

**Report from the meeting of the
Scientific Council (SC) of the Bureau Central de Magnétisme Terrestre (BCMT)
on June 10, 2021
Notes and Recommendations**

Meeting

Due to the pandemic, the meeting had to be organized as a virtual meeting of reduced duration. It took place on June 10, 2021, from 13:30 to 17:30 CEST. The following SC members participated:

- Kusumita Arora, CSIR-National Geophysical Research Institute, Hyderabad, India
- Jean-Paul Boy, École et Observatoire des Sciences de la Terre, Strasbourg, France
- Dominique Jault, Institut des Sciences de la Terre, Grenoble, France
- Monika Korte, Deutsches GeoForschungsZentrum GFZ, Potsdam, Germany
- Alexey Kuvshinov, Eidgenössische Technische Hochschule Zürich, Switzerland
- Anne Le Friant, Institut de Physique du Globe de Paris, France
- Susan Macmillan, Geomagnetism, British Geological Survey, Edinburgh, United Kingdom
- Aurélie Marchaudon, Institut de Recherche en Astrophysique et Planétologie, Toulouse, France

Chairman Jeffrey Love (U.S. Geological Survey) was excused, and Monika Korte accepted to chair the council.

The SC had been provided with a written report on the BCMT activities for 2019 – 2021 beforehand. Presentations about important points were given by Vincent Lesur, Aude Chambodut and further members of the BCMT. Several points were discussed in more detail.

Notes

(1) Priority of BCMT

The SC regards (1) the acquisition of high-fidelity magnetometer data time series from magnetic observatories in France and across the globe with regular absolute calibration observations, (2) the transmission, processing, management, and dissemination of observatory data (and metadata), and (3) the development and the dissemination of products (various filtered data and indices) that are derived from observatory data to be (together) services of high value for the pure and applied French-domestic scientific communities, as well as for related international scientific communities. This is seen as a priority task of the BCMT in view of the broad applications of these data. These include scientific studies of the Earth's geodynamo, mantle, and the lithosphere; ocean currents; the ionosphere and magnetosphere; and solar-terrestrial interaction, as well as the broad utility of observatory data for individuals and agencies across the academic, commercial, and governmental sectors, which include geomagnetic mapping and geophysical modeling, natural resource assessment and development, and space-weather monitoring and the assessment and mitigation of related geomagnetic hazards.

The BCMT notes that the production of magnetic observatory data adhering to the high international quality standards still requires (1) skillful regular manual absolute observations at the observatories and (2) extensive data processing that cannot be fully automated, which requires sufficient staff.

(2) Staff

The SC is very pleased to see that an additional scientist has been hired at EOST to relieve the tight situation for the EOST observatory network and welcomes the planned addition of an engineer (25% FTE). The SC also notes positively that good solutions have been found to ensure continuation of the large range of responsibilities of the now retired engineer X. Lalanne at IPGP.

(3) Funding

- The SC thanks the INSU for the ongoing good support of the BCMT.
- The SC thanks the IPGP for support of the BCMT and ongoing support for observatories (BOX, CLF, DLT, EDA, IPM, KOU, LZH, MBO/SOK, PHU, PPT, TAM).
- The SC thanks the EOST for support of the BCMT and ongoing support for observatories (AMS, CZT, DMC, DRV, PAF, TAN).
- The SC thanks the Centre National d'Etudes Spatiales (CNES) for ongoing support (the KOU observatory).
- The SC thanks the Institut Polaire Français Paul-Emile Victor (IPEV) for support of the southern Indian Ocean observatories (AMS, CZT, PAF) and Antarctic observatories (DMC, DRV).
- The SC thanks Institut de Recherche pour le Développement (IRD) for their help towards setting up the new observatory in Senegal (SOK).

(4) Observatory network

The SC notes that the COVID-19 pandemic caused delays for maintenance (including training of locals for absolute observations) or repair tasks at several observatories that are beyond control of the BCMT, as travel was not possible.

The SC is concerned about the artificial noise detected at CLF observatory and urges the BCMT to further investigate the source.

Like BCMT itself, the SC is concerned about the data quality of DLT due to the strongly increased human activities close to the observatory. If an alternative site nearby cannot easily be found to replace DLT with reasonable effort, considering that DLT is not the only observatory in Vietnam it might be more beneficial to focus the efforts on ensuring high quality data from PHU. Given the limited resources, the affordability of the effort for a location has to be seen in light of the value, where clearly the value of the data is higher the more distant the location is from other existing observatories.

