IAGA V-MOD
Business Meeting

M5, City Cube, Level 3
Berlin, Germany
IUGG, July 15, 2023 12:00-13:30
Agenda

- Acceptance of draft agenda
- Status of IGRF-13
- Status of WDMAM
- Data available for IGRF-14 field modeling
- IGRF-14 Task Force
- IGRF-14 Schedule
- Revisiting the 1945/1950 DGRF
- Election of VMOD chair and co-chair
- Suggestions for sessions at next IAGA
- Any other business
Status of IGRF-13

RMS difference vs CHAOSv7.13:

- 2020: 4.4 nT
- 2021: 14.9 nT
- 2022: 28.5 nT
- 2023: 48.0 nT

Difference in Main Field (left) and SV (right) between CHAOSv7.13 and IGRF-13 at 2023-01-01
Status of IGRF-13

RMS difference

Difference in Main Field (left) and SV (right) between CHAOSv7.13 and IGRF-13 at 2023-01-01
A few words on the World Digital Magnetic Anomaly Map (WDMAM)

- In Praha (2015) and Montréal (2019) it was decided to build WDMAM v.2.x by adding new data following the same methodology as used for v.2 (renamed v.2.0) of 2015.

- Due to lack of work force, the new WDMAM v.2.1 is only available now. The web site wdmam.org is having a major upgrade and v. 2.0 and 2.1 will shortly be available there.

- New data include Antarctica (ADMAP), Brazil, Caribbean and Gulf of Mexico, East and Southeast Asia (MAMEA), Marine data Worldwide, and revised map of Russia. See our presentation on July 18th!
A few words on the World Digital Magnetic Anomaly Map (WDMAM)

- For the future, the present team has served for 10 years (2013-2023) as for now and expects a transition to a new team, to be completed in IAGA Lisbon (2025).

- After release of WDMAM v.2.1, we will issue a call for manifestation of interest to

1. build WDMAM v.3.0 (i.e., involving new methodologies and digging for new data), and
2. take the leadership of the WDMAM Task Force.
Data available for IGRF-14

- **Satellites**
  - Swarm A, B, C, https://swarm-diss.eo.esa.int
  - CSES
  - Cryosat-2
  - GOCE
  - GRACE
  - ePOP
  - Macau-Sat (MSS-1)

- **Ground observatories**
  - INTERMAGNET, http://intermagnet.org (see web services)
  - ESA AUX_OBS_HMV (viresclient [python])
  - WDC for Geomagnetism (FTP)
IGRF-14 Task Force

● The Task Force will be responsible for evaluating candidate models, voting on how to construct the final IGRF-14 models, and preparing a manuscript for the IGRF special issue (in 2025)

● IGRF-13 Task Force
  ○ British Geological Survey (W. Brown, wb@bgs.ac.uk, C. Beggan, ciar@bgs.ac.uk)
  ○ DTU Space (C. Finlay, cfinlay@space.dtu.dk)
  ○ GFZ Potsdam (M. Rother, rother@gfz-potsdam.de)
  ○ IPGP (G. Hulot, gh@ipgp.fr)
  ○ Kyoto University (H. Toh, tou.hiroaki.7u@kyoto-u.ac.jp)
  ○ University of Colorado Boulder (P. Alken, alken@colorado.edu)
  ○ University of Leeds (P. Livermore, P.W.Livermore@leeds.ac.uk)
  ○ Universite de Nantes (E. Thebault, erwan.thebault@univ-nantes.fr)
  ○ Universite de Strasbourg (I. Wardinski, wardinski@unistra.fr)
  ○ Universite de Grenoble (N. Gillet, nicolas.gillet@univ-grenoble-alpes.fr)

● If interested in joining the task force, contact Ciaran, ciar@bgs.ac.uk
IGRF-14 Schedule

- Spring 2024: call for candidate teams to note their intentions (by email)
- May 2024: official invite to candidate teams
- September 2024: deadline for candidate model submissions to Task Force along with short description of the methodology
- October-December 2024: Evaluation of candidate models and voting
- December 2024 / January 2025: release of IGRF-14 coefficients, maps and web services
- Q3 2025: submit candidate papers to IGRF special issue
- Q4 2025: Publication of all IGRF papers to special issue

Any suggestions for improving the efficiency of evaluation or administration using new tools (e.g. GitHub)?
Discrepancies in the 1945-1955 Definitive Geomagnetic Reference Field

- QC of monthly means showed discrepancies with DGRF – worst between 1940 and 1955
- Notably large discrepancies at observatories providing data for DGRF
- DGRF introduced in IGRF-5 is worse fit to data than initial IGRF-4 model
Discrepancies between data and DGRF

• Data is limited in this period due to WWII, but not significantly more so than at similar times

• Misfit to time-continuous COV-OBS.x2 (Huder et al, 2020, EPS, https://doi.org/10.1186/s40623-020-01194-2) shows abrupt changes
Should DGRF be consistent with time-continuous models?

- Behaviour noted by Xu, 2000, EPS, [https://doi.org/10.1186/BF03352355](https://doi.org/10.1186/BF03352355)
- Higher degree coefficients are anomalous

- 1900–1940 from continuous B-spline model
- 1945–1960 are models of discrete 5-year windows centre on each epoch
- Recent model candidates variously constructed but often derived from time-continuous models

- Time-continuous models fit same data, but constrain smooth time variation
Revisiting the 1945/1950 DGRF

With thanks to Will Brown for analysis - from his talk in A23b

- Do we wish to invite IGRF-14 candidate models for revisions to MF coefficients for 1945, 1950 and 1955?
- Similarly should we consider revising 2010 in light of new platform magnetometer data?
- Should ‘definitive’ mean never changes or just fixed in that release of the model (e.g. generation 14)?
- From Miora’s talk (A22): should IGRF-14 extend SV from 8 to degree 13 to facilitate core field studies?
Election of VMOD Chair

Candidates:

Ciaran Beggan (BGS)
Election of VMOD Co-Chair

Candidates:

Clemens Kloss (DTU)
Suggestions for sessions at next IAGA (Lisbon in 2025)

IUGG-2023:

A21 - Satellite-Based Geomagnetic Field Measurements and Modeling

A22 - Planetary Magnetic Fields and Secular Variation at All Temporal Scales (with DIV I)
(Joint session with WDMAM and seismic community)

1. Modelling, ground and space-based data and innovations from the IGRF-14 generation and for the future
   a. Convenor: Ciaran Beggan, Clemens Kloss, Naomi, Frederik

2. The future of WDMAM and crustal magnetic anomaly mapping
   a. Convenor: Jerome Dyment, Will Brown

3. Joint session with V-OBS and data based modeling
Any Other Business

- Swarm 10th Anniversary science meeting in Copenhagen, April 2024

- Thank you to Patrick for his contribution over the past 8 years
Thank you