

# 4<sup>th</sup> European MagNetE Workshop

## Helsinki, 8-10 June, 2009

### Summary and Conclusions

The 4<sup>th</sup> European Repeat Station (MagNetE) Workshop was hosted by the Finnish Meteorological Institute in Helsinki on 8-10 June, 2009. 21 participants from 12 countries attended the workshop and colleagues from at least 4 more countries expressed their interest, sent regards and partly information about their repeat station activities, although they were not able to attend the workshop this time.

The workshop consisted of 4 oral sessions and a poster session, a visit to Nurmijärvi geomagnetic observatory and two discussion sessions.

An important part of the oral and poster sessions were overviews of repeat station activities during the past 2 years throughout Europe. Measurements have been carried out in many countries in 2007 and/or 2008. Further presentations dealt with secular variation in Europe, the possible use of repeat station data to discriminate between remanent and induced lithospheric magnetisation, the problem of missing data in (hourly) mean observatory values and historical European data and their applications.

#### **Minutes of the Discussions**

The following is a summary of dedicated discussion sessions and topics discussed following presentations. Tasks assigned to individuals are marked by the label 'ACTION ITEM' in the following.

#### ***Information on global field and secular variation models and other European data***

Apart from IGRF, which mainly is a model for practical purposes, several continuous global models with better secular variation descriptions exist and are developed particularly based on the recent magnetic satellite data. The availability of several models was briefly discussed and is summarized here for reference (covering historical to most recent times):

- gufm, covering epochs 1590 – 1990, based on historical and recent data (Jackson, A., A. R. T. Jonkers, and M. R. Walker (2000), Four centuries of geomagnetic secular variation from historical records, *Phil. Trans. R. Soc. Lond. A*, 358, 957–990.) No website, but available from Andy Jackson (or contact Monika Korte if interested)
- CM4, latest version covering epochs 1960 – 2001, based on all available data and including quiet time external and induced field contributions (Sabaka T.J., Olsen, N., and M.E. Purucker (2004): Extending Comprehensive Models of the Earth's Magnetic Field with Oersted and Champ Data, *Geophys.J.Int.*, 159, 521-547) Download and further information at <http://denali.gsfc.nasa.gov/cm/>
- Models using the recent satellite data since epoch 2000, e.g. CHAOS (Olsen, N.; Lühr, H.; Sabaka, T. J.; Manda, M.; Rother, M.; Tøffner-Clausen, L.; Choi, S.

(2006): CHAOS - a model of the Earth's magnetic field derived from CHAMP, Ørsted, and SAC-C magnetic satellite data, *Geophysical Journal International*, 166, 1, 67-75.) and GRIMM (Lesur, V.; Wardinski, I.; Rother, M.; Manda, M., 2008: GRIMM: the GFZ Reference Internal Magnetic Model based on vector satellite and observatory data, *Geophysical Journal International*, 173, 2, 382-394.)

Download and further information at <http://www.gfz-potsdam.de/magmodels>

The portal [www.geomind.eu](http://www.geomind.eu) was mentioned as a multilingual European source of geophysical data, which could be useful for MagNetE participants.

### ***Repeat station measurement practice***

As a task from the last workshop, Isabel Socias was in charge of collecting information about need/availability of instruments etc. for mutual support between the European countries to carry out repeat station surveys. She reported that she received very few replies to her query and no requests for instruments, so no more action was taken.

### ***Data processing, formatting***

Gerald Duma gave a brief presentation of the RS-ENTER program he wrote to facilitate the formatting of survey results into the MagNetE format and for submission to the WDC Edinburgh. The discussion confirmed that the program is useful and the format is welcome by the WDC.

Suggestions and comments about the program included

- a) is it possible to facilitate the entry of time series from individual points, in order to allow to format also time series of previous survey results?
- b) is it possible to allow manual entry of the year or expand the list to choose from, in order to enable older (even historical) data that is not yet available from the WDC?

**ACTION\_ITEM:** Gerald Duma will look into improvements to RS-ENTER

There were no objections against the suggestion that the program could be made available also to interested colleagues from other countries to facilitate data formatting. Moreover, it would be useful to make the program available via download from a website, as spam-filters of e-mail programs often block attachments with executable programs (even if hidden in a zip-file). If the program is distributed by e-mail, the extension should be changed. The program should also be put on the (new) MagNetE website (see below) for download.

### ***European data distribution***

There was some discussion again about the distribution of repeat station surveys in Europe.

**ACTION\_ITEM:** Miaora Manda and Isabel Socias offered to try to find out about possible geomagnetic repeat station activities in Greece and Portugal, respectively.

### ***Recent survey data, data availability***

Most MagNetE data now seem to be available from the WDC, but it can happen that there is a delay in uploading data to the WDC if unknown data formats are used. Repeat station data can be sent to [wdcgeomag@bgs.ac.uk](mailto:wdcgeomag@bgs.ac.uk) but preferably should be sent directly to Tom Shanahan ([tjgs@bgs.ac.uk](mailto:tjgs@bgs.ac.uk))

**ACTION\_ITEM:** A representative of each country should download the country's data from the WDC database and check that all data are there.

