



## **Geomagnetic Secular Variation as derived from Brunhes Chron lavas from Central Mexico and hints to four geomagnetic excursions**

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There are around 8000 volcanoes within the Transmexican Volcanic Belt (TMVB) (between the Pacific coast and the Gulf of Mexico ( $19^{\circ}$  to  $21^{\circ}$ N)), and several hundred, which have erupted during the normal polarity Brunhes Chron, making the TMVB an excellent locality to study spatial and temporal variations of the Earth's magnetic field and the time-averaged field for the latitude of Mexico. To conduct such a study, we have carried out an integrated palaeo- and rock magnetic study of 75 lava flows from three distinct volcanic provinces: the Valle de Bravo-, the Ceboruco-San Pedro- and the Michoacan-Guanajuato Volcanic Field. Approximately 1100 oriented mini-samples, with a length of 10 mm and a diameter of 12 mm were collected from 75 cooling units that were previously dated by the  $40\text{Ar}-39\text{Ar}$  method. Rock magnetic experiments included high-temperature thermomagnetic analyses, isothermal remanence acquisition, hysteresis measurements, FORC measurements, ore microscopy, SEM observations and low temperatures magnetic measurements (20-300 K). Those studies revealed that in most cases, remanences are carried by Ti-poor titanomagnetite of pseudo-single-domain magnetic structure that have undergone variable degrees of low-temperature oxidation (maghaemitisation). Thermal and AF-demagnetisation data generally show a uni-vectorial decay of magnetic remanence towards the origin of the vector component diagrams with minor secondary viscous overprints, usually removed at  $200^{\circ}\text{C}/20\text{ mT}$ . We calculated site mean directions for 61 lava flows, which yielded 47 well defined results with  $a95$  values between  $2$  and  $8^{\circ}$ . The majority of palaeomagnetic site mean directions produced VGPs scattered around the north geographic pole, as expected for normal polarity for the latitude of Mexico. Palaeosecular variation is consistent with previously proposed models. Intermediate to reversed di-

rections were found in five flows. According to their radiometric ages they can be put into direct relationship with documented geomagnetic excursions derived from numerous magnetostratigraphic studies of marine sediments.