



## SCAR Report

### ANTARCTIC DIGITAL MAGNETIC ANOMALY PROJECT (ADMAP)

**Bremen, Germany  
25 July 2004**

Below we summarize the progress of the IAGA-SCAR Working Group for the Antarctic Digital Magnetic Anomaly Map Project (ADMAP) in completing its goals since the 9<sup>th</sup> ISAES meeting in Potsdam, Germany.

#### **D) ACCOMPLISHMENTS:**

**A. ADMAP must now operate as either a short-term ‘Action Group’ or a longer term ‘Expert Group’ in the reorganized SCAR. Thus, at the 9<sup>th</sup> ISAES meeting, the SCAR Geosciences Scientific Standing Group created an ‘ADMAP Action Group’ chaired by Marta Ghidella that is working to have ADMAP formally designated an ‘Expert Group’ at SCAR28.**

**B. Marta Ghidella also coordinates ADMAP’s participation in the World Digital Magnetic Anomaly Map (WDMAM) project.**

**C. The ADMAP grids were released to the public in Nov.’03 and are available at url => <http://www.geology.ohio-state.edu/geophys/admap>**

The released ADMAP grids include:

- 1) the 5-km grid of airborne and shipborne survey data only with large gaps in coverage,
- 2) the 5-km grid of airborne and shipborne survey data with the coverage gaps filled in using a crustal magnetization model that satisfies both the near-surface and 400-km altitude magnetic observations from the Magsat satellite mission. This map merges over 400 thousand line-kilometers of airborne and shipborne survey data with more than 5.6 million line-kilometers of Magsat satellite observations.

The map was published under the citation=> *Golynsky, A., M. Chiappini, D. Damaske, F. Ferraccioli, J. Ferris, C. Finn, M. Ghidella, T. Isihara, A. Johnson, H.R. Kim, L. Kovacs, J. LaBrecque, V. Masolov, Y. Nogi, M. Purucker, P. Taylor, and M. Torta, 2001, ADMAP – Magnetic Anomaly Map of the Antarctic, 1:10 000 000 scale map, in Morris, P., and R. von Frese, eds., BAS (Misc.) 10, Cambridge, British Antarctic Survey.*

- 3) and a preliminary 10-km grid of airborne and shipborne survey data with the coverage gaps filled in using a crustal magnetization model that satisfies both the near-surface and 650-km altitude magnetic observations from the Ørsted satellite mission.

**D. The free release of these ADMAP grids to the public was announced at the AGU Fall'03 meeting in session GP21D by the convener, Michael Purucker.**

**E. New ADMAP papers in-review, in-press, and published include:**

- 1) Ferraccioli F., P. C. Jones, M. L. Curtis, P. T. Leat, and T. R. Riley, (in-review), Tectonic and magmatic patterns in the Jutulstraumen rift(?) region, East Antarctica, as imaged from high-resolution aeromagnetic data, *Earth, Planets and Space*.
- 2) Ferraccioli F., Damaske D., Bozzo E., & Talarico F., (in-review), Aeromagnetic anomalies as a tool for Early Paleozoic terrane analysis over Oates Land and Victoria Land (East Antarctica), Geological Society, London, Special Publications.
- 3) Kim, H.R., R.R.B. von Frese, Golynsky, A.V., and P.T. Taylor, (in-review), Magnetization modeling of the Maud Rise crust in the southwest Indian Ocean, in: S. Okuma and R. Saltus (Ed.s), *Earth, Planets, and Space*.
- 4) Kim, H.R., R.R.B. von Frese, Golynsky, A.V., P.T. Taylor, and J.W. Kim, (in-review), Utility of satellite magnetic observations for estimating near-surface magnetic anomalies, *Earth, Planets, and Space*.
- 5) Golynsky, A., M. Chiappini, D. Damaske, F. Ferraccioli, C. Finn, M. Ghidella, T. Ishihara, H.R. Kim, L. Kovacs, V. Masolov, P. Morris, Y. Nogi, and R. von Frese, (in-press), ADMAP – A digital magnetic anomaly map of the Antarctic, in: IX ISAES Proceedings, Springer-Verlag, Heidelberg.
- 6) Golynsky, A. V., Golynsky, D. A., Masolov, V. N. and Volnukhin, V. S., (in-press), Magnetic anomalies of the Grove Mountains region and their geological significance, in: IX ISAES Proceedings, Springer-Verlag, Heidelberg.
- 7) Golynsky, A. V., Masolov, V. N. and Volnukhin, V. S. and Golynsky, D. A., (in-press), Crustal provinces of the Prince Charles Mountains region and surrounding areas in a light of aeromagnetic data, in: IX ISAES Proceedings, Springer-Verlag, Heidelberg.
- 8) von Frese, R.R.B., H.R. Kim, P.T. Taylor, and M.F. Asgharzadeh, (in-press), Reliability of CHAMP anomaly continuations, in: C. Reigber, H. Luehr, P. Schwintzer (Eds.), *Second CHAMP Mission Results for Gravity, Magnetic and Atmospheric Studies*, Springer-Verlag, Heidelberg.
- 9) H.R. Kim, L.R. Gaya-Pique, R.R.B. von Frese, P.T. Taylor, and J.W. Kim, (in-press),

