overprinted by exhumation structures to determine the constrictive or emplacement origins of the nappe. The apparent continuation of a pebbly mudstone from the west to higher metamorphosed equivalent (amphibolite schist) towards the east and above the Pelagonian core suggests derivation from the NE-emplacing Mesohellenic slab.

Compared to the "rooted" Mesohellenic ophiolites that exhibit abundant constrictional structures associated with emplacement, all these small complexes are overprinted by "extensional" or transtensional structures. The thickness of these rootless ophiolites is so small compared to the distance of displacement from either potential root zone that an emplacement as a single, once contiguous, obduction nappe is probably not possible. Their outcrops over a long distance from a root zone can only result from thrusting within the Jurassic subduction followed by later extensional exhumation. Our study questions what these bodies show as representative portions of the roof zone above the exhuming complex. The metasomatic veining and heavy alteration of serpentinite is probably a remnant of exhumation beneath these "rootless" oceanic remnants.

Holocene tsunamis in coastal areas of northern Greece: sedimentological and geoarchaeological evidences

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Shallow drill cores in flat and southerly exposed coastal areas around the Thermaikos Gulf (Thessalonica and Katerini areas, and west coast of Kassandra, the western "finger" of Chalkidiki) and the coast in northern Greece near the cities of Lagos and Alexandropoulis provided evidence for past high-energy sedimentary events, which are interpreted as tsunamites. As a result, several Holocene coarse clastic layers have been found intercalated in sandy beach, clayey or gypsiferous lagoonal deposits. These layers have erosive bases, show fining-up and thinning-up sequences, and include shell debris, foraminifera and rip-up clasts of lagoonal sediments. Widely observed significant feature of these layers involve mud-coated beach clasts and rip-up clasts that rework the high-plasticity clays of lagoons. Such features that indicate highly disturbed sedimentological conditions (hyperpyncal flows) are rarely described elsewhere. Repeated intercalations of these layers with all the mentioned indicative features downhole are interpreted paleotsunami deposits from tsunamis generated by earthquakes or earthquake-triggered submarine landslides resulted by seismic shaking in the Thermaikos Gulf or the North Aegan Basin. However, we have to distinguish individual events (the one layer case) and packages of fining-up deposits, which are deposited during one event, but during several waves (usually 3-4 subsequent fining-up layers). Another important observation is that open beach conditions end immediately with a tsunamigenic event, and later lagoons form. Hence, both the coastal parallel currents, which are currently promoting spit deposits and lagoons, and tsunami events are shaping the coastlines of northern Greece.

A major tsunamigenic source is located along the western tip of the North Anatolian Fault Zone (NAFZ) in the North Aegean Basin, where water depths ranging between 1.200 and 1.650 m are sufficiently deep to generate tsunamis. Historic tsunamis have also been observed, e.g. the 1893 Samothraki event. However, the event layers up to now cannot be assigned to individual seismic or landslide sources, but the potential of a tsunami threat in the Thermaikos Gulf area can now be tested, following both sedimentological and modelling processes. Such potential threat regarding the Thermaikos Gulf has only recently been notified but never tested and studied in depth. Modelling of the tsunami potential of the basin-

bounding fault southwards of the Thermaikos Gulf provides an example for possible tsunami generation at only one segment of NAFZ along an approx. 55 km normal fault at the southern fault-bound margin of the North Aegean Basin.

The Herodotus Histories report on inundations and sea withdrawals occurring during the Greek-Persian war, which occurred near Potidea on Kassandra. In the ancient Greek village Mende we found evidence for a tsunamigenic layer, dated with shells to 2500 BP, which may tentatively be interpreted as the sedimentary remains of the "Herodotus tsunami" in 479 BC. Other tsunamigenic events, e.g. near Sozopoli village, occurred c. 5000 BP.

Triassic and Jurassic radiolarians from the Dinaridic Ophiolite Belt (Zlatibor area, SW Serbia)

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The Dinaridic Ophiolite Belt of western and SW Serbia is made up of ophiolites and widespread mélanges containing different components up to nappe-size, interpreted as radiolaritic-ophiolitic trench fills in front of advancing nappes. Matrix ages of the different mélange complexes are very rare, but play a crucial role in the reconstruction of the emplacement of the ophiolite nappes. From the radiolaritic matrix between different ophiolite, radiolarite and rare carbonate blocks of the ophiolitic mélange in three southern Zlatibor areas (A. south of Trnava in the valley of Katušnica River, B. south of Ljubiš in one double road curve, and C. east of Ljubiš near Visoka village) we isolate radiolarians of Early Callovian to Middle Oxfordian age; therefore the age of this Trnava/Ljubiš mélange Blocks of ribbon radiolarite in the mélange are of Middle (Ladinian) to Late Triassic (Norian) age indicated by radiolarians. These radiolarites are interpreted to derive from the sedimentary cover of the Neotethys oceanic crust. Therefore the age of the reworked oceanic crust must be slightly older than the youngest radiolarite component. A derivation from the Middle Triassic volcanics, which is widespread in the Dinaridic realm, can be excluded. These volcanics are covered by Late Ladinian and Late Triassic shallow-water carbonates, missing in the clast spectrum of the mélange.

According to this radiolarian data the age of the radiolaritic-ophiolitic mélange corresponds to the age of the Sjenica ophiolitic mélange further south. Also the component spectrum is similar. The whole Trnava/Ljubiš mélange succession is interpreted to be a primary sedimentary synorogenic radiolaritic trench-fill sequence that formed simultaneously with nappe emplacement and ophiolite obduction/accretion, overprinted by contemporaneous and younger tectonics forming a typical mélange. This mélange was deposited during the late Middle to early Late Jurassic period coeval with ophiolite nