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FORMATION OF A STRUCTURAL DOME DUE TO TRANSPRESSION: THE LIM PALAEOZOIC UNIT OF CENTRAL DINARIDES

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Introduction

The arcuate Alpine orogenic system of southeast Europe is characterized by superposed late Cretaceous and Tertiary double-vergent orogenic systems. The central Dinarides exposes NW-trending units which were transported towards the Adria/Apulian microcontinent. These zones include the East Bosnian-Durmitor unit. The working area is located at the boundary between the Dinaride Ophiolite belt and the East Bosnian-Durmitor unit in westernmost Serbia and easternmost Montenegro of Yugoslavia (Fig. 1). The East Bosnian-Durmitor unit represents a composite pile of nappes (Dimitrijevic, 1997), and is considered to represent the continental margin of an Apulian plate (Robertson and Karamata, 1994; Pamic et al., 1997). The outcrops south-west of the Dinaride Ophiolite nappe show mainly Palaeozoic successions, which are overlain by detached Triassic sedimentary and volcanic rocks (Pamic, 1984). The Lim Palaeozoic unit was overthrusted by the Dinaride Ophiolitic nappe (Figs. 1, 2).

Here we report new structural data from the Central Dinarides, at the boundary between External Dinarides and Dinaric ophiolite belt, in order to constrain tectonic evolution of the Lim Palaeozoic unit.

Results

The Lim Paleozoic unit comprises low-grade metamorphic core complexes, including the Lim Palaeozoic unit of Carboniferous age, which is overlain by detached Triassic sedimentary successions. Within the Lim Palaeozoic unit, the conditions of metamorphism are within greenschist facies conditions. Associated ductile fabrics with a flat-lying mylonitic foliation and a N-S-trending stretching lineation are related to predominant top-south shear which suggest, therefore, dextral transpression during emplacement of the East Bosnian-Durmitor nappe. Preliminary Ar-Ar dating resulted in a two stage evolution of tectonothermal overprint, at ca. 80 and 40-45 Ma (Ilic et al., 2003). The Lim Palaeozoic unit was overthrusted by the Dinaride Ophiolitic nappe (Fig. 1) during Cretaceous times, associated with low-grade metamorphic conditions. This led to formation of semiductile and ductile fabrics along thrust zones.

Palaeozoic and Triassic rocks of the investigated area, as well as the rocks of “ophiolitic melange” of Dinaride Ophiolite nappe, show a strong ductile deformation which decreases in intensity from footwall to hangingwall units. In the Lim Palaeozoic units, the NW-SE trending metamorphic foliation dips mainly to the NE with dip angles ranging from 20 to 70 degree is widespread in the whole study area. On the foliation planes of Palaeozoic rocks, a N-S trending, strongly developed stretching lineation is observed. Lim Palaeozoic unit is characterized by several types of folds, which are common in the area. These comprise:

(1) Folds within alternating metasandstones/slate successions with also show a pronounced axial plane foliation; these folds have axes trending roughly N-S, and they are considered to represent D1 folds.
(2) folds (D2) with bend the S1 foliation and consequently postdate D1 deformation;
(3) kink folds which are common in strongly sheared lithologies; these folds have axes which trend NW-SE and they represent later, D2 or D3 deformation stage.

The Dinaric Ophiolite nappe comprises a number of distinct lithologies with a different rheological behaviour, which resulted in lithology-specific structures. In general, contacts between distinct lithologies are disrupted, what resulted in a mélange-type structure. Radiolarites, one part of "ophiolitic melange", display metre-scaled, SW-vergent kink folds. Corresponding fold axes trend ca. NW. Only near contacts to the underlying Lim Palaeozoic unit, a pressure-solution foliation and a stretching lineation have been developed within shales due to slip during overthrusting. The lineation trends ca. NW-SE or E-W and is formed within very low-grade metamorphic conditions. The dominant stretching lineation trends NNW, approximately parallel to the nappe boundary (Fig. 3), and subsequent folds trend NE. These observations suggest transpressive emplacement of the Dinaric ophiolite nappe.