CHAMP magnetic anomalies of the Antarctic crust, in: C. Reigber, H. Luehr, P. Schwintzer (Eds.), Second CHAMP Mission Results for Gravity, Magnetic and Atmospheric Studies, Springer-Verlag, Heidelberg.

- 10) von Frese, R.R.B., 2003, Advances in crustal and subcrustal studies from new generation satellite geopotential field missions, in: P. Stauning, H. Lühr, P. Ultré-Guérard, J. LaBrecque, M. Purucker, F. Primdahl, J.L. Jørgensen, F. Christiansen, P. Høeg, and K.B. Lauritsen (Ed.s), ØIST-4 Proceedings (4<sup>th</sup> Ørsted International Science Team Conference), pp. 107-114, Narayana Press, Copenhagen.
- 11) Kim, H.R., R.R.B. von Frese, P.T. Taylor, and J.W. Kim, 2003, "CHAMP enhances utility of satellite magnetic observations to augment near-surface magnetic survey coverage," in: C. Reigber, H. Luehr, P. Schwintzer (Eds.), First CHAMP Mission Results for Gravity, Magnetic and Atmospheric Studies, pp. 296-301, Springer-Verlag, Heidelberg.
- 12) von Frese, R.R.B., L.V. Potts, H.R. Kim, C.K. Shum, P.T. Taylor, J.W. Kim, and S.C. Han, 2003, CHAMP gravity anomalies over Antarctica, in: C. Reigber, H. Luehr, P. Schwintzer (Eds.), First CHAMP Mission Results for Gravity, Magnetic and Atmospheric Studies, pp. 180-186, Springer-Verlag, Heidelberg.
- 13) von Frese, R.R.B., H.R. Kim, P.T. Taylor, and J.W. Kim, 2003, CHAMP, Ørsted, and Magsat magnetic anomalies of the Antarctic lithosphere, in: C. Reigber, H. Luehr, P. Schwintzer (Eds.), First CHAMP Mission Results for Gravity, Magnetic and Atmospheric Studies, pp. 309-314, Springer-Verlag, Heidelberg.
- 14) Ferraccioli, F. and Bozzo E., 2003. Cenozoic strike-slip faulting from the eastern margin of the Wilkes Subglacial Basin to the western margin of the Ross Sea Rift: an aeromagnetic connection. *Intraplate Strike-Slip Deformation Belts* (Storti, F., Holdsworth R.E., & Salvini F., eds). Geological Society, London, Special Publications, **210**, 109-133.
- 15) Damaske D., Ferraccioli F., Bozzo E., Chiappini M., 2003. Images of aeromagnetic anomalies over Edward VII Peninsula, northwestern Marie Byrd Land, Antarctica, Geol. Jahrbuch B95, 79-100.
- 16) Ferraccioli F., Damaske D., Bozzo E. & Talarico F., 2003. The Matusевич aeromagnetic anomaly over Oates Land, East Antarctica. *Terra Antarctica* 10(3), 221-228.
- 17) Reitmayr G., Korth W., Caneva G., Ferraccioli F., 2003. Gravity survey at the Oates Coast area, East Antarctica, during the joint German Italian expedition 1999/2000, *Terra Antarctica* 10(3), 97-104.

