EGU26-14934, updated on 10 Nov 2026
https://doi.org/10.5194/egusphere-egu26-14934
EGU General Assembly 2026
© Author(s) 2026. This work is distributed under
the Creative Commons Attribution 4.0 License.

Effects of the Historical Geomagnetic Field on Earth's Energetic Particle Environment: Magnetic Anomalies and Auroral Regions

Kirolosse Girgis[1], Maximilian Arthus Schanner[2], Sanja Panovska[2], and Akimasa Yoshikawa[1,3]
[1]International Research Center for Space and Planetary Environmental Science (i-SPES), Kyushu University, Fukuoka, Japan (girgiskirolosse@i-spes.kyushu-u.ac.jp)
[2]Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum GFZ, 2.3 Geomagnetism, Potsdam, Germany
[3]Department of Earth and Planetary Sciences, Graduate School of Sciences, Kyushu University, Fukuoka, Japan

Three centuries ago, auroral emissions could be observed over the Korean sector, where the West Pacific Anomaly (WPA) coexisted with the South Atlantic Anomaly (SAA). To investigate this phenomenon, the present study builds upon our recent numerical simulations of the inner proton radiation belt [Girgis et al., JSWSC (2021), Girgis et al., SW (2023,2024)], in which we examined the effects of space weather on the near-Earth particle environment. Here, we extend our modeling framework to explore the historical distribution and state of the radiation environment. A key aspect of this research is the incorporation of a geomagnetic field configuration representative of the year 1650, and the comparison of the resulting particle environment with that derived from contemporary magnetic field models. The primary objective is to model the near-Earth particle environment in a manner that enables future coupling with atmospheric models, while also accounting for the influence of external space weather conditions. A comprehensive understanding of both the present-day and historical particle dynamics in the near-Earth environment is essential for predicting radiation conditions relevant to low Earth orbit (LEO) missions and for assessing the potential impact on Earth’s atmosphere.