

## Surface Productivity and bottom water circulation changes in the Eastern equatorial Pacific

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Integrated Ocean Drilling Program Expedition 320/321 Pacific Equatorial Age Transect (PEAT I and II) was carried out to recover complete paleoceanographic record in the Eastern equatorial Pacific during Cenozoic. Especially clarifying accumulations of biogenic carbonates and carbonate compensation depth (CCD) fluctuations were one of the highest priorities in these expeditions. The cruise we attended (PEAT II) were recovered cores from two locations (Sites 1337 and 1338) to understand equatorial paleoceanography since middle Miocene in the Pacific. In this study, we performed geochemical analysis in order to reveal the bottom water hydrography in the eastern Equatorial Pacific from the middle Miocene to Holocene.

The cores U1337 and U1338 were pelagic sediments composed of calcareous chalk with laminated diatom bulbs. Inorganic carbon (IC) and total organic carbon (TOC) was analyzed shipboard using coulometry and CHN analyzer. IC contents of core was 0-99% and 30-90 % through the cores in U1337 and U1338, respectively and indicated mostly good preservation of calcium carbonates. On the other hand, the carbonate crash representing anomalous decreasing of carbonate accumulation was detected both sites at Middle-Late Miocene (ca. 11-9 Ma), and it affected more strongly in U1337 rather than U1338. TOC contents was mostly very low (~0.1 %) through both cores but showed 0.3 - 0.5 % in some layers that were indicated laminated diatom concentrated layers. It suggested that frequent productivity changes had occurred during middle - late Miocene.

Trace metal analysis was performed for benthic foraminifers in core U1338 to understand deepwater temperatures and other geochemical properties. *Cibicides mundulus* and *Oridorsalis umbonatus* were used for Mg, Sr, Mn/Ca analysis. Mg/Ca showed that 0.4 - 1.5 mmol/mol through the core. This fluctuation showed similar trend with global  $\delta^{18}O$  fluctuations of benthic foraminifera. It suggests that bottom water temperature was affected with global climate changes related to ice volume effects.

Keywords: PEAT, Eastern equatorial Pacific, Middle Miocene, CCD, benthic foraminifera, bottom water circulation

## Lithostratigraphy and radiolarian age of the Upper Cretaceous Suhaylah Formation of the Oman Ophiolite

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In this study, the lithostratigraphy and radiolarian biostratigraphy of the Suhaylah Formation within the northern Oman Ophiolite are reinvestigated in order to understand the history of pelagic sedimentation and radiolarian faunal transition process during Late Cretaceous.

Radiolarian investigation has been conducted in "Wadi Jizzi" section, located at Suhaylah, about 40 km west of Sohar. In the analyzed section, three lithologies were recognized in ascending order: umber (metalliferous sediments) interbedded with thin chert layers (8 m), red shale with chert intercalations (4 m), and micritic limestone (6 m). The umber is dark purple to dark red in color, weakly stratified, and very fine grained with metallic luster. The thin lamination within the bed is frequently observable. The red shale is very fine grained. In the upper part of the shale sequence, several chert layers are intercalated with the shale. The micritic limestone is red in color in the lower part and greenish gray in the upper part.

We recognized three radiolarian assemblages from the section, based on the species composition. Assemblage A, recognized in the chert within umber and red shale, contains *Thanarla pulchra* (Squinabol) and *Guttacapsa biacuta* (Squinabol), indicating late Cenomanian in age. Assemblage B, characterized by the abundant occurrence of *Rhopalosyringium scissum* O'Dogherty and *Dictyomitra formosa* Squinabol, is recovered from red shale and micritic limestone. The age of this assemblage is assigned to early Turonian. Assemblage C is recognized in micritic limestone, including *Mylocercion* sp., *Schadelfusslerus* sp., *R. scissum*, and *Dictyomitra formosa* Squinabol. This assemblage is assignable to early Turonian or slightly younger age, based on the stratigraphic relationship to Assemblage B. Based on these radiolarian occurrences, the Cenomanian/Turonian boundary occurs within the red shale, being approximately 4 meters below the micritic limestone.

Keywords: Oman Ophiolite, Suhaylah Formation, radiolarians, Upper Cretaceous

## Late Cretaceous pelagic sedimentary rocks on the extrusive rocks of the Oman Ophiolite and their radiolarian age

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The Oman ophiolite, a member of the Tethyan ophiolites, crops out over 600 km long and up to 150 km wide in the Oman Mountains. The ophiolite suite consists of mantle peridotites, gabbros, a sheeted dyke complex, and extrusive lavas overlain by pelagic sediments. The basaltic 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., 1998). Pelagic sediments with metalliferous sediments (umber) commonly occur at the boundaries between these volcanic units. We are now reinvestigating radiolarian biostratigraphy of the pelagic sediments, and here we present newly-obtained Turonian radiolarians from micritic limestone overlying the V2 lava.

Radiolarian study for the micritic limestone was conducted in "South of Wadi Hilti" section, located in an area about 40 km west of Sohar. At this section, the radiolarian-bearing micrites with a total thickness of 6 m conformably overlie the uppermost part of the V2 lava. In this section, basaltic rocks of the V3 lava thrust over the micrite. The micritic limestone is thinly bedded (3 to 5 cm thick) and light brown in color in the lower part and red in the upper part. Numerous radiolarian shells can be observed in the muddy matrix of micrite but they are commonly calcified. Total 11 samples were collected from this section for radiolarian biostratigraphic analyses. Well-preserved radiolarians were recovered from two samples of red micrite. From these samples, we recovered *Dictyomitra formosa* Squinabol, *Pseudotheocampe tina* (Foreman), *Amphipyndax stocki* (Campbell and Clark), *Mylocercion* sp., and *Rhopalosyringium scissum* O'Dogherty. According to O'Dogherty (1994), the first appearances of *P. tina* and *R. scissum* are near the base of Turonian. Thus, these radiolarians are assignable to early Turonian or slightly younger age.

Very recently, the details of volcanostratigraphy and geochemical features for the upper part of the V2 lava including boninite are becoming clearer (S. Miyashita, pers. comm.). Compilation of the present result, in combination with the volcanostratigraphy and future reinvestigation of radiolarian biostratigraphy across a much wider area, will provide essential information on age constraints and formation process of the Oman ophiolite.

Keywords: Oman Ophiolite, Late Cretaceous, radiolarians, pelagic sedimentary rocks