Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

MIS25-P01 Room:Poster Time:April 28 18:15-19:30

Is the growth hiatus of ferromanganese crusts a local or global event?

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Recent applications of an Os isotope dating method revealed that some ferromanganese crusts collected from the Pacific Ocean might have experienced the growth hiatus. However, it is still controversial whether this growth hiatus was a local or global event. In the present study, we discuss the geological trigger of this growth hiatus based on our results of the Os isotope dating on various ferromanganese crust samples collected from Northwestern Pacific, South Atlantic Oceans and Philippine Sea.

Keywords: ferromanganese crust, Os isotope, geochemistry, growth hiatus, paleoceanography

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Sedimentation rate of the end-Permian to earliest Triassic black claystone strata in the Panthalassic deep-sea

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The greatest mass extinction occurred at the end-Permian, its aftermath continued during following Early Triassic. This period, especially interval between the end-Permian and Induan is characterized by occurrences of the black claystone in the pelagic deep-sea depositional area where now locate in Japan and western North America etc. This black claystone generally contains high organic matter and few silicic fossils, in contrast that bedded chert before the mass extinction event has few organic matter and abundant radiolarian tests. Detailed background of this black claystone has not been fully understood due to the scarcity of well-preserved lithologic sequences. Herein, we show preliminary achievement on continuous black claystone strata based on the one of most continuous Permian-Triassic Boundary section (Akkamori-2 section; Takahashi et al., 2009).

We polished the outcrops of the study section using hand grinders with diamond-blades and diamond-polishing pad for observation of sedimentary facies and structures. Observing the outcrop, structural geology examination was conducted (See Yamaguchi et al. in this session). Using their results, we divided the outcrop into 20 subsections that preserve continuous lithologic stratigraphy. Then, high-resolution lithologic column was reconstructed from these subsections.

After careful observation on the polished surface of the outcrop, we found many key bed layers. For instances, dolomitic layers, light and dark grey colored siliceous claystone interbeded within black claystone, and alternations of black and grey colored claystones. Using these key beds, we correlated the lithologic columns from each subsection. In the case of that useful key beds were not found, we simply built the columns up, because no duplication of strata was recognized. After these processes, totally ca. 10 m thick lithologic column of black claystone was reconstructed. Its lower most horizon accords to carbon isotopic negative excursion (Takahashi et al., 2010) coinciding with the main mass extinction event, ca. 252.2 Ma (U-Pb dating by Shen et al., 2011). Meanwhile, in the thick grey-color siliceous claystone horizon from uppermost part of the strata, conodont fossils of Neospathodus waageni and Eurygnathodus costatus were recovered. This combination indicates lowest Smithian. After interpolation by Geologic Time Scale 2012 (Gradstein et al., 2012), beginning of Smithian (end of Induan) is ca. 250.0 Ma. Using these absolute ages, sedimentation rate of black claystone is calculated 4.34mm/kyr (= 10000 mm /2300 kyr). This calculation is still comprehensive. Also, we can calculate the sedimentation rate in another way using the earliest Triassic conodont occurrence of Hindeodus parvus in the 7.5 m above the base of black claystone. The first occurrence horizon is estimated to be 252.3Ma in the type section of Permian-Triassic Boundary (Shen et al., 2011). The calculated sedimentation rate of black claystone in this way is 7.5 mm/kyr (750 mm/100 kyr). As the fossil age is uncertain between the basal 7.5 m interval, this is a maximum estimation. These two results of sedimentation rate indicate that the black claystone beds were accumulated in several millimetres per a thousand year. This rate is in similar class of sedimentation rate of radiolarian chert deposited before and after the black claystone deposition. In fact, recent study of Ikeda et al. (2010) concluded several centimetres thick one chert-clay couplet accords about 20 kyr. The sedimentation rate of the black claystone as similar as silicic fossil rich bedded chert before mass extinction event implies that some materials increased into the pelagic deep-sea at and after the extinction event instead of significantly decreased radiolarian tests (Takahashi et al., 2009). Possible materials are terrigenous clastic material (Algeo and Twitchett, 2009; Sakuma et al., 2012) and very fine silicic biotic crust (such as silicic sponges).

