



## Implementation of the Admiralty Bay Geographic Information System, King George Island, Antarctica

JORGE ARIGONY-NETO<sup>1,2</sup>, JEFFERSON C. SIMÕES<sup>1</sup>  
and ULISSES F. BREMER<sup>1</sup>

<sup>1</sup>Núcleo de Pesquisas Antárticas e Climáticas, Departamento de Geografia, Instituto de Geociências  
Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves, 9500 – 91501-970 Porto Alegre, RS, Brasil

<sup>2</sup>Curso de Pós-Graduação em Sensoriamento Remoto  
Centro Estadual de Pesquisas em Sensoriamento Remoto e Meteorologia  
Universidade Federal do Rio Grande do Sul, Av. Bento Gonçalves 9500 – 91501-970 Porto Alegre, RS, Brasil

### ABSTRACT

The first layers for the Admiralty Bay Geographic Information System (GIS) are ready and available at the *Núcleo de Pesquisas Antárticas e Climáticas*, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. The implementation of this GIS follows the SCAR Standing Scientific Group on Geoscience standards, allowing compatibility with King George Island GIS project. The GIS serves as an important support tool for the Admiralty Bay Antarctic Specially Managed Area management plan. It can be used for the planning of scientific and logistic activities, monitoring and environmental impact evaluations.

**Key words:** Admiralty Bay, GIS, environmental management.

### INTRODUCTION

Human activity in Admiralty Bay has generated a considerable impact on the local ecosystem (Harris 1991). The creation of the first Antarctic Specially Managed Area (ASMA) [ATCPs 1996] was proposed by Brazil and Poland, in co-ordination with Ecuador and Peru. Its purpose was to prevent and/or minimize the risk of cumulative impacts on the marine and terrestrial environments, to intensify the cooperation between the countries that operate in the bay and to protect important environmental, historic and scenic assets. Figure 1 presents the location and limits of Admiralty Bay ASMA. A Geographical Information System (GIS) was proposed by Simões et al. (2001) as a support tool for the management plan of the ASMA. This note presents this GIS implementation.

### MATERIALS AND METHODS

The Admiralty Bay GIS has been implemented, with the integration of diverse data sources. Seven layers are ready at present: topography, bathymetry, coastline, glaciology, ice-free areas, human presence and place names (Arigony-Neto 2001).

Following the SCAR Standing Scientific Group on Geoscience (GSSG 2003a) standards, the suggestion of Sievers and Bennat (1989) was adopted for map projection (Lambert Conformal Conic Projection) and the WGS84 as the datum. The 1: 50,000 scale was chosen to correspond to the accuracy of the input data and ASMA management needs.

The **topography** is based on the work developed by Braun et al. (2001a), which produced a Digital Elevation Model (DEM) for KGI. The **bathymetric** layer was extracted from the Brazilian Navy Hydrographic chart (Diretoria de Hidrografia e Navegação 1992); depths were also determined

Correspondence to: Jorge Arigony-Neto  
E-mail: jorge.arigony@geographie.uni-freiburg.de

