Paleoclimate reconstruction using fossil pollen analyses from a sedimentary sequence around the Matuyama-Brunhes polarity transition in the Chiba composite section

*Makoto Okada[1], Hitomi Takizawa[1], Yuki Haneda[2], Yusuke Suganuma[3,4], Quentin Simon[5]

1. Department of Earth Sciences, College of Science, Ibaraki University, 2. Graduate school of Science and Technology, Ibaraki University, 3. National Institute of Polar Research, 4. Graduate University for Advanced Studies, 5. Aix-Marseille University

To examine the “Svensmark effect”, linking climate cooling and geomagnetic field strength decrease, during the time of geomagnetic reversal, we have conducted a pollen analysis in the Chiba Composite Section including the Matuyama-Brunhes polarity reversal boundary, and correlated the quantitative paleoclimatic variation deduced by the modern analog method with the paleomagnetic and ^{10}Be records. The samples used in this study are from 33 horizons in a stratigraphic interval between 4-31 m above the Byk-E tephra bed where the sample density of pollen fossil data used in the previous study (Suganuma et al., 2018) is low. Samples were subjected to KOH-acetolysis treatment (Moore et al., 1991) and hydrofluoric acid treatment as pretreatment to extract pollen fossils. As a result of microscopic examination with an optical microscope, we identified 27 genera in total of 3 families, 24 genera of woody pollen, 2 genus pollen grasses and 2 spores. The abundant pollen fossils are Pinus, and some other genera distributed in the subarctic to cool temperate zones such as Picea, Tsuga, Fagus, etc.
Applying the modern analog method (Nakagawa et al., 2002) to the pollen assemblage data, the reconstructed paleoclimatic parameters show lower overall temperatures than the current study area. Comparing various climatic parameters from the modern analog method with the oxygen isotope records, insolation, ^{10}Be showing the penetration of galactic cosmic ray into the atmosphere and relative paleointensity, the reconstructed climatic parameters showed a variation consistent with paleoceanographic temperatures deduced from oxygen isotopes of planktonic foraminifera. Moreover, we do not recognize any trend of decreasing in air temperature corresponding to geomagnetic field strength collapse at the M-B boundary as reported by Kitaba et al. (2017).

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