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三畳紀、ジュラ紀深海堆積物中に保存された白金族元素濃度異常
Platinum group element anomalies in the Triassic-Jurassic deep-sea sediments

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One of the biggest mass extinctions in the Phanerozoic occurred at the Triassic-Jurassic (T-J) boundary (e.g., Sepkoski, 1984). The large magmatic activity associated with the breakup of Pangaea and the initial stage of rifting in the Central Atlantic Magmatic Province (CAMP) are characteristic across the T-J boundary (McHone, 2000; Nomada, 2007). So, these magmatic activities likely changed the climate and caused biotic crisis at the T-J boundary (e.g., Deenen et al., 2010). On the other hand, Olsen and others (2002) suggested that bolide impact triggered the climatic change and mass extinction, based on an Ir anomaly preserved in the Newark rift basin. In addition, it is also proposed that the encounter with dark clouds and supernova explosion caused extreme environmental change on the earth surface (the mass extinction and glaciation; Kataoka at el., 2012). However, the possibilities of these hypotheses remain controversial because of insufficient geological evidence.

In this research, we present secular variation of platinum group elements (PGEs) concentration in the Triassic-Jurassic succession in Inuyama, central Japan. Previous Ir anomalies have been reported from sediments with high sedimentation rate, around the T-J boundary (Olsen et al., 2002; Hori et al., 2007). However, sediments with low sedimentation rate are suitable for the PGEs analyses. In the Inuyama, the depositional rate of the shale part in bedded chert is about one to two orders slower than those of the chert (Hori et al., 1993). Therefore, the best target for the PGEs analyses is the shale part in bedded chert preserved in the accretionary complex.

We conducted geological survey at the Inuyama section, because of good exposure of the T-J boundary. We developed detailed geological map of the study area and collected rock samples bed-by-bed to determine the secular variation of PGEs concentrations. In particular, we collected about 250 samples from shale part in the bedded chert and analyzed the PGEs concentrations of 20 shale samples across the T-J boundary. For whole-rock analyses of PGEs, all shale samples were powdered in an Alumina planetary mill. After chemical separation from coexisting matrix elements using a chromatographic technique, PGEs concentrations were analyzed by coupled plasma mass spectrometry (ICP-MS) at Tokyo Institute of Technology. The PGEs concentrations were determined by isotopic dilution method. The results show that Ir concentration reach ca. 1 ppb just above the T-J boundary. As compared to the previous works (Olsen et al., 2002; Hori et al., 2007), the Ir anomaly is the highest across the T-J boundary and attributes to the difference of their depositional rate and/or sampling resolution. Olsen and others (2002) suggested the possibility of volcanic or impact events for origin of the Ir anomaly. The Ir anomaly in this research also may be associated with impact event, despite the lack of shocked quartz and other index of impact origin (e.g., Grieve et al., 1996). In order to recognize the correlation between PGEs concentrations and CAMP, we need additional stratigraphic and isotopic analyses.

In this presentation, we would like to discuss the origin of the Ir anomaly and its relation to evolution of life.

Reference

Deenen, M. H. L. (2010). Earth and Planetary Science Letters, 5, 291, pp. 113-125.
Grieve, R. A. F. (1996). 2, Significance in geoscience: Meteoritics, 31, pp. 6?35.
Hori, R. (1993). Island Arc, 3, pp. 170-180.
Hori, R. (2007). Palaeogeography, Palaeoclimatology, Palaeoecology, 5, 244, pp. 391-406.
Kataoka, R. (2012). New Astronomy, 21, pp. 50-62.
McHone, J. G. (2000). Tectonophysics, 5, 316, pp. 287?296.
Nomade, S. (2007). Palaeogeography, Palaeoclimatology, Palaeoecology, 5, 244, pp. 326-344.
Olsen, P. (2002). The Geological Society of America Special Paper, pp. 505-522.
Sepkoski, J. J. (1984). Paleobiology, 10, pp. 246-267.

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