IAGA V-MOD Business Meeting
23 August 2021
Chair: Patrick Alken
Co-Chair: Ciaran Beggan (minutes)
Meeting held virtually (15 attendees in total)

Agenda

1. Acceptance of proposed agenda
2. Report on IGRF-13
3. Status of data available for field modeling
4. Spatial uncertainty of IGRF models
5. Possible revisit of DGRF-2010
6. Report on WDMAM
7. 2023 IAGA sessions
8. AOB

Acceptance of proposed agenda

Accepted

Report on IGRF-13

Patrick outlined the steps for the recent release of IGRF-13. He thanked each of the fifteen teams for their contributions and noted that all teams wrote a paper for the EPS Special Issue (https://earth-planets-space.springeropen.com/igrf13). He next explained the method for creating the final DGRF, IGRF and SV models and the generation of the coefficients, maps and forecast of how the poles will move between 2020 and 2025.

Within the IGRF-13 evaluation paper (doi:10.1186/s40623-020-01281-4), Patrick also examined the IGRF-12 performance in retrospect and made an analysis of the different candidate forecast methodologies to compare how well IGRF-12 matched the final magnetic field over the 2015 to 2020 era. All models missed the jerk in Africa and Indonesia which began around 2015. After the differences are reduced to a single RMS number, it is clear that the differences in each component are very close between candidates. Patrick noted the two best models (BGS and IPGP) incorporated a physics based approach.

Status of data available for field modeling

Patrick noted the use of continued availability of Swarm, CSES and ePoP as well as the release of data from calibrated platform magnetometers such Cryosat-2 and GRACE FO.
Patrick noted that ground observatory data continue, of course, to be available too for modelling. Vincent Lesur pointed out that in future, efforts could be made to use ground-based variometer data that are calibrated.

Spatial uncertainty of IGRF models

Following an action from the IUGG2019 V-MOD Business Meeting, Ciaran made an analysis of the spatial error of an IGRF model. The aim of this action was to estimate large-scale spatial errors of IGRF to determine which components have larger uncertainties. The methodology was to compute globally averaged residuals between IGRF and measurements from repeat stations and observatories since 1980.

Residual histograms revealed means clustered around 0 (degrees for D/I and nT for field components). The standard deviation for the Z component was 292 nT, about twice as large as the X and Y components. The declination had a standard deviation of 0.39 degrees, while inclination was 0.29 degrees.

In summary, Ciaran noted that the IGRF fitted the ground data quite well. He did not find a strong latitudinal variation in the residuals, attributed to the use of quiet-time data selection in the repeat station and annual mean values. If useful to the community, Ciaran is willing to publish this study. He has more details in a poster in Session 1.4 (see attached slides also).

Possible revisit of DGRF-2010

As CHAMP data were available for around 9 months after the 2010 DGRF epoch and there were gaps in the Oersted data stream between 2010 and 2013 before Swarm launched, there is potentially the opportunity to improve the DGRF2010 using recently-released calibrated platform magnetometer datasets covering the era.

There are new Cryosat-2 data, calibrated by Nils Olsen, that could be used to improve the 2010 DGRF model. In order to help inform the IGRF-14 call, Patrick created a quick model to determine if there was an improvement by adding in Cryosat-2 data to CHAMP and estimating a new field model for 2010.

After selecting for quiet time data, a new model TESTIGRF-13 was created. The model is not too different from the official model (< 5 nT in X/Y/Z globally) i.e. within the differences between the candidates anyway. There’s a slight improvement in the fit of the new model to the input satellite data with reduced standard deviations, though not by much (a few percent).

Gauthier Hulot thanked Patrick for his effort and thought it was a good idea to look into the new datasets. The benefit is not large as he noted, and would require a significant effort to replace the DGRF2010 in IGRF-12 and 13 (e.g. organisational, asking for volunteer teams to compute a new candidate). He also wondered if users would be interested in an improved model and asked how does the TESTIGRF-13 model compare to the original candidate models used to make the DGRF? He also suggested a short note or letter to EPS to inform that community as to the outcome of his analysis and whether a DGRF revision is worthwhile undertaking.

Patrick asked if there is a historical precedent to changing DGRFs in the past. Ciaran proposed to check with Susan Macmillan on this point.

Jerome Dymont noted a new DGRF2010 could create confusion with people processing magnetic data from marine surveys or aeromagnetic data where anomalies are stored without reference to the actual model values but just the IGRF version. Using a later version of IGRF with a new DGRF2010 could create steps or complications in the processed data.

Patrick suggested another discussion at IUGG2023 might be useful as not many attendees were present at this virtual BM. Gauthier pointed out that not many people are working on Cryosat data besides DTU so there might be a limited response to a call.

Report on WDMAM

Jerome Dymont reported on the latest iteration of the World Digital Magnetic Anomaly Map (WDMAM). A new version, WDMAM2.1, will be released later in 2021. New data have been added from Brazil, Russia, Antarctica, Caribbean, East Asia along with a new compilation of the marine data created by digitising paper maps. Currently the taskforce are assembling the data and finalising the map.

Jerome noted that new data are always welcome. There are still gaps in India which could be filled in for example. The project is still running (since 2013) and the taskforce would be happy if new people are interested in helping.

2023 IAGA sessions

The following sessions are proposed for the 2023 meeting:

- Satellite-based geomagnetic field measurements and modeling (joint with V-OBS)
    - Convenors: Hulot, Alken
    - Should be joined with V-OBS (to include ground observatories)
- The geomagnetic field and its secular variation (joint with DIV-I)
    - Convenors: William Brown
- Modelling the lithospheric field
    - Convenor: J. Dymont

AOB

None