Keywords: Permian, Triassic, pelagic deepsea, black claystone, mass extinction

MIS25-P03 Room:Poster Time:April 28 18:15-19:30

Stratigraphy and formation process of Late Cretaceous pelagic sediments in the Wadi Hilti area of the Oman Ophiolite

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The Oman Ophiolite consists of mantle peridotites, gabbros, a sheeted dyke complex, and basaltic lavas. The extrusive rocks have been subdivided into three volcanic units: the V1 lava with the N-MORB signature, the V2 lava formed by intra-oceanic volcanism, and the V3 lava generated by intra-plate seamount magmatism (Ernewein et al., 1988). Pelagic sediments commonly occur at the boundaries between these volcanic units. Thick sediments upon the V1 lava in the Wadi Jizzi area are subdivided into the Suhaylah and Zabyat formations; the former is composed of metalliferous and fine-grained pelagic sediments of Cenomanian-Santonian? age, and the latter consists of conglomerate derived mainly from a collapsed oceanic crust during the thrusting stage (Fleet and Robertson, 1980; Tippit et al., 1981; Woodcock and Robertson, 1982; Robertson and Woodcock, 1983).

The V2 and V3 lavas are widely distributed in the Wadi Hilti area, about 25 km west of Sohar, northern Oman Mountains. Recently, the eruption and emplacement mechanism of the V3 lava has been studied by Umino (2012). Pelagic sediments, about 50 m thick at a maximum, overlie the V2 lava and are covered by the V3 lava. The sediments also occur on and within the V3 lava. Based on our field examination for several sections in the Wadi Hilti area, the stratigraphy of the pelagic sediments on the V2 lava consists of metalliferous sediments, micritic limestone, red mudstone, conglomerate, V3 lava, and siliceous mudstone, in ascending order. We first found conglomerate containing gravels of lavas and pelagic cherts from this area. From fine-grained pelagic sediments on the V2 and V3 lavas, we obtained *Rhopalosyringium scissum* O'Dogherty and *Hemicryptocapsa polyhedra* Dumitrica that can be assigned to a Turonian age (O'Dogtherty, 1994). In addition, *Rhopalosyringium petilum* (Foreman) and *Guttacapsa biacta* (Squinabol) were recovered from a block of siliceous mudstone probably within the conglomerate. According to O'Dogtherty (1994), the co-occurrence of these species is restricted to be middle to late Cenomanian.

Based on these age assignments, the fine-grained pelagic sediments on the V2 lava (metalliferous sediments, micritic limestone, and red mudstone) in the Wadi Hilti area can be correlated with the Turonian part of the Suhaylah Formation in the Wadi Jizzi area. This reveals that the activity of the V2 lava was terminated in Turonian. The conglomerate and the siliceous mudstone on the V3 lava are correlated with the Zabyat Formation, indicating that the eruption of the V3 lava occurred in Turonian. These age constraints for basaltic extrusive rocks imply that the tectonic setting from subduction to oceanic-thrusting changed rapidly in a short period of Turonian time.

Keywords: Oman Ophiolite, pelagic sediments

MIS25-P04 Room:Poster Time:April 28 18:15-19:30

Stratigraphy and radiolarian age of the Zabyat Formation at Lasail section in the Wadi Jizzi area, Oman Ophiolite

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The Oman Ophiolite consists of mantle peridotites, gabbros, a sheeted dyke complex, and extrusive lavas overlain by pelagic sediments. The basaltic extrusive rocks have been subdivided into three volcanic units (the V1, V2, and V3 lavas) (Ernewein et al., 1988). The overlying pelagic sediments, named the Suhaylah Formation, consist of metalliferous and fine-grained calcareous sediments of Cenomanian-Santonian? age (Fleet and Robertson, 1980; Tippit et al., 1981). The Zabyat Formation, which covers conformably the Suhaylah Formation, is composed of conglomerate derived mainly from a collapsed oceanic crust during the thrusting stage (Woodcock and Robertson, 1982; Robertson and Woodcock, 1983). Although Robertson and Woodcock (1983) investigated the sedimentation process of this formation, they did not study the biostratigraphic age of fine-grained sediments intercalated with conglomerate at Lasail section in the Wadi Jizzi area.

