The need for globally coordinated magnetic field measurements to understand the nature and behaviour of the geomagnetic field was recognized as early as the 1830s by Carl Friedrich Gauss, Wilhelm E. Weber and Alexander von Humboldt. To realise their vision they founded the Göttingen Magnetic Union in 1836, an organization devoted to coordinated magnetic field measurements using standardized instruments and operating at agreed times all over the world. Simultaneous measurements started at nine European observatories in 1836 and this number increased to more than thirty observatories across the world within five years. However, despite an increasing number of magnetic observatories being established in the following years, the systematic global collection of geomagnetic data really only started with the creation of the World Data Centres in the 1950s. The subsequent digital era then opened up the possibility of real-time collection of huge amounts of high-resolution data and large databases were created in all geoscience disciplines for scientific research and applications.

Now EPOS offers an added dimension for users of geomagnetic data, by breaking down barriers to data access and by offering users the opportunity to combine data from across the geosciences. The mission of the EPOS Thematic Core Service (TCS) ‘Geomagnetic Observations’ is therefore to:

- Enhance existing services providing geomagnetic data and indices (e.g. INTERMAGNET-INTERNational Real-time MAGnetic observatory NETwork; World Data Centre (WDC) for Geomagnetism; IMAGE- International Monitor for Auroral Geomagnetic Effects; ISGI-International Service of Geomagnetic Indices)
- Develop and build access to magnetotelluric (MT) data, including transfer functions and time series data from temporary, portable MT-arrays in Europe, and provide lithospheric conductivity models derived from MT data
- Develop common web and database access points to global and regional geomagnetic field and conductivity models, for example the International Geomagnetic Reference Field and the World Magnetic Model
- Establish clear common geomagnetic metadata structures to serve the scientific community and ensure interoperability between the TCS and the EPOS Integrated Core Service (ICS)
SERVICES

The IMAGE magnetometer array of 35 magnetometer stations maintained by ten institutes from Estonia, Finland, Germany, Norway, Poland, Russia and Sweden

TCS will provide access to fifteen data products and services. The first elements, to be delivered during the first 24 months of the EPOS implementation phase, are access to

- Geomagnetic observatory data from WDC-Geomagnetism & INTERMAGNET
- Variometer data from IMAGE and its Baltic extensions
- Geomagnetic indices from ISGI
- Geomagnetic events (e.g. solar flare effects) from Ebro Observatory and ISGI
- IMAGE electrojet indices
- IGRF and WMM global magnetic models

The remaining elements, to be made accessible to users within a further two years are access to

- Magnetic survey data from the WDC-Geomagnetism
- Magnetotelluric time-series
- Historical data from the Helsinki and SMA networks
- Substorm Events
- Magnetotelluric transfer functions
- Ground magnetic variations
- Lithospheric conductivity models
- World Digital Magnetic Anomaly Map, 'WDMAM'

USE CASE

Finding magnetic north

Users often want a simple ‘calculator’ that enables them to compute magnetic field strength and direction for a given location and time, or visualisation of geomagnetic data for subsequent analysis. All of this will be possible using the tools envisaged by the TCS

‘Geomagnetic Observations’. However the power of EPOS is that researchers and others can now combine and integrate data. For example a user may want to recognise and isolate seismic activity corrupting geomagnetic observatory data or recognising periods of poor GNSS accuracy that correlate with geomagnetic activity caused by space weather. EPOS will make such cross-disciplinary activities far easier.

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