Geochemical fingerprinting of event deposits in Japan Trench by using multivariate analyses of XRF-scanning data

Tobias Schwestermann[1], *Jyh-Jaan Huang[1], Gerold Wefer[2], Ken Ikehara[3], Toshiya Kanamatsu[4], Arata Kioka[1], Timothy Ian Eglinton[5], Negar Haghipour[5], Michael Strasser[1,2]

1. Institute of Geology, University of Innsbruck, Innrain 52, 6020 Innsbruck, Austria, 2. MARUM –Center for Marine Environmental Sciences and Department of Geosciences, University of Bremen, Klagenfurter Str., 28359 Bremen, Germany, 3. Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba Central 7, 1-1-1 Higashi, Tsukuba, 305-8567, Japan, 4. Research and Development Center for Earthquake and Tsunami, Japan Agency for Marine-Earth Sciences and Technology (JAMSTEC), 2-15 Natsushima-cho, Yokosuka, 237-0061, Japan, 5. Geological Institute, ETH Zurich, Sonneggstrasse 5, 8092 Zurich, Switzerland

Large earthquakes, such as the 2011 Mw 9 Tohoku-oki earthquake, trigger extensive subaqueous sediment resuspension and redeposition. Such redeposition has been detected as event deposits within small depositional trench basins from the southern to the northern Japan Trench by means of high-resolution sub-bottom profiles and sediment cores, and are considered as the potential tool in subaqueous paleoseismology. However, a statistical analysis of the geochemical signature of these deposits, which is crucial to understand sediment provenance and remobilisation processes, is so far lacking. For this purpose, this study performs sediment analysis based on X-Ray Fluorescence (XRF) core scans and Total Organic Carbon (TOC) on cores retrieved during cruises of R/V Sonne SO219A and SO251A, covering the entire along-strike extent of the Japan Trench from 36˚ to 40.4˚ N. Cores were measured on the Avaatech XRF core scanner at MARUM, University of Bremen, with a sampling interval of 1cm with 10 kV and 30 kV for the elements Al, Si, K, Ca, Ti, Mn, Fe and Br, Rb, Sr, Zr, respectively. To avoid closed-sum effect of XRF scanning results the centred log-ratio transformation has been applied. The complexity of the resulted data has been reduced from original 12 to 5 variables by means of Principal Components Analysis (PCA). With further application of Ward’ s clustering analyses, the sedimentary record can be grouped into different geochemical subfacies. Thus, geochemical signatures of event deposits among spatial and temporal distribution can be identified.

Keywords: XRF Scanning, Japan Trench, Multivariate analyses

