Evolutionary Model for Exhumation of the Meliata Blueschists, Western Carpathians (Slovakia)

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Convergence of the African related continental blocks with southern margin of the European plate resulted in closure of the Tethyan Triassic oceanic basins and formation of suture zone with occurrences of high-pressure rocks that can be traced from the Western Carpathians through Rhodopian to Taurid in West and Central Turkey. Structural analyses and paleogeographic reconstructions from most of these high-pressure terrains indicate an eastward motion of the Apulian promontory and subduction of oceanic basins beneath the European related continental blocks. Based on the present nappe structure in the Western Carpathians, subduction of the Meliata oceanic basin and subsequent exhumation of blueschists have been interpreted to occur along the south-dipping thrusts plans that are coincident with main convergence direction of Cretaceous collision. In this contribution we present new data on a westward exhumation mechanism for the Jurassic blueschists that were overprinted by northward Cretaceous collisional processes in the Western Carpathians.

The Eastern boundary of the Meliata accretionary wedge is situated along the southern margin of the West Carpathians in Slovakia and northern Hungary. It is a thrust over the crystalline basement consolidated during Variscan orogeny. The Meliata accretionary wedge is a complex stack of crustal and oceanic units, which is formed from bottom to top by: (1) Lower Thrust Sheet composed of sub-blueschist facies (8–10 kbar 350–400 °C) quartz phyllite and conglomerate of Permian age. (2) Upper Thrust Sheet consisting of blueschist facies (10-13 kbar 400-450 °C) marbles with metabasites and phyllites, which are derived from Triassic oceanic materials, but some Variscan amphibolite-facies basement rocks with blueschist overprint are also part of this sheet. According to geochronological dating, the blueschist facies rocks, formed during Middle Jurassic time (156 Ma) were exhumed in time space of 125–145 Ma. (3) Very low-grade (4–6 kbar 300–350 °C) Meliata Mélange composed of Permian evaporates and Jurassic shells, marls and sandstones that contain blocks (olistoliths) of Triassic radiolarites, cherts, limestones, serpentinites, gabbros and blueschists. (4) Very low-grade to non-metamorphosed Turna and Silica nappes derived from Apulian shelf and formed by Upper Permian – Jurassic limestones, shales, sandstones and some volcanic rocks.

Structural and metamorphic evolution of the Meliata accretionary wedge is characterized by fabrics and mineral assemblages testifying HP stage, retrogression during exhumation and emplacement of thrust sheets and late shortening of whole wedge during buttressing stage. The HP deformation stage $D_{1\text{-}2}$ in the Lower and Upper Thrust Sheets is manifested by development of penetrative SE dipping metamorphic fabric, bearing intense stretching lineation plunging to the southeast. The $S_{1\text{-}2}$ metamorphic fabric in the Meliata mélange that related to accretionary metamorphism (Upper Jurassic/Lower Cretaceous) is only preserved within competent Triassic marbles forming olistostromes. D_3 deformation stage – buttressing is developed in all thrust units of the Meliata wedge as well as in the underlying parautochtonous Paleozoic basement. It is characterized by N-S trending buckle and striking folds and steep ESE dipping slaty or spaced axial plane cleavage. The Cretaceous overprint was a polyphase process controlled by indentation of southern block actively moving to the north. The new structural data in combination with petrologic and geochronoloogic results allow to constraint a tectonic model for exhumation that is good agreement with paleogeographic reconstructions considered for the suture zones in the Rhodop massif, Aegean Sea and in West Turkey. Our new results fit well with paleomagnetic record of Jurassic drifting and subsequent anticlockwise rotation of African plate during Cretaceous.

Biotic Responce of Mid-Cretaceous Palaeoceanographic Changes: Data Sets from Planktic Foraminiferal Analysis of Red Beds (Ukrainian Carpathians)