At Lasail section, the stratigraphy of the Zabyat Formation consists of the lower conglomerate interbedded with micritic limestone and red mudstone and the upper red mudstone and siliceous mudstone. The micritic limestone of the lower part contains *Alievium superbum* and *Rhopalosyringium scissum*, indicating Turonian in age (O'Dogtherty, 1994). From the red mudstone of the upper part, we obtained *Pseudoaulophacus lenticulartus*, *Pseudoaulophacus praefloresensis*, and *Theocampe salillum*. The occurrence of these species assigns the upper part of the Zabyat Formation to Coniacian (Pessagno, 1976; Bandini et al., 2008). Our biostratigraphic result of the Zabyat Formation, taken together with that of the Suhaylah Formation, shows that the change of the tectonic setting from mid-ocean ridge through subduction zone to oceanic thrusting occurred in a short period (c.a. 4 m.y.) of latest Cenomanian to Coniacian time.

Keywords: Oman Ophiolite, pelagic sediments

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Deformational features of Permian-Triassic boundary preserved within an on-land accretionary complex

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Pelagic siliceous sediment covering on oceanic crust is one of the components in subduction plate boundaries where old oceanic plate subduct. Its mechanical, frictional and fluid transport properties are key to understand faulting and earthquake mechanics in such settings (Kimura et al., 2012; Yamaguchi et al., this meeting). Plate boundary deformations are strongly affected by inhomogeneity of incoming sediments: in the case of Jurassic accretionary complex in Japan (Mino-Tanba belt), siliceous/black claystone at Permian-Triassic boundary horizon within bedded chert functioned as plate boundary decollement, and only Triassic-Jurassic chert is preserved in the complex, whereas Carboniferous-Permian chert is lacking (Nakae, 1993). However, few outcrops in the Jurassic accretionary complex comprise continuous sections across Permian-Triassic boundary. To understand the limitation of lithology-controlled deformations, we investigated structural analysis of the Permian-Triassic boundary section in the North Kitakami Belt (Akkamori-2 section; Takahashi et al., 2009), where the most continuous Permian-Triassic boundary is observed.

Permian gray-color siliceous claystone to Triassic gray-color siliceous claystone through black claystone is successively observed in this outcrop (lithology detail: see Takahashi et al., this session). Orientations of 36 bedding dips, 90 low-angle cleavages, 17 high-angle cleavages, and 22 faults are measured from the outcrop. Strikes of bedding and low-angle cleavage vary NW-SE to NE-SW, gently dip eastward. Faults have two populations: one is subparallel to bedding and low-angle cleavage; the other is dipping gently to the north. Shear sense of the faults is unclear because of the lack of shear sense indicators due to intense development of overprinting high-angle cleavage.

In contrast to the scattered orientations of low-angle cleavage, strike of high-angle cleavage is limited to N40-70E with subvertical dip. The high-angle cleavages are recognized as axial plane cleavage of map-scale Hiraniwa-dake Syncline (Sugimoto, 1974) striking NW-SE and plunging southeastward, since the studied section is located nearby the axis of the syncline. Orientations of bedding, low-angle cleavage, and fault would be also rotated by secondary-order outcrop-scale open folds.

Hiraniwa-dake syncline involves several chert-clastics sequences in this region (Ehiro, 2008). Substracting fold-related deformations, bedding-parallel cleavages and low-angle faults (likely to be thrust) are only initial deformations observed in the studied outcrop. Those deformational features are also typical in off-scraped and underthrusted accretionary complex (Kimura and Hori, 1993, Raimbourg et al., 2009). Lack of intense deformation in the black claystone suggests that not only lithology-controlled physical properties but other factors (e.g. topographic and thermal effects) would be also important to constrain the position where decollement develops.

Keywords: Permian-Triassic Boundary, subduction zone, accretionary complex, Deformation structure