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Geomagnetic Paleosecular Variation During the Early Cretaceous

Everton Frigo (Federal University of Pampa (UNIPAMPA)), Jairo Savian (Instituto de Geociências; Universidade Federal do Rio Grande do Sul (UFRGS)), ALANA BAIOCO (Federal University of Rio Grande do Sul (UFRGS)), Carlos Augusto Sommer (Federal University of Rio Grande do Sul (UFRGS))

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Introduction

The period between 120 and 83 million years ago (Ma) was characterized by the occurrence of either no polarity reversals or very few in the Earth's magnetic field. This interval, during which the geomagnetic field exhibited predominantly normal polarity, is referred to as the Cretaceous Normal Superchron (CNS). During the CNS, the geomagnetic intensity did not remain stable at consistently low or high values but instead exhibited oscillations. In addition, directional variations were characterized by low amplitudes. However, between approximately 140 Ma and 120 Ma, a significant transition occurred in the behavior of the geomagnetic field, shifting from a period of frequent polarity reversals to the CNS. Understanding directional variations is essential to comprehending the overall behavior of the geomagnetic field during this transitional period.

Method and/or Theory

In this study, the amplitude of secular geomagnetic variation is investigated using directional paleomagnetic data obtained from rock samples collected in geological sections of the Paraná Basin. The samples were taken from lava flow sequences located in the states of Rio Grande do Sul and Santa Catarina, with a mean radiometric age of 133 Ma. Based on the geomagnetic inclination and declination data from each section, the positions of the virtual geomagnetic poles (VGP) were calculated. For each VGP distribution, angular dispersion was computed as a measure of the amplitude of paleosecular geomagnetic variation.

Results and Conclusions

The angular dispersion values obtained were lower than those estimated by the paleosecular variation model G and subsequent studies, which serve as references for the period studied. These findings indicate that the amplitude of directional geomagnetic variation was already low even before the onset of the CNS.