

A New Satellite Image Map of King George Island (South Shetland Islands, Antarctica)

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Summary: A new satellite image map in the scale of 1:100 000 of King George Island (Antarctica) is presented. A multi-spectral SPOT satellite image mosaic from 1994/2000 forms the base of the map. Contour lines were derived from a digital elevation model, which was computed from various data sources. Comprehensive meta-information on map accuracy and compilation is included on the map.

Zusammenfassung: Eine neue Satellitenbildkarte im Maßstab 1: 100 000 für King George Island (Antarktis) wird vorgestellt. Grundlage der Karte ist ein multispektrales SPOT Satellitenbildmosaik aus dem Jahre 1994/2000. Die Höhenlinien wurden aus einem digitalen Geländemodell abgeleitet, welches aus verschiedenen Quellen generiert wurde. Umfangreiche Metainformationen zur Kartenerstellung und Genauigkeit wurden in die Karte aufgenommen.

BACKGROUND

The South Shetland Islands, and in particular King George Island, gained historic importance by the first landfall on the Antarctic continent in 1819. Subsequently, sealing and whaling ships frequently visited the region due to its rich fauna, sheltered harbours and relatively easy access. Until today, King George Island remains one of the most frequented sites in Antarctica, now with 10 permanent research stations and several minor refuges located all around the island. The Chilean air strip on Fildes Peninsula forms a major turntable of logistic operations for the Antarctica Peninsula region down to the Filchner Ronne area. Moreover, several thousand tourists visit the island each year. At present, five sites of special scientific interest (SSSI) and the first Antarctic Specially Managed Area (ASMA) are designated on King George Island to protect ecologically sensible areas. Nevertheless the human presence leads to a considerable impact on the vulnerable ecosystems.

As a consequence, probably nowhere else in Antarctica the need for coordinated approaches in research activities and environmental management is more evident than on King George Island. This is reflected by recommendation XXVI-6 by the Scientific Committee on Antarctic Research (SCAR) adopted at the XXVIth Meeting of SCAR in Tokyo, July 2000,

calling for efforts to integrate scientific objectives and for collaboration among the nations working on the island.

Frequently a major obstacle for the successful implementation of such agreements and measures, e.g. management plans or joint research projects, in Antarctic regions is a lack of adequate topographic information. Although charting of King George Island started within the first years after its discovery, a reliable map for the entire island was lacking so far. The present satellite image map in a scale of 1 : 100 000 closes the gap between several large-scale maps for isolated ice-free areas and overview maps in the scale smaller than 1: 200 000. In addition, the digital basis of this map forms a comprehensive platform for the King George Island GIS (KGIS) project by the SCAR Working Group on Geodesy and Geographic Information (WGGGI) (CISAK 2001, SIMOES et al. 2001, VOGT 2001) and the global glacier inventory compiled by the GLIMS initiative (BRAUN et al. 2001a).

THE KING GEORGE ISLAND SATELLITE IMAGE MAP

To enable a wide-spread application of the map, emphasis was drawn to implement the recommendations of the SCAR WGGGI (SIEVERS & BENNETT 1989) as well as to include meta-information about data sources, data processing and accuracy.

A satellite image mosaic based on a multi-spectral SPOT scene from February 23rd, 2000 supplemented with scenes from November 26th, 1994 and March 20th, 1995 forms the data base of the map. Hence the map shows the current state of glacier front positions, which have considerably retreated in the last decades (e.g. BRAUN 2001, SIMOES et al. 1999, WUNDERLE 1996). The imagery was geo-rectified using 12 reference points and seven control points from maps and GPS observations in Admiralty Bay, Fildes Peninsula and on Stigant Point.

Contour lines were derived from a digital elevation model (DEM) computed for the entire island using data extracted from various large-scale maps. Furthermore, highly accurate topographic data from two mobile DGPS surveys in 1997/98 and 1999/2000 were included for the central ice cap of the island. A comprehensive description of the DEM compilation is given in BRAUN et al. (2001b). The annotations of the map contain a figure where the different input data layers are shown and a table with the respective accuracy is given, too. Thus an estimation of the elevation accuracy for different areas of the map is facilitated. Deficiencies can be identified in the eastern part of the island where available accurate

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topographic data remain scarce. However, due to features such as shading visible in the underlying satellite image, the topographic information is considerably improved in comparison with the so far only available map in a similar scale (ANTARCTIC PLACE NAMES COMMITTEE OF FOREIGN AND COMMONWEALTH 1986).

Place names were extracted from the online Gazetteer Antarctica compiled by the SCAR WGGGI (WORKING GROUP ON GEODESY AND GEOGRAPHIC INFORMATION 1999). However, multi-naming and therefore naming ambiguities are common on King George Island due to the long-standing activities of a great variety of nations working on the island. In such cases, the suggestions by SIEVERS & THOMSON (1998) were followed granting priority to the first given name.

OUTLOOK

Improvements of the topographic information for King George Island still are a necessity for several areas of the island, particularly for the eastern part. Radar interferometry is expected to help overcome this deficiency in the near future. The database compiled will form a major contribution to the SCAR KGIS project, which aims to establish a publicly accessible GIS for the entire island in various scales. As all data integration was performed in a GIS a fast and easy update of the map as well as subset extraction for specific regions of interest is guaranteed.

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