ハラミヨサブクロン下限における気候変化と地球磁場変動

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Climate and magnetic field variations across the Lower Jaramillo polarity transition

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The influence of the geomagnetic field on Earth’s climate has been disputed for about a half century. This continuing debate now enters a new phase as a correlation has been demonstrated between galactic cosmic ray (CR) flux and cloud cover, suggesting that the geomagnetic field intensity variation may cause a climate change through modulation of CR flux. However, at present we have no geological evidence that supports such a long-term effect of the CR and cloud correlation. In order to examine the CR-climate relationship, we performed detailed paleomagnetic, sulfur, diatom and pollen analyses on a sequence around marine oxygen isotope stage (MIS) 31 of the 1700-m core from Osaka Bay, Japan. MIS 31 is an interglacial period which includes a polarity reversal (the Lower Jaramillo transition), like MIS 19 including the Matuyama-Brunhes polarity transition. Relative paleointensity, sea-level, and climate data were obtained across the Lower Jaramillo (LJ) geomagnetic polarity reversal, a time when the CR flux significantly increased because of the reduced geomagnetic field intensity. In the early MIS 31 interglacial, the postglacial rapid sea-level rise occurred, but the postglacial warming was quite gradual. At the sea-level highstand, the temperature did not reach a peak value. These sea-level and temperature variations disagree with features of a typical interglacial. A rapid warming occurred in the later MIS 31. The gradual warming phase is almost correlated with the time of low-geomagnetic field intensity (c. 20-30% of a normal intensity) just before the main LJ polarity boundary, and the rapid warming phase occurred in conjunction with the geomagnetic field intensity recovery. We discuss the possibility of an impact of the geomagnetic field on the Earth’s climate, comparing with paleoclimate observation results for other interglacial periods in the 1700-m core.