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A First Assessment of the interconnection between celestial pole offset and geomagnetic field variations

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The Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG) provides the geodetic infrastructure needed to monitor the Earth system.. The understanding of forced temporal variations of celestial pole motion (CPM) could bring us significantly closer to meeting the GGOS goals (i.e. 1 mm accuracy and 0.1 mm/year stability on global scales in terms of the ITRF defining parameters). Besides astronomical forcing, CPM excitation depends on the processes in the fluid core and the core-mantle boundary. The same processes are responsible for the variations of the geomagnetic field (GMF). This study investigates the interconnection between the celestial pole offset (CPO) and effective geophysical processes that contribute to the Earth's rotational variation. We use the CPO time series obtained from very long baseline interferometry (VLBI) observations together with the latest GMF data such as geomagnetic jerk and magnetic dipole moment, and a state-of-the-art geomagnetic field model to explore the correlation between CPM and GMF.

Our results confirm the findings of previous studies, revealing that substantial free core nutation (FCN) disturbance occurred at the epochs close to the GMJ events. The results also reveal some common features in the FCN and GMF variation, which show the potential to improve knowledge regarding the GMF's contribution to the Earth's rotation.