INVESTIGATION OF THE RELATION BETWEEN METEORITE IMPACT AND MAGNETIC REVERSAL

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Introduction: An old hypothesis [1] suggested that a meteorite impact could result in a magnetic reversal. Here we continue to investigate the proposed relationship between a meteorite impact and Matuyama-Brunhes magnetic reversal .

Methods and results: Large impacts of meteorites occur at random angles averaging near 45° [2, 3, 4, 5] with respect to the Earth's gravity (Fig. 1). This may provide the sufficient moment to the exterior of the outer core to cause motion relative to the outer core (Fig. 1). Thus, the angular difference between the two shells disrupts the convective heat transfer to the mantle as well as the position of the magnetic poles on the Earth's surface. Resetting the convection pattern would influence the electric currents in the liquid outer core to produce a modified set due to new core convection dynamics in response to modified Coriolis forces. In addition the anisotropic inner core's [6] angular momentum change due to the new core convection dynamics, in respect to the mantle, would modify the heat transfer through the inner core and contribute to the dynamo reset. This may cause variations in the currents producing the earth's magnetic field and result in a magnetic polarity reversals.

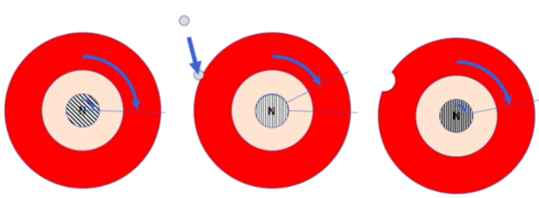

Fig. 1: Illustration of the mantle displacement (red) in respect to the liquid outer core (pink) after meteorite impact. Inner solid core is shown with black lines marking the inner core's anisotropy. Letter "N" indicates the view from the south pole. The blue arrow shows the direction of meteorite.

A study [7] in Indonesia from marine sediments ODP site 769 showed a micro-tektite level, which is a production of cosmic impacts, approximately 1.5 m below the Matuyama-Brunhes magnetic reversal (Fig. 3). Another study [8] in South Atlantic from marine sediments ODP hole 1082C showed oscillations in VGP's latitude approximately at the same depth (1.5 m) below the reversal (Fig. 3). In addition, sediments from both of the studies [7, 8] have very similar sedimentation rate which is 8-10 cm/kyr. Other sediments [9, 10] from different locations showed similar fluctuations in inclination data similarly to cave sediments in Czechia in Central Europe [11] (Fig. 2).

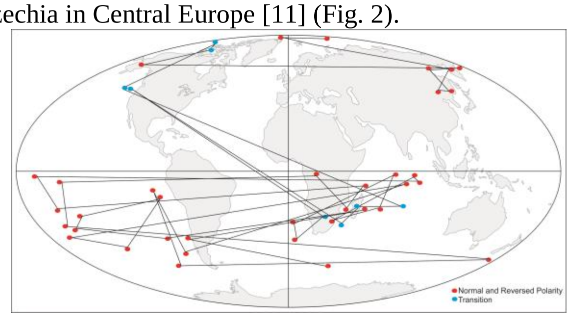

Fig. 2: Virtual pole positions from the cave sediment in Czechia.

Discussion and conclusion: We showed consistency from different studies that could be supporting evidence to the hypothesis for meteorite impact and magnetic reversal. The first occurrence of the magnetic dipole motion is towards the South America and this suggests the impact that caused the Matuyama Brunhes was directed northward over the Indonesia region [12], causing an apparent motion of the magnetic South pole towards the South America. Displacement in this direction is a base for further modeling of the angular momentum and convective pattern change in the liquid core.

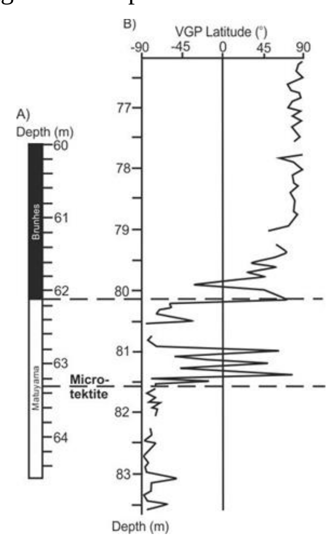

Fig. 3: A) Micro-tektite level 1.5 m below the Matuyama-Brunhes boundary [7]. B) Oscillations in VGP's latitudes 1.5 m below the transition from reversed to normal polarity [8]. Dashed lines show M/B boundary and microtektite level. Modified after [7, 8].

Acknowledgements: Jaroslav Kadlec and Tereza Kamenikova for help with sample measurements and retrieval. Support for GK came from the Czech Science Foundation 20-08294S, 20-00892L, Ministry of Education, Youth and Sports LTAUSA 19141, and institutional support RVO 67985831.

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