Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BPT23-P01 Room:Convention Hall Time:May 23 15:30-17:00

Massive soil erosion and the Late Devonian mass extinction

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The Late Devonian mass extinction was characterized by stepwise extinctions of marine organisms during the spread of vascular land plants. Algeo and co-authors hypothesized that the spread of vascular land plants resulted in increased pedogenic weathering rates and the flux of soil-derived nutrients to marine ecosystems leading to the mass extinction. However, since presentation of that hypothesis in 1995, no evidence of massive soil erosion has been reported. Here we show that massive soil erosion occurred rapidly in the latest Frasnian, which marks the culmination of the stepwise Late Devonian mass extinction and sea level rise. The evidence includes maxima in organic geochemical indicators of soil erosion and vascular land plants in the top of the Frasnian composed of mudstone in a shallow marine sequence from Belgium. The Late Devonian is an unique period marked by massive soil production in flood plains by vascular land plants and massive sediment yield in uninhabited hinterland by rapid physical weathering before development of seeds in the Famennian, resulting in the massive accumulation of soil and sediments on plains. Therefore, similar events have not occurred after the Devonian. We hypothesize that flooding due to global sea-level rise eroded the massive soil and sediments, providing abundant nutrients and a massive mud supply to marine ecosystems, which resulted highly selective decimation of shallow-water sedentary organisms.

Keywords: Devonian, mass extinction, soil, sea level, vascular land plants

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BPT23-P02 Room:Convention Hall Time:May 23 15:30-17:00

Predominance of even-numbered n-alkanes spanning the end-Permian mass extinction and the Induan-Olenekian biotic turnove

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The greatest mass extinction occurred at the end of the Permian. The biotic recovery was much delayed until the beginning of the Middle Triassic, and hostile environments for organisms are thought to have occurred repeatedly during the Early Triassic. We present new information regarding the marine environment of the Early Triassic, using organic molecules. We show that a predominance of even-numbered n-alkanes (n-C14 to C18 and C16 to C22) occurred spanning the end-Permian mass extinction and the Induan-Olenekian biotic turnover. We attribute this to expansion of microbial communities and/or diagenetic products under acidic ocean conditions across these boundaries. These unusual phenomena are thought to be related to the mass extinction and the I-O biotic turnover.

Keywords: early Triassic, n-alkane

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BPT23-P03 Room:Convention Hall Time:May 23 15:30-17:00

Growth and habitat of the Jurassic ammonoids, Quenstedtoceras, inferred from stable isotopic compositions

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Oxygen and carbon isotopic compositions of the exquisitely well-preserved Jurassic ammonoid Quenstedtoceras were analysed for understanding habitat and growth of well diversified Mesozoic ammonitids. Thermal structure of the Jurassic epicontinental sea estimated from oxygen isotopic temperatures of benthic foraminifers and nektonic vertebrate remains represents 10?C and 24?C for bottom and surface temperatures, respectively. Oxygen isotopic temperatures of 15 and 17 ?C for Quenstedtocesas indicate that these ammonoids analysed were nektonic swimmer within the Jurassic epicontinental water column.

Keywords: Stable isotopes, Paleoecology, Ammonoids, Jurassic, Paleotemperature

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Sequential changes in valve size distribution of planktonic diatoms from Hiruzenbara Formation, Okayama

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Fossil freshwater planktonic diatoms from laminated diatomite in Middle Pleistocene Hiruzenbara Formation were observed. Stephanodiscus komoroensis was abundantly observed mainly in light-colored laminae and Puncticulata sp. was dominated in dark-colored laminae. Former occurred through the 20-m thick section but latter did not occur from uppermost 2-m thick section. Abundance of S. komoroensis is smaller than 10 % in the section with Puncticulata sp. and quickly increased to almost 100 % occurrence in the section without Puncticulata sp. Valve size distribution of S. komoroensis sequentially changed: large size (80-100 micro-m in diameter) dominated in the section with abundant Puncticulata sp.: dominant size range shifted to 100-120 micro-m in the section just beneath that without Puncticulata sp.: small size (40-60 micro-m in diameter or less) occurred more than 30 % in the section without Puncticulata sp. Our results of species composition and their size distribution generally coincident with previous studies and give insight to competition between planktonic diatom species.