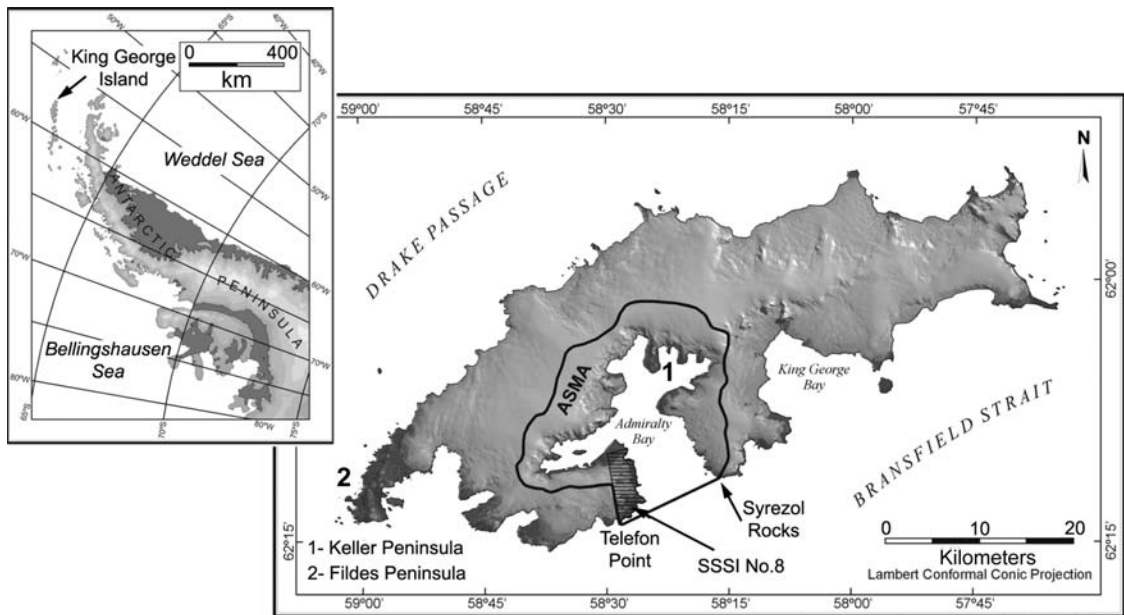


Fig. 1 – Location and limits of the ASMA Admiralty Bay.

from marine bottom sediment samplings (Gruber 1989, Aquino 1999). The coastline was based on a SPOT image (except along ice fronts).

Data layers were created containing the position of the **coastline** in several years (1956, 1979, 1988, 1995 and 2000). The current coastline was digitized from a SPOT image, February of 2000 (Braun et al. 2001b). Historical data were obtained from the British topographic map of KGI, for 1956 (Antarctic Place Names Committee – Foreign & Commonwealth Office 1986), from the Polish topographical map of the Admiralty Bay area, for 1979 (Battke 1990) and from two SPOT images, 1988 and 1995.

The **glaciological** layer corresponds to the delimitation of the glacial drainage basins (Simões et al. 1999) and to historic ice front positions. In future, data of the ice thickness, snow line altitude and glacier velocity vectors will be added. The **ice-free areas** layer was elaborated with information taken from a SPOT image of February 2000.

The **human presence** layer corresponds to the position of scientific stations, refuges and historical monuments. The revised limits of the

ASMA, 362 km<sup>2</sup>, and of the Site of Special Scientific Interest No. 8 (SSSI No. 8) were obtained from the Brazilian-German DGPS survey, the Polish map (Battke 1990) and information from articles (ATCPs 1996, Foreign & Commonwealth Office 1997). It also includes the tourist paths on the Keller Peninsula.

Due to the number of countries that maintain activities in the Admiralty Bay and its long history of occupation, it is common to have several names for the same geographical feature. Therefore, the **place names** layer was elaborated, based on the rule of “one place name per feature” proposed by Sievers and Thomson (1995), giving priority to the first recorded name. The place names were selected from the Composite Gazetteer of Antarctica (GSSG 2003b).

## CONCLUSIONS

The first layers for Admiralty Bay GIS are ready and available at the *Núcleo de Pesquisas Antárticas e Climáticas*. The implementation of the GIS follows the standards of SCAR GSSG (GSSG 2003a),

allowing for compatibility with the King George Island GIS (KGIS) project. This GIS serves as an important support tool for the ASMA management plan. It could be used for the planning of scientific and logistic activities, monitoring and environmental impact evaluations. Additional layers will be integrated with the system and areas near scientific stations mapped with more details, for example, at 1: 2,000.

#### ACKNOWLEDGMENTS

The Brazilian National Council for Scientific and Technological Development – CNPq (Project 49.0047/99) supported this project. J Arigony-Neto would like to thank CNPq for a studentship. We also thank Matthias Braun from *Institut für Physische Geographie* (IPG), University of Freiburg, for the KGI data, and the Environmental Systems Research Institute (ESRI) for the ARC/INFO license.

#### RESUMO

A primeira fase da implementação do Sistema de Informações Geográficas (SIG) da baía do Almirantado foi finalizada e está disponível no Núcleo de Pesquisas Antárticas e Climáticas, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil. O SIG implementado serve de ferramenta de suporte ao plano de gerenciamento da Área Antártica Especialmente Gerenciada (AAEG) Baía do Almirantado, podendo ser utilizados no planejamento de atividades científicas e logísticas, monitoramento e avaliações de impacto ambiental. Este SIG é compatível com o projeto similar para a ilha Rei George.