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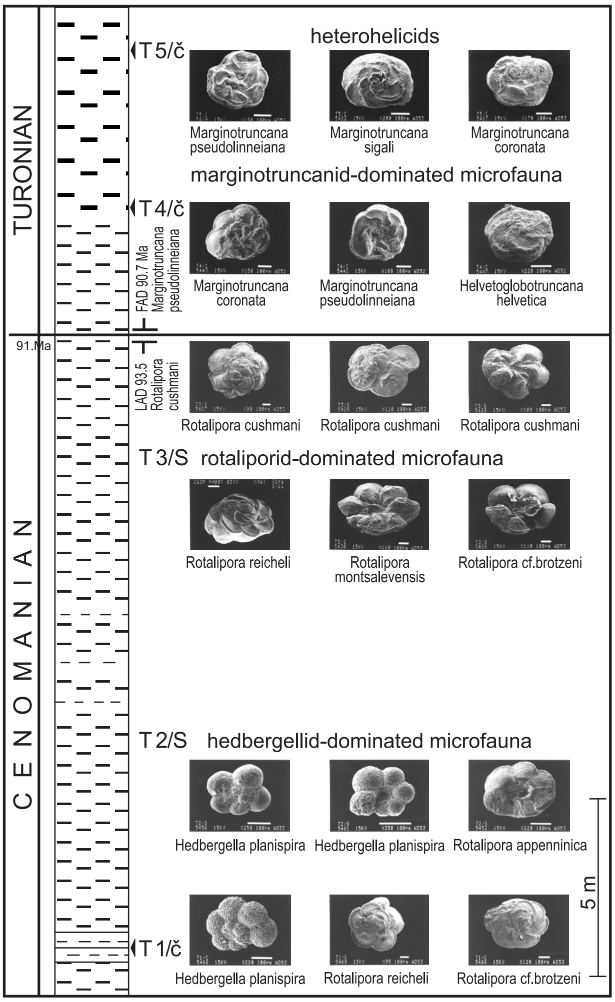
Mid- to Late Cretaceous changes in global oceanic regime are marked by black- to red-bed transition in the Ukrainian Carpathians. Two sections of red beds have been studied in orded to determine a high-resolution biostratigraphy and life mode of planktic foraminifers (Tissalo and Dragovo sections). Red coloured sediments produced in well oxygenated environment appeared here in the Early Cenomanian during the Rotalipora brotzeni Zone. The red beds recorded short-timed fluctuations in composition of foraminiferal associations (Fig. 1), mainly in ratio of oportunists (e.g. hedbergellids, whiteinellids, etc.) and keeled foraminifers (e.g. rotaliporids, dicarinellids). Distribution of these habitats depends on productivity changes in surface or intermediate waters. Generally, the foraminifers living in the thermocline (deep sea dwellers) and adapted to oligotrophic feeding mode (large keeled rotaliporids) gradually increased to the maximum in the Rotalipora greenhornensis and R. cushmani zones. This



trend in foraminiferal strategies indicates a thermal stratification of water columndue to input of cold and oxygenated polar waters into oceanic depths.

The major turn in red marl microfauna in the Tissalo section links with the Cenomanian/Turonian boundary when the rotaliporids disappeared in the planktonic foraminifer spectrum (Fig. 1). The decline of this fauna was caused by general reorganization of the latest Cenomanian oceanic regime, when the thermocline became unstable due to climate warming and subsequent water column homogenization. The rotaliporids settled in deeper part of the water column were exposed to larger ecological stress accompanying the expansion of oxygen minimum zone up to thermocline. Advancing warming at the end of Cenomanian produced general anoxy. This horizon has been determined in the Tissalo section, where three decimeter-scale intervals of black shales like the Bonarelli Beds (OAM 2) occur in the top of the Rotalipora cushmani Zone (Fig. 1). Lower Turonian foraminifer association from red marls above extinction horizon of rotaliporids is characterized by helvetotruncanid opportunistic fauna. Higher up in the Tissalo section, the first representatives of marginotruncanids became to appear in greater amount, which indicates return of meso- to oligotrophic conditions.

Fig. 1. Distribution of planktic foraminifers in the Tissalo section (Ukraine)

Turbidite Bed Thickness Distributions Applied in Interpretation of Submarine-Fan Depositional Environments of the Kyčera Beds (Rača Unit, Magura Group)

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Introduction

Turbidite bed thickness distribution is considered to be a useful tool for interpretation of submarine-fan depositional environments (e.g. Carlson, 1998, Carlson and Grotzinger, 2001, Talling, 2001). Statistic approach to bed thickness distribution could identify a stacking pattern of data commonly collected by geologists. Understanding on identiffication and interpretation of this patterns could therefore become an usefull cheap and effective complementary procedure in describing sedimentary processes and subenvironments. However, it can´t supply classical interpretations.

An adequate amount of data is required to relevant statistical data processing. Relative sufficient bed thickness data were collected during sedimentary research around Outer Flysch Carpathians in NW Slovakia. This paper provides demonstration how current understanding on statistical distribution was used in intrepretation of sedimentary deposition of Kyčera Beds (Eocene formation of turbiditic sandstones).

Background

The thickness of a turbidite bed at a given point within a sedimentary basin is determined by the shape of the bed and distance to the source, with bed shape depending upon factors such as intial sediment volume, grain size(s) and flow concentration. The frequency distribution of turbidite thickness thus records information on flow dynamics, initial sediment volumes and source migration which are important for reconstructing the evolution of ancient sedimentary basins (Talling, 2001). It has