Gerald Duma has prepared a report in form of a pdf document distributed to all participants of the workshop about the recent status of repeat station measurements in each country. The report should be put on the new MagNetE website (see below).

**ACTION\_ITEM:** A representative of each country should check and if applicable update the information in this report by sending the information in the respective questionnaire to Gerald Duma ([gerald.duma@zamg.ac.at](mailto:gerald.duma@zamg.ac.at))

### ***European declination map and MagNetE publication***

Options to produce, as a result from the MagNetE group activities, a European declination map and publication are discussed. The following details were agreed on:

#### a) Epoch of the map

2006.5, because it is long enough ago that each country should have results from that epoch or a nearby year, it agrees with recommended MagNetE schedule to do biannual measurements in even years, and it's rather in the middle of the time span the MagNetE group has been active.

#### b) Data compilation

Most data should be available at the WDC Edinburgh, but for some countries there might not be results for 2006.5. These countries should adjust their data from recent earlier and/or later years to 2006.5 for the map data by suitable secular variation estimates/interpolations.

**ACTION\_ITEM:** Tom Shanahan and Isabel Socias will get an overview over the data and contact colleagues who have to adjust their data to 2006.5. Isabel Social will collect all the 2006.5 data for the map.

Proposed deadline for data compilation: September 2009

#### b) Modelling strategy

An interpolation with suitable parameters as provided by software like Geosoft, Surfer or gmt of the declination component seems the best choice for a reasonable, yet simple declination map of Europe. Values from a global model will be used in areas devoid of data to provide a complete map for Europe. However, the areas where real MagNetE data were available, and where only model data have been used, respectively, have to be marked on the final map. The suggestion is to plot these two categories of areas in different colour scales. Before publication the map will be sent to all MagNetE

participants to confirm that the map agrees to a sufficient degree with their own national maps.

**ACTION\_ITEM:** When the dataset has been compiled, Barbara Leichter and Monika Korte will do interpolations with the Geosoft and gmt software, respectively, compare the results and send the a draft map to all MagNetE participants for evaluation.

Proposed deadline for map: December 2009

#### c) Publication of map and description

The map and a paper describing it and the underlying data should be published. The updated pdf documentation of MagNetE activities by Gerald Duma will be a good basis for the paper. However, the most suitable option where to publish this is not obvious. Unfortunately there is no European equivalent to the AGU newspaper EOS. The EGU "Journal of Modelling" is focussed on numerical models and does not seem suitable. EGU outreach activities might provide a suitable option.

**ACTION\_ITEM:** Mioara Manda offered to inquire with the Geological Commission of the World whether they agree to publish a regional map (normally global maps are published there). Moreover, she offered to inquire about EGU outreach options.

#### *MagNetE website*

Some information about MagNetE exists on the web in form of remaining webpages from the 1<sup>st</sup> and 3<sup>rd</sup> workshop. The information from the second workshop had been distributed to all participants on a CD, no website exists from that. The Finnish colleagues agreed to keep the website of the 4<sup>th</sup> website online. However, it would be good to have a general MagNetE website with links to the workshop sites and some additional information, e.g. the possibility to download the RS-ENTER program for formatting survey results in the MagNetE format. The important information from the websites from the workshops hosted at the different institutes should be archived together with the new webpage.

**ACTION\_ITEM:** Monika Korte agreed to take care of setting up such a page

#### *MagNetE visibility*

It was suggested to design a MagNetE Flyer to inform about our activities. It should include the logo, some fotos about repeat station work and/or instruments, a map of the European stations and a brief description of purpose and actions of MagNetE. The flyer particularly could be displayed at the upcoming IAGA meeting in Sopron in August this year.

**ACTION\_ITEM:** Gerald Duma agreed to take the task of designing the flyer

#### *Next MagNetE meeting*

Guido Dominici and his colleagues kindly offered to host the next MagNetE meeting in 2011 in Rome, Italy. To avoid a clash with the IUGG meeting taking place at the end of June, the MagNetE meeting should preferably take place in May 2011.

It was suggested that perhaps the website html code from the Helsinki meeting could be used as a kind of template for future meeting and passed on to the next hosts in order to avoid the same work and give some recognizable MagNetE identity.

ACTION\_ITEM: The italian and finnish colleagues should check out this possibility for the 2011 workshop.

### ***Outlook***

It is suggested that to complement the upcoming ESA magnetic satellite mission Swarm (planned to be launched in 2010) it could be good have a few stations in each country where measurements are carried out each year. Variometric stations on locations far away from the existing observatories and in reliable, undisturbed areas would be best.

### ***New MagNetE Committee***

The new MagNetE committee consists of

Gerald Duma

Isabel Socias

Guido Dominici

Tom Shanahan