**Palavras-chave:** baía do almirantado, SIG, gerenciamento ambiental.

#### REFERENCES

- ANTARCTIC PLACE NAMES COMMITTEE – FOREIGN & COMMONWEALTH OFFICE. 1986. APC Misc 64, South Shetland Islands, Sheet 1 King George Island, 1: 100,000, 10th edition.
- AQUINO FE. 1999. Sedimentação moderna associada a geleira de maré Lange. Porto Alegre: Universidade Federal do Rio Grande do Sul, 91 p. Unpublished M.Sc. dissertation.
- ARIGONY-NETO J. 2001. Determinação e interpretação de características glaciológicas e geográficas com sistema de informações geográficas na Área Antártica Especialmente Gerenciada Baía do Almirantado, Ilha Rei George, Antártica. Porto Alegre: Universidade Federal do Rio Grande do Sul, 84 p. Unpublished M.Sc. dissertation.
- ATCPS. 1996. A proposal prepared by Brazil and Poland, in co-ordination with Ecuador and Peru, that Admiralty Bay, King George Island (South Shetland Island) be designated as an Antarctic Specially Managed Area (ASMA). Twentieth Antarctic Treaty Consultative Meeting, Utrecht, May 1996.
- BATTKE Z. 1990. Admiralty Bay, King George Island. Map, 1: 50.000. Warsaw: Nakladem Instytutu Ekologii, Polish Academy of Science.
- BRAUN M, SIMÕES JC, VOGT S, BREMER UF, BLINDOW N, PFENDER M, SAURER H, AQUINO FE AND FERRON FA. 2001a. An improved topographic database for King George Island – compilation, application and outlook. *Antarct Sci* 13: 41–52.
- BRAUN M, SIMÕES JC, VOGT S, BREMER UF, BLINDOW N, PFENDER M, SAURER H, AQUINO FE AND FERRON FA. 2001b. The compilation of a DTM and a new satellite image map for King George Island (Antarctica). *Geo-Spatial Inform Sci* 4: 47–51.
- DIRETORIA DE HIDROGRAFIA E NAVEGAÇÃO. 1992. Baía do Almirantado – Ilha Rei George. Rio de Janeiro: DHN, Marinha do Brasil. (1: 40,000).
- FOREIGN & COMMONWEALTH OFFICE. 1997. List of Protected Areas in Antarctica. London: Foreign & Commonwealth Office, 33 p.
- GRUBER NLS. 1989. Contribuição ao estudo da sedimentação glacio-marinha da baía do Almirantado, ilha Rei George, Antártica. Porto Alegre: Universidade Federal do Rio Grande do Sul, 174 p. Unpublished M.Sc. dissertation.
- GSSG – STANDING SCIENTIFIC GROUP ON GEOSCIENCE. 2003a. <http://www.geoscience.scar.org>.
- GSSG – STANDING SCIENTIFIC GROUP ON GEOSCIENCE. 2003b. Composite Gazetteer of Antarctica. [http://www.pnra.it/SCAR\\_GAZE](http://www.pnra.it/SCAR_GAZE).
- HARRIS C. 1991. Environmental effects of human activities on King George Island, South Shetland Islands, Antarctica. *Polar Rec* 27: 193–204.
- SIEVERS J AND BENNETT H. 1989. Reference systems of

maps and geographic information systems of Antarctica. *Antarct Sci* 1: 351–362.

SIEVERS J AND THOMSON W. 1995. Adopting one name per feature on maps of Antarctica: an experimental application – Topographic Map (Satellite Image Map) 1: 250,000 Trinity Peninsula SP21-22/13. *Polarforschung* 65: 123–131. [Published in 1998].

SIMÕES JC, BREMER UF, AQUINO FE AND FERRON FA. 1999. Morphology and variations of glacial drainage basins in the King George Island ice field, Antarctica. *Ann Glaciol* 29: 220–224.

SIMÕES JC, FERRON FA, BRAUN M, ARIGONY-NETO J AND AQUINO FE. 2001. A GIS for the Antarctic Specially Managed Area (ASMA) of Admiralty Bay, King George Island, Antarctica. *Geo-Spatial Inform Sci* 4: 8–14.