

Paleoceanography for future prediction: Possibility of climatic mode jump in response to global warming

Ryuji Tada

(University of Tokyo , Department of Earth and Planetary Science, Professor)

【Outline of survey】

This research aims to examine the linkage among Asian monsoon, westerly jet meandering, and amplification and propagation of abrupt climatic changes using East Asia and northwestern Pacific as a test field. This research further aims to explore possibility of the climatic mode warmer than the present during past interglacial periods and clarify the condition and controlling factors of such a mode. To accomplish these objective, we will reconstruct temporal variations of 1) summer monsoon intensity, subpolar front position in the Japan Sea, Amur River discharge, and SST and SSS of the Okhotsk Sea, and 2) winter monsoon intensity, westerly jet axis position above the Japan Sea, sea ice distribution, polynia position, and intermediate water production rates in Okhotsk, Berling, and Chukchi seas since the last glacial period, and examine their interrelationships. Special emphasis will be put on possibility of the climatic mode warmer than present during the last interglacial and early Holocene periods, in order to clarify the speed, process, threshold, and forcing of the mode jump. Based on these results, we will compare the difference in interrelationship among different paleoclimatic proxies, as well as difference in amplitude, pattern, and frequency of their variations between glacial and interglacial periods so as to clarify the amplification and propagation mechanism of rapid climatic changes.

【Expected results】

Through this research, we expect to understand the linkage of westerly jet - Asian summer monsoon - Amur River discharge - paleoceanography of East Asian marginal seas, as well as that of westerly jet - Asian winter monsoon - sea ice and polynia formation - North Pacific Intermediate Water. We further expect to understand what kind of role(s) such linkages play on amplification and propagation of rapid climatic changes, and how such linkages operate under the climatic mode warmer than the present. To understand problems such as what the oceanic environment in the Northwestern Pacific was under such a warm climatic mode, how rapid the jump to such warm climatic mode was, and what controls such climatic jump, will provide information useful to predict future oceanographical changes in the Northwestern Pacific.

【References by the principal researcher】

- Tada, R., Onset and evolution of millennial-scale variability in Asian monsoon and its impact on paleoceanography of the Japan Sea, in Clift, P. et al. (eds.) Continent-ocean interactions within east Asian marginal seas, AGU Monograph Series 149, 283-298, 2004.
- Irino, T. and R. Tada, High resolution reconstruction of variation in aeolian dust (Kosa) deposition at ODP site 797, the Japan Sea, during the last 200 ky, Global Planetary Change, 35, 143-156, 2003.
- Tada, R., S. Sato, T. Irino, H. Matsui, and J.P. Kennett, Millennial-scale compositional variations in late Quaternary sediments, ODP Site 1017, Southern California Margin, Proceedings of ODP, Scientific Results, 167, Ocean Drilling Program, College Station, TX, 277- 296, 2000.
- Irino, T. and R. Tada, Quantification of aeolian dust (Kosa) contribution to the Japan Sea sediments and its variation during the last 200 kyr, Geochemical Journal, 34, 59-93, 2000.
- Tada, R., Irino, T., and Koizumi, I., Land-ocean linkage in orbital and millennial timescales recorded in Late Quaternary sediments of the Japan Sea, Paleoceanography, 14, 236-247, 1999.

【Term of project】 FY2006 - 2010

【Budget allocation】 29,400,000 yen

【Homepage address】

<http://www-sys.eps.s.u-tokyo.ac.jp/~paleo/>