18) Damaske D., Ferraccioli F., & Bozzo E., 2003. Aeromagnetic anomaly investigations along the Antarctic coast between Yule Bay and Mertz Glacier. *Terra Antarctica* 10(3), 85-96.

19) F. Talarico, Armadillo E., Ferraccioli F., & N. Rastelli, 2003. Magnetic petrology of the Ross Orogen in Oates Land (Antarctica). *Terra Antarctica* 10(3), 197-220.

20) expand list to include all WG citations for 2003-2004!!!!

## II) CURRENT EFFORTS:

**A) We are producing a CD-ROM of the ADMAP grids and related surveys for release to the public through the World Data Centers. The CD will include:**

- 1) The aeromagnetic profiles used for the map published by *Golynsky et al., (2001)* in the format agreed upon at the ADMAP III meeting of the Working Group in Columbus, Ohio.
- 2) The marine magnetic surveys processed for the anomaly grid will not be included in the ADMAP CD because they are available in the GEODAS CD (<http://www.marine-geo.org/antarctic>). However, the Working Group is also considering including in the CD the anomaly values and related coordinates that were used for the production of the ADMAP grid.
- 3) The CD will contain limited metadata giving the basic details of the datasets and a simple location map for each survey.
- 4) the 5-km grid published by *Golynsky et al. (2001)*,
- 5) the 5-km grid of aeromagnetic and marine anomalies,
- 6) the 5-km regional anomaly grid with Magsat gap predictions, and
- 7) documentation describing the production of the CD.
- 8) The CD will have the same authorship as the map published by *Golynsky et al., (2001)*.

## III) RECOMMENDATIONS:

**A) The ADMAP Working Group wants to produce the CD before the end of 2004 and release it to the World Data Centers before Summer'05.**

Completing this objective requires roughly a month of dedicated effort by one or two Working Group members and a meeting of the full Working Group. The Working Group meeting is necessary to endorse the CD's release to the World Data Centers and renew

ADMAP's protocols for maintaining and updating the database. The meeting is also necessary to plan ADMAP's contributions for the International Polar Year.

The Working Group requests a SCAR contribution towards its goal of securing roughly \$30K to support these activities. In the past, the prestige of SCAR's financial endorsements of ADMAP has enabled the Working Group to obtain significant matching funding from the international agencies that support Antarctic research. Thus, the SCAR contribution will greatly benefit our efforts to complete the CD for timely release to the Antarctic geosciences community.

**B) To contribute to the International Polar Year, the ADMAP Working Group must plan for:**

- 1) implementing ADMAP's protocols to maintain and update the database with new airborne and shipborne magnetic survey data and related metadata as they become available, and
- 2) updating the near-surface anomaly predictions from Magsat in the ADMAP database with the significantly more accurate observations from the Ørsted and CHAMP satellite missions. We also must consider incorporating magnetic gradient measurements from ESA's recently authorized the multi-satellite SWARM mission. These observations will greatly improve crustal anomaly detail at satellite altitudes since one of the mission's main objectives is to model the polar external fields.
- 3) developing improved modeling of the Antarctic core field and its secular variations, and external fields for better definition of the crustal anomalies in magnetic survey data,
- 4) compiling rock magnetic and other physical properties into a database to support geological applications of the ADMAP data,
- 5) developing and promoting regional and continental scale interpretation efforts of the ADMAP data. This will provide new insight into global tectonic and geologic processes in the Antarctic context. New data and interpretations will also enhance studies addressing interplays between geological boundary conditions, Antarctic ice sheets and climate change. Finally, these efforts will also greatly assist in identifying high-priority areas for new collaborative magnetic surveys.
- 6) expanding collaborative efforts with Arctic working groups for more bi-polar magnetic exploration and research.
- 7) providing a broad collaborative framework for new frontiers in the magnetic exploration of the polar regions, such as by long-range aircraft and UAV platforms.

At the meeting of the full Working Group to release the CD to the WDCs, we must also plan for these activities and others such as the publication of new collections of ADMAP scientific papers in special journal issues.

**C) What else to keep ADMAP going into the future as a SCAR initiative funded at \$?K/year?**