The SC is concerned about potential threats to data quality from planned installation of a Galileo station and a solar power plant at DRV and AMS observatories, respectively. This concern leads to one of the recommendations below, i.e. the establishment of protected zones of at least 100 m

radius around the magnetic instrument locations. The SC discussed that in view of the fact that anthropogenic noise is an increasing problem for observatory locations all over the world and in very different cultural settings, this requires assessment of the level at which communication with the local authorities or population is required. On the one hand, support from high-level authorities might ensure that protected zones are legally binding, while on the other hand direct communication with the local population might lead to direct local acceptance of protected zones. Possibilities of leasing a zone of 200-250 m diameter around the Observatory buildings might be looked into for a more lasting solution.

The SC appreciates that BCMT takes the opportunity to establish a magnetic observatory on La Réunion island, which is a useful addition to the global network not originally foreseen in the strategic plan.

(5) Data dissemination

The SC is concerned about the delays in standard data product dissemination from AMS, CZT, DMC, DRV and PAF observatories, but understands that this was due to the staff shortage at EOST up to 2019. The SC strongly urges that the data will be fully processed and disseminated by end of summer 2021 as promised in the BCMT report.

Near real-time data dissemination is becoming increasingly important for several applications, e.g. in the space weather context. The SC is concerned about the fact that some data products, in particular ones that do not fit into current international archives (INTERMAGNET, WDC, SuperMag), the main example being non-INTERMAGNET near real-time data, cannot at present be stored and promptly disseminated according to the FAIR and TRUST principles. The SC welcomes the BCMT activities to get support from existing national infrastructures (IPGP DataCentre, ForM@Ter), but also urges coordination of these efforts with the full international community by continuing to engage with INTERMAGNET, WDC and SuperMag.

(6) Standardization of data production

The SC understands that the standardization of data acquisition and processing methods has been delayed by the pandemic as regular meetings between IPGP and EOST were not possible in 2020 and the first half of 2021. The SC expects the BCMT to resume these activities as soon as possible.

(7) Magnetometer development

The SC acknowledges the benefit of magnetometer development at BCMT for several reasons: (1) to facilitate standardization of Instrumentation and data processing chains at the large number of BCMT observatories; (2) to facilitate repairs in case of failures due to direct and intimate knowledge about the technology; (3) to preserve the knowledge about magnetometer development. Magnetometers for geomagnetic observatories have to fulfill rather special requirements and the number of manufacturers worldwide is small.

Commendations

- The SC commends the BCMT for its operation of magnetic observatories with broad geographic distribution and under a wide range of different and often difficult conditions.
- The SC commends the BCMT for its operation of magnetic observatories for long durations of time and with high levels of temporal continuity.
- The SC commends the BCMT for the prompt replacement of MBO with the SOK observatory, the opening of the EDA observatory and successfully averting threats of artificial disturbances at KOU observatory
- The SC commends the IPGP for the development of accurate (stable-baseline) fully digitized magnetometer systems.

Recommendations

(1) Protection of observatories from cultural noise

The BCMT SC, being concerned about increasing threats from anthropogenic noise to magnetic observatories in general, urges the BCMT, local partners and authorities to establish protected zones of at least 100 meters radius around the instrument location at geomagnetic observatories. Such protected zones of at least 100 m radius are known as amagnetic areas where man-made activities are not permitted and any additional infrastructures (building, cable track, etc.) or changes to the magnetic environment (moving rocks, building a path or a road, etc.) are prohibited. 100 meters is a minimal distance at which e.g. vehicles can in general be expected to cause less than 1 nT of noise (see IAGA Guide for Magnetic Observatory Measurements and Practice, Jankowski and Sucksdorff, IAGA, Warsaw 1996).

(2) Data archival and dissemination

The BCMT SC, being concerned about proper data archival and prompt dissemination, urges the BCMT to collaborate with national data repositories and the international geomagnetic community to find long-term solutions to archiving and promptly disseminating all their data according to FAIR and TRUST standards.

Acknowledgements

The SC thanks Marc Chaussidon, Vincent Lesur, Aude Chambodut, as well as the staff of IPGP and EOST, for the organization of the virtual meeting of the SC of the BCMT.



Dr. Monika Korte, on behalf of the BCMT SC