

## Spongy parenchyma found in meta-tuff of Hitachi Cambrian Akazawa Formation

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Hitachi Cambrian meta-tuffs containing spongy parenchyma occur as gravels in the Miyata River and the Ayukawa River. Spongy parenchyma consists of siliceous sphere with several layers and dark matrix. This texture is not like to siliceous oolite, pisolite, and spherulite, but to silicified sponge.

Keywords: Hitachi Cambrian, meta-tuff, spongy parenchyma, sphere

## Middle-Late Ordovician biodiversification and relevant environmental changes in Estonia

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Following up the 'Cambrian explosion', marine biodiversity increased dramatically during the Ordovician, as known as the 'Great Ordovician Biodiversification Event' (GOBE). Estonia in central Baltoscandia provides excellently continuous Ordovician sedimentary package for detailed analysis. We are analyzing the drilled core samples of the Middle-Upper Ordovician strata (ca. 150 m-thick) collected from Velise in central Estonia, in order to clarify litho-, bio-, and isotope stratigraphy of C and Sr, and to reveal the cause and processes of the GOBE. We will report on our preliminary results.

Keywords: Ordovician, Baltoscandia, GOBE, stratigraphy, drilled core

## Organic geochemical evidences for smoke clouds induced by an asteroid impact at the Cretaceous-Paleogene boundary

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An asteroid impacted the continental shelf of Mexico 66 Myr ago. Although the resulting ejecta containing asteroidal and terrestrial materials in the stratosphere caused acid rain, darkness, and a mass extinction, the mechanisms of the extinction remain under debate. We demonstrate that the impact caused the ejection of combusted fossil oil into the stratosphere, forming a smoke plume that remained for several years. The absorption of solar radiation by the smoke led to the devastation of plants, causing the extinction of the dinosaurs and some marine invertebrates at the end of the Cretaceous. Combusted organic molecules containing coronene are concentrated in the microspherule-dominated coarse deposits and the superjacent fine layer containing iridium derived from the asteroid in Haiti. The coronene percentage in the completely combusted organic molecules and  $\delta^{13}\text{C}$  values in the ejected layers show similar values in the coarse deposits and the iridium layer in the proximal site and also in the iridium layer in a distal site (Spain) for the impact crater, implying that the combusted organic molecules remained in the stratosphere globally for several years. The carbon preference index values of *n*-alkanes in the coarse ejected layers indicate that the *n*-alkanes were primarily sourced from oil. The stable carbon isotope ratio values of short-chain *n*-alkanes in Haiti show devastation of marine life occurred within a year after the impact. The  $\delta^{13}\text{C}$  profile of long-chain *n*-alkane implies devastation of land vegetation by darkness. Therefore, we suggest that these smoke clouds contributed to the mass extinction.

Keywords: coronene, Cretaceous, Paleogene, smoke clouds, stable carbon isotope ratio

## Euxinic conditions at Three Gorges area as opposed to global oxidation event, around PC/C boundary

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It is widely accepted that the Neoproterozoic was a transitional period to modern Earth in terms of oceanic redox condition. Some geological evidences, including carbon and sulfur molybdenum isotopic data, support this idea, and fossils of large multicellular animal have been discovered from Neoproterozoic strata throughout the world. In contrast, some of the fossils were discovered from anoxic sediments and iron speciation analyses indicate existences of ferruginous and euxinic conditions in some points.

Three Gorges area, South China, is one of the best places to decipher surface environmental changes during the Ediacaran and Cambrian due to the successive deposition on Yangtze platform. Our group conducted on-land drilling at the Three Gorges to collect fresh and continuous rock samples. The age range of the core samples is from the beginning of the Ediacaran to the end of the early Cambrian. I measured molybdenum concentration of the core samples by XRF analysis using glass bead. The result shows that molybdenum concentrations of organic carbon-rich black shale layers deposited at ca. 560 Ma and 525 Ma are up to 800 ppm. Same horizons contain high levels of rhenium, approaching 3 ppm, and TOC, more than 10 %. Abundant pyrites are also included in the black shale, and all of these evidences suggest that euxinic conditions occurred at Three Gorges during these periods.

In modern Black Sea, surface layer is oxic but bottom layer is euxinic because of down-welling of organic matter. As referring to this concept, euxinic conditions of Three Gorges area might imply both onset of effective burial of organic material and oxic surface layer around PC/C boundary.

Keywords: Three Gorges, molybdenum, euxinic