MODELING THE OCEANIC LITHOSPHERE OBDUCTION: CONSTRAINTS FROM THE METAMORPHIC SOLE OF MIRDITA OPHIOLITES (NORTHERN ALBANIA)

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ABSTRACT

The Hellenic-Dinaric belt of the Eastern Mediterranean sea is characterized by huge and well preserved obducted slices of ophiolites. A well developed and very thick metamorphic sole generally occurs at the base of the obducted ophiolite sequences. The best preserved metamorphic sole of the Hellenic-Dinaric belt crops out in association with the Albanian ophiolites. In the Mirdita area (northern Albania) the metamorphic sole consists of an up to 600 m thick assemblage of metasediments and amphibolites. Four different types of amphibolites, referred as T1 to T4, have been identified on the basis of grain-size and mineralogical assemblages. The protoliths of all the amphibolites are basic rocks with OIB affinity, representative of within-plate magmatism typical of oceanic seamounts; no MORB derived rocks have been identified. The associated metasedimentary rocks are presumably derived from oceanic covers. All the lithologies from the Mirdita metamorphic sole are strongly deformed under lower to upper amphibolite facies conditions. A discontinuous inverted gradient is observed close to harzburgites in the metamorphic sole, that shows high-grade amphibolite facies metamorphism. There are no prograde greenschist facies metamorphic rocks, although all the lithologies from the Mirdita metamorphic sole are affected by greenschist facies retrogression. The different types of amphibolites display different P and T values at metamorphic climax conditions. The temperatures range from 624±9° to 796±50°C in the different units where the pressure is always lower than 0.7 GPa. The boundaries between the amphibolite slices with different peak metamorphism as well as the bodies of the gneisses and micaschists are sheared bands. The structural pattern common to all lithologies identified in the Mirdita metamorphic sole developed through two deformation phases under amphibolite facies conditions, followed by a third phase under greenschist facies. The petrologic and structural characteristics of the metamorphic sole are discussed in order to highlight the kinematics of the obduction process.