Implications from geomagnetic observation for the interannual fluctuations of Earth rotation

*Seiki Asari[1], Masanori Kurihara[1], Kenji Morinaga[1], Shingo Nagamachi[1]

1. Kakioka Magnetic Observatory, Japan Meteorological Agency

Kakioka Magnetic Observatory has a history of magnetic observation over as long time as more then a century. It has supported a progress of scietific researches and industry by providing accurate data, developing observation technology, certifying measurement instruments, as well as playing a geodetic role as a magnetic reference station of Japan. The observatory is even increasingly expected to stay as one of world's principal observatories, with the increase of demands for prompt data issuance to serve as reference for the recent satellite magnetic observations.

Geomagnetic variations consist of different components with varying sources and timescales. The accumulation of enormous amount of data from the recent satellite observations in the late years have drawn attentions to the interannual variations of the geomagnetic main field originating in Earth core. These variations had not been well recognised, with their tiny signals hidden by the magnetic perturbations from the magnetosphere. If these signals are resolved more clearly, they can be a precious key to reveal the interannual phenomena in Earth fluid core such as hydromagnetic waves. Imaging of the core fluid flow relies entirely on mangetic observations, as the seismic and gravitational observations do not provide high enough sensitivity, while the net fluctuations of the core may be analysed by using Earth rotation variation.

Currently, monthly mean database for the past half century has been under construction at Kakioka Magnetic Observatory such that they are optimised for better identifying the interannual main field variations. It has been found that approximately 70 percent of the external field perturbations can be eliminated from monthly data at any observatories at low- and mid-latitudes. A better mapping of the fluid core flow may be possible for even longer period. In this presentation, a report for the progress and prospect is given, together with discussion on implications for the interannual Earth rotation fluctuations through the core flow map imaged from magnetic observations. A spatiotemporal features of the westward core fluid jet at the polar region in the northern hemisphere, which may be responsible for both the rapid changes in both the geomagnetic main field and the length-of-day.

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