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Characteristics of subtropic karstic Dinaride Lake in its unstable geothectonic regime

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Geotectonic evolution of Dinarides started in Mid-Cretaceous, when this part of African Plate approached Stable Europe. Geodynamic style is as follow: “subduction-termination / colision (Paleocene / Eocene), collision (Eocene), postcollision / colapse (Oligocene / early Miocene)” (Cvetković et al., 2004). Longlasting melting of lower crust (ibid: fig. 11). “The gravity colapse of the Dinaride orogen is inferred from the faulth pattern and shape” as mirrored in sedimetary record of lacustrine basin (ibid). So, at the turn from Paleogene to Neogene on Dinarides was formed large subtropical karstic system of lakes.
Another part of Africa is the Adriatic Plate mowing northwards under the Alps (Schmid et al., 2006: fig. 1 and there in). Two coal seams (brown coal and lignite), formed during colateral catastrofic earthquakes, indicate two main phases of tectonic push of Adriatic plate. Evolution of Dinaric Lake(s) from shallow freshwater aquatorium toward deep saline lake was influenced by northward movements of Adriatic Plate and the response of Pannonian Mass.
The sediment column of Dinaride Neogene was devided into tree parts (Milojević, 1963). They lay, in places, above reddish (continental) Oligocene sediments with Helix (Čičić & Milojević, 1977), but mostly in the Sava trough (Ugljevik, Banovići). Otherwise above Mesozoic and Paleozoic rocks.
First part: basal zone above lie several brown coal seams indicating that the Adriatic Plate push was divided into phases. Catastrophic earthquake pull down the forest together with its large dwellers (Chalicotherium grande, an of Ungulata with claws) and sorted tree trunks at southern side of the lake Plevlja (Krstić et al., 1994). In this period freshwater ostracodes, and numerous characean gyrogonites, among them a genus similar to the Oligocene Harissichara, fill up some of beds. None of Congeria pelecipods are present. Charophyta algae making yellowish-brown limestone in Middle Bosnian depression lie just bellow the brown coal. To WNW Charophyta algae were collected during mapping of the sheet Udbina (Sokač et al., 1976). Farther on, toward ESE, in Sinj (see fig. 1, bellow) only Alisma (swampy plant) seeds were determined (Mandić et al., 2008).
Second part, is characterized by compensated calcium carbonate sedimentation (mostly lacustrine chalk up to 95% of CaCO3). In some places textures of subsurface lacustrine current are shown, like obstacle flow, therefore Lake should be deep in its central parts. Diverse Congeria genera are enough numerous. Charaophyta gyrogonites are present in lacustrine chalk 4m abowe the coal (key fossil Rabdochara langeri in Plevlja, Otilovići) but up the column are lacking while water becmome to deep and turbid. Thickness of sediments between two coals (brown and lignite) in the central depressions (Livno) amount 1.500 m (Kochansky & Slišković, 1980).
Third part with its lignite coal belong to time of another tectonic push by Adriatic Plate. This time up to 17 lignite beds were counted (in Livno), many of them with tree trunks nearly 10m in diameter, fractured mainly in small parts, one extra large peace was 10m long. Between particular earthquakes must have elapsed several thousands of years to allow Sequoia and other trees to grow on hilly islands. Most of interbeds make different gastropods: numerous well preserved Hydrobiids and single shells of Planorbarius (key-genus for the swampy shoreline) completely pressed. Some white laminated interbeds are very light and it is not known if this is not a diatomite. Ostracode assemblages slighly differ from previous, maybe because the sediment has lesser CaCO3 component. No Charophyta algae are mentoned. Congeria in the limestone of Sarajevo regia belong to the slišković species indicating high energy environment. To WNW, in the Bihać area numerous gastropods also indicate high energy water; opposite to them excelent preserved saltwater ostracodes (Krstić, 2000) like Chinometacypris, Clonocythere (oriental genera descriebed from Chinese Eocene-Oligocene salt lakes), among other the endemic genus Dinarocythere, lived in calm milleu (Krstić, 1987).

Margins of Dinaride Lake subsided slower than the central ones with lesser sediment amount – ca. 200 m instead of 1,500. First example is the Lake gulf of Maoče characterized by influx of freshwater, possibly from the Eastern landmass diluting the Lake water and bringing terrestrial sediments. Therefore in Maoče gulf fine grained siliciclastites sedimented with occasional interlayers of marl and marly limestone instead of the limestone and lacustrine chalk. Another example is Berane depression with pine-oak leaves of subtropical-tropical climate (Đorđević & Ćulafić, 2008), just at the middle of marl between two coal seams.
Age were recently determined by the characteristic Lower Miocene organ-species Rhabdochara langeri (cf. Krstć et al., 2008). Therefore the large Dinaric Lake has to be attributed to early Miocene, as an equivalent of marine Aquitanian / Burdigalian of western Europe. Important are terrestrial gastropods collected at Sjenica (Prysjaznjuk, 2008) and atrubuted to Ottnangian-Karpatian, lying just bellow the analcimite basaltic rocks which absolute age measurements was 22.95 + 1.25 Ma (Cvetković et al., 2004). As "the Serbian ultrapotasic rocks display many characteristics that are consistent with contamination of their mantle source by a subducted sediment component" (Cvetković et al., 2004: 179 and fig. 11), they should be younger – maybe 18-19 Ma covering Lower Miocene middle-upper part.

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