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Prasinophyte bloom and intense micritization as evidences for enhanced nutrient load during Basal Choteč Event - a preliminary report

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There is still no agreement concerning mechanism responsible for the formation of organic-rich sediments. There are basically two concepts - the “preservation and productivity models” (for discussion and summary see TYSON 2005). The productivity model concerns the nutrient-stimulated high primary productivity to be responsible for organic matter enrichment (due to the oxygen demand caused by decay of organic matter). In contrast, the preservation model considers anoxic or dysoxic conditions to be the primary cause of enhanced organic matter accumulation. The establishment of anoxia (or dysoxia) is usually regarded as a result of the vertical expansion of oxygen-depleted zone mainly during sea-level rise.

Deposition of organic rich sediments in the Devonian is well documented. One of the first Devonian events, which is connected with organic matter accumulations is the so-called Basal Choteč Event and has been defined and typified in the Prague Basin, Czech Republic (CHLUPÁČ & KUKAL 1986). This event has been regarded as anoxic (e.g., CHLUPÁČ & KUKAL 1986 and 1988, HOUSE 2002) and is correlated globally with a transgressive pulse slightly above the Lower-Middle Devonian boundary.

In a first attempt to better understand causes of these environmental changes, combined palynological, sedimentological and geochemical studies have been carried out in the type area of Basal Choteč Event, the Prague Basin. Extensive algal blooms were recorded close to the base of Choteč Limestone at several localities: Na Škrábku quarry, Barrandov road-cut and U Němců section at Karlštejn to a lesser extent. A high amount of large (up to 500µm), thick-walled, three-dimensionally preserved palynomorphs was obtained during conodont standard preparation (Na Škrábku quarry). These palynomorphs were identified as phycomata of prasinophyceen algae and occur in dark peloidal grainstone with high content of micritized echinoderm ossicles, 20 cm above the base of Choteč Limestone. The intensive micritization is characteristic feature for the unit of Choteč Limestone and therefore the designation “peloidal” was necessary, only the crinoidal ossicles, being the most resistant against micritization, has been recognized.

Prasinophyte blooms in the Palaeozoic are characteristically linked to black-shale event related beds, and often accompanied by mass extinctions (TAPPAN 1980, TYSON 1995). Some basic requirements must be met for algal bloom to take place, the most important factor, however, is considered to be nutrient availability. The algal bloom recorded here is not the only indirect evidence for over-supply of nutrients. Higher activity of microborers resulting in intense micritization of skeletal grains and subsequent origination of peloids are also attributed to nutrient contain (e.g., HALLOCK 1988, PETERHÄNSEL & PRATT 2001) Therefore, the hypothesis of enhanced nutrient load is suggested as a triggering mechanism for prasinophyte blooms, which were responsible for oxygen deficiency and consequently reducing of diversity and habitat tracking among benthic invertebrates.

The geochemical and sedimentological aspects, possible source of nutrients and concomitant climatic changes will be discussed.

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