

Paper for Consideration by HSSC 11

North magnetic pole shifting rapidly and unpredictably, impact on navigation

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Executive Summary:	North Magnetic pole is shifting rapidly and unpredictably. This is unnoticed by most people in the world, but the fact that the pole is going fast has an impact on the navigation in the Arctic region, making this region more prone to large errors.
Related Documents:	M-3 Resolution 1/1932 as amended IHC 12 A1.6 NOAA NCEI website dedicated to geomagnetism (https://www.ngdc.noaa.gov/geomag/geomag.shtml)

Introduction / Background

Originally located in Canada's far north in the 1900s, the north magnetic pole reached the Arctic Ocean in 2001, then the eastern hemisphere and Siberia in 2018. The movement of the north magnetic pole has considerably accelerated over the past thirty years, from 15 km per year in the early 1990s to 55 km per year nowadays. Since the end of 2014, its position has unpredictably changed. This displacement of the magnetic north has impacts on safety of navigation, particularly in the strategic region of the high Arctic. In this area, compass navigation is preferred, as GNSS positioning is imprecise.

Analysis/Discussion

The global World Magnetic Model (WMM) is the standard model used by the U.S. Department of Defense, the U.K. Ministry of Defence, the North Atlantic Treaty Organization (NATO) and the International Hydrographic Organization (IHO), for navigation, attitude and heading referencing systems using the geomagnetic field. It is also used widely in civilian navigation and heading systems. For example, roses of declination on marine charts and corresponding MAGVAR values in ENCs are drawn from information given by WMM.

The WMM is calculated every 5 years jointly by the NOAA's National Centers for Environmental Information (NCEI) and the British Geological Survey (BGS) from satellite and ground observatory data. Today, it is highly dependent on data acquired through European Space Agency's Swarm mission. The last version of WMM was computed in 2015, with the current model expiring on December 31, 2019.

Because of the rapid drift of the Earth's north magnetic in recent decades, a loss of accuracy of the WMM is observed, particularly at high northern latitudes. The U.S. military has consequently requested an unprecedented early review of the model. The new model (WMM2015v2) was officially released on 4th February 2019. It should be noted that henceforth, the WMM2015v2 release includes an uncertainty value associated to the declination which reaches 0.5° to the high northern latitudes. As it's tough to predict what will happen to the north magnetic pole, it will probably be necessary to update the model more frequently than every 5 years.

From M-3 publication, we can read :
COLLECTION AND EXCHANGE OF MAGNETIC DATA
Resolution 1/1932 as amended IHC 12 A1.6

1 It is recommended that cooperation between countries mutually interested in the collection and exchange of magnetic data be further developed.

2 It is resolved that Member States take every opportunity to collect magnetic data in the course of the hydrographic and oceanographic work of their surveying vessels, and encourage other agencies in their respective countries also to collect such data. Particular efforts should be made to obtain data in parts of the world where observations are most sparse.

3 It is recommended that magnetic data be forwarded to the appropriate national agency for onward transmission to one of the World Data Centres which exist under the auspices of the International Association of Geomagnetism and Aeronomy.

These recommendations are more relevant than ever.

Conclusions

- insist on the importance of collecting and sharing magnetic data
- note that the satellite SWARM dedicated to magnetic measurements ended in 2020.
- assess whether the update rate (5 years) is still adequate
- note that the addition of a value of uncertainty (excluding environmental factors) must be generalized for future models.

Action Required of HSSC

The HSSC is invited to:

- a. note this paper
- b. initiate actions within the IHO as considered necessary