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Keywords: diatom, valve size, Hiruzenbara Formation, lacustrine deposit, laminated diatomite

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How to compare disparity across the molluscan classes?: refinement of theoretical morphospace and beyond

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Study on global biodiversity through geologic time has been a leading paleontological science over the past few decades. The biodiversity is commonly estimated by taxonomic richness through compilations of the fossil records. On the other hand, disparity, a morphological aspect of biodiversity, has attracted less attention despite its significances. It may be partly because assessment of disparity is not so easy as counting the number of taxa. Measurement of disparity is defined through accommodating a variety of taxonomic groups into an integrated morphospace; in other words, it cannot be described without common morphological traits across all taxa of interest. The affair does matter when we try to compare morphological diversity between disparate organisms. For instance, disparity in bivalves is rarely compared with that in gastropods, notwithstanding a great success in theoretical morphology of molluscan shells. Indeed, even the number of parameters necessary for defining shell form is prone to differ between theoretical models designed for clams and snails. An integrated model and morphospace, as well as an appropriate measure of disparity itself, is required for future development of study on long-term disparity patterns in mollusks.

Here, I would propose a method to compare disparity across the different classes of the Conchifera described as follows. The shell form is represented by the five parameters; tightness of shell coiling, translation rate of the aperture along the coiling axis, the relative size of the aperture, the orientation of the aperture with respect to the coiling axis, and the angle of the aperture to the radial direction. The parameters are log-transformed and normalized to give data with standard normal distribution. Distance for each morphological trait between a pair of shell forms is defined as a difference in parameter value between them. Disparity is assessed by the mean distance between all pairwise combinations. If the parameters approximate normality, the mean pairwise distance does not depend on sample size. Relation of the morphological distance defined herein to the taxonomic unrelatedness was analyzed in more than a thousand conchiferan species to find a disparity measure which is independent of taxonomic distinctness.

Keywords: disparity, morphospace, Mollusca

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The Bivalve Heresy revisited: crystallographic evidence implies inoceramids are protobrachs rather than pteriomorphians

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The Inoceramidae, the most flourished bivalves throughout the Late Cretaceous, have been subjects of paleontologist's attention because of their great biostratigraphic utilities and biological enigma. In particular, their phylogenetic position has been a matter for debate in the last decade over a controversial heresy raised by Johnston and Collom (1998), i.e., the Inoceramidae should be placed with cryptodonts in the Protobranchia, not Pteriomorphia. The "Bivalve Heresy" is grounded on morphological and paleoecological traits that can only be regarded as inconclusive evidences. Here we present a new evidence for the "Bivalve Heresy" through the crystallographic features of the shell.

In this study, we focused on distribution of crystallographic orientation in the nacreous shell layer because it is different among higher taxa in the Bivalvia. We analyzed orientation of aragonite crystals in a total of three inoceramid species, namely *Inoceramus mihoensis*, *Sphenoceramus naumanni* and *S. sachalinensis*. Pearlescent fossil specimens recovered from the Upper Cretaceous Yezo Group were utilized for the orientation mapping using electron backscatter diffraction (EBSD: Oxford-HKL Channel5) attached with a SEM (Hitachi S-3400N). The EBSD analyses revealed that preferred orientation of the *a*-axis is unclear in all inoceramid specimens examined. Such a character was also reported in nucleoid protobranchs and is totally different from the crystallographic preferred orientation seen in pteriomorphians in which the *a*-axes are well aligned along the growth lines. Although crystallographic data hitherto been available are limited for protobranchs, this result exhibits a sign of inappropriateness of assigning the Inoceramidae to the Pteriomorphia.

Keywords: inoceramids, nacreous structure, crystallographic orientation, EBSD