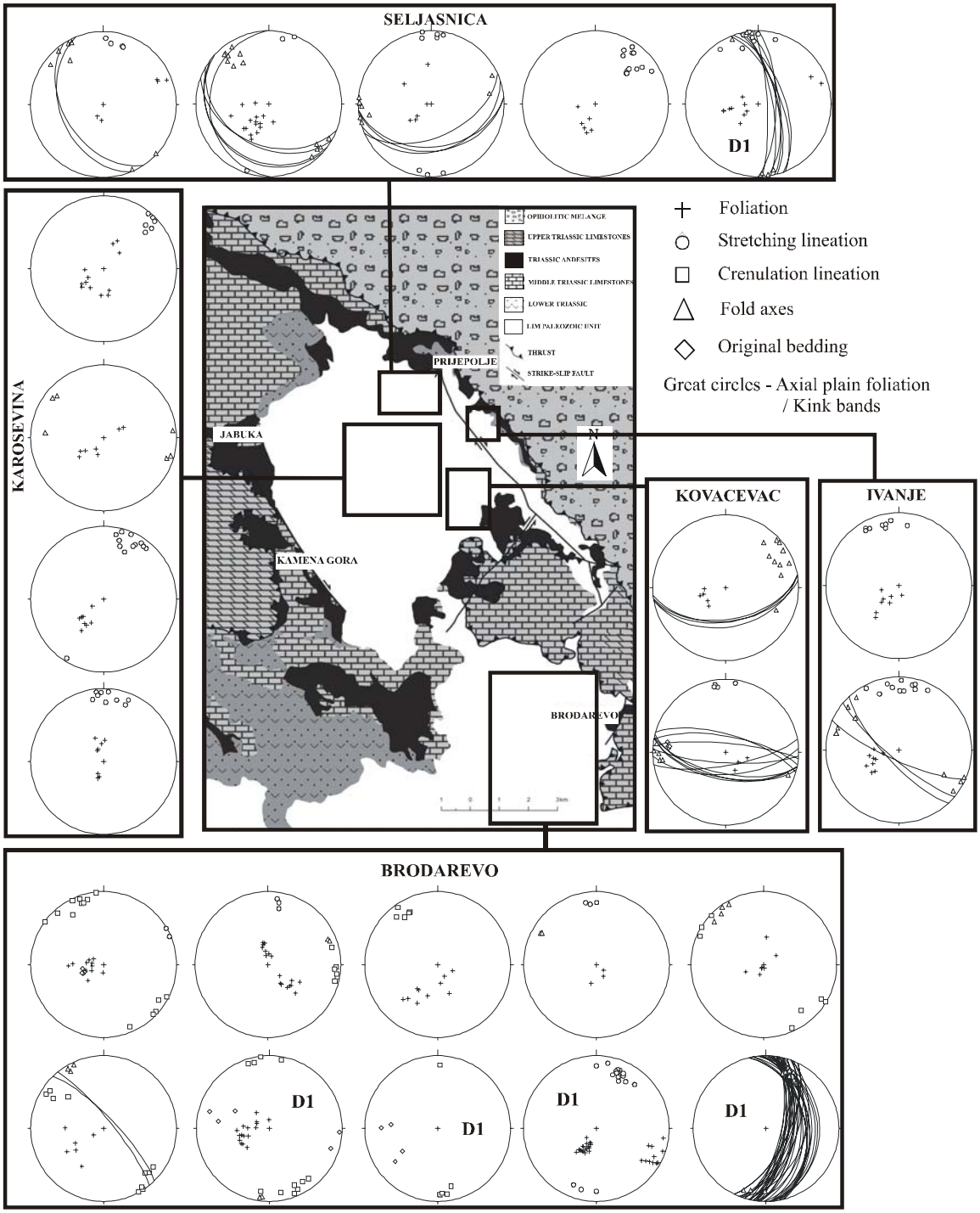

Fig. 1. Geological map of the working area and structural data from the Lim Palaeozoic unit.

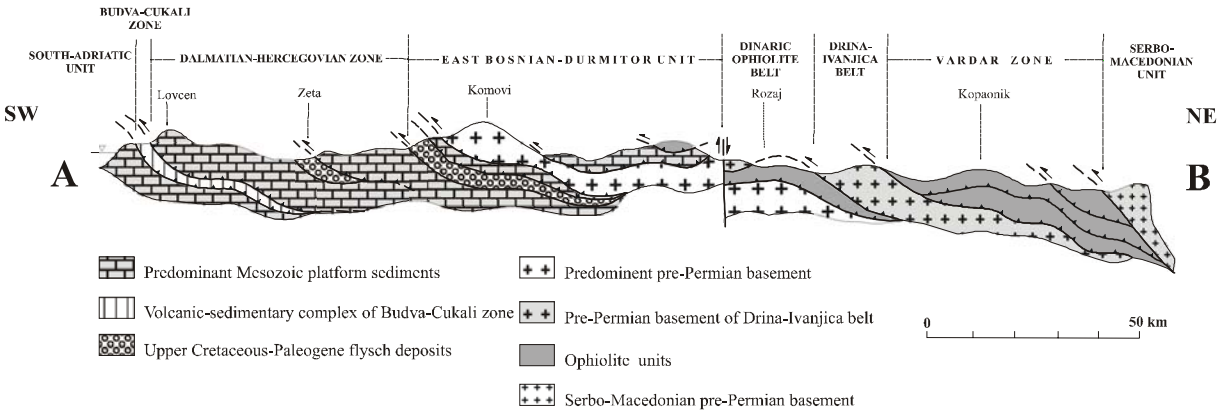

Fig. 2. Simplified geological cross section through the Internal and inner External Dinarides (southernmost part of the working area (modified after Grubic, 1980)

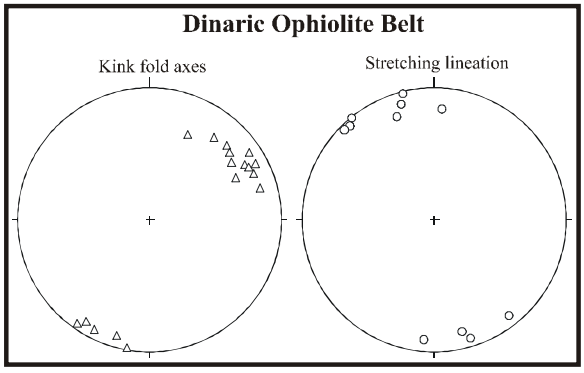

Fig. 3. Representative structural data from the westernmost margin of the Dinaric Ophiolite nappe

Discussion

Emplacement of the Dinaric ophiolite nappe occurred likely within transpressive conditions, in accordance with initial ductile deformation of footwall units.

The Lim Palaeozoic unit of central Dinarides is interpreted to represent a structural dome formed from a detached, subducted piece of the Apulian microplate which was later extruded during Late Cretaceous transpressional collapse in the footwall of the Dinaric ophiolite nappe, contemporaneous with overthrusting onto the Maastrichtian to Palaeogene Durmitor Flysch (Fig. 2). Subhorizontal internal shortening was partly accommodated by folds of axial plane foliation, which also resulted in updoming. This also suggests detachment of the Lim dome from underlying Adriatic microplate.

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