreat of ice cliffs,King George Island,South

- Shetland Islands, Antarctic Peninsula. *Annals of Glaciology*, 1998, 27: 633~635
- [20] Rakusa\_Suszczeński S. The maritime Antarctic coastal ecosystem of Admiralty Bay. Department of Antarctic Biology, Polish Academy of Sciences, Warsaw, 1993. 216
- [21] Rakusa\_Suszczeński S. The hydrography of Admiralty Bay and its inlets, coves and lagoons (King George Island, Antarctica). *Polish Polar Research*, 1995, 16(1/2): 61~70
- [22] Rau F, Braun M, Saurer H, et al. Multi\_year snow cover dynamics on the Antarctic Peninsula using SAR imagery. *Polarforschung*, 2000, 67(1/2): 27~40
- [23] Rott H, Skvarca P, Nagler T. Rapid Collapse of northern Larsen Ice Shelf, Antarctica. *Science*, 1996, 271: 788~792
- [24] Rott H, Rack W, Nagler T, et al. Climatically induced retreat and collapse of northern Larsen Ice Shelf, Antarctic Peninsula. *Annals of Glaciology*, 1998, 27: 86~92
- [25] Skvarca P, Rack W, Rott H, et al. Evidence of recent climatic warming on the eastern Antarctic Peninsula. *Annals of Glaciology*, 1998, 27: 628~932
- [26] Simões J C, Bremer U F, Aquino F E, et al. Morphology and variations of glacial drainage basins in the King George Island ice field, Antarctica. *Annals of Glaciology*, 1999, 29: 220~224
- [27] Smith A M, Vaughan D G, Doake C S M, et al. Surface lowering of the ice ramp at Rothera Point, Antarctic Peninsula, in response to regional climate change. *Annals of Glaciology*, 1998, 27: 113~118
- [28] Smith R C, Stammerjohn S E, Baker K S. Surface air temperature variations in the western Antarctic Peninsula region. *Antarctic Research Series*, 1996, 70: 105~121
- [29] Splettstoesser J. Antarctic Global Warming? *Nature*, 1992, 355(6 360): 503
- [30] Stark P. Climatic warming in the central Antarctic Peninsula area. *Weather*, 1994, 49(6): 215~220
- [31] Turner J, Colwell S R, Harangozo S. Variability of precipitation over the coastal western Antarctic Peninsula from synoptic observations. *Journal of Geophysical Research*, 1997, 102(D12): 13 999~14 007
- [32] Warren C R. Iceberg calving and the glaciomarine record. *Progress in Physical Geography*, 1992, 16(3): 253~282
- [33] Wunderle S. Die Schneedeckendynamik der Antarkische Halbinsel und ihre Erfassung mit aktiven und passiven Fernerkundungsverfahren. *Freiburger Geographische Hefte*, 1996, 48: 172
- [34] Braun M, Saurer H, Vogt S, Simões J C, et al. The influence of large\_scale atmospheric circulation on surface energy balance on the ice cap of King George Island. *International Journal of Climatology*, 2001, 21(1): 21~36

出版日期：2001年6月1日

<http://www.wanfangdata.com.cn/qikan/periodical/Articles/dqkjxxkxxb-e/dqkj2001/0102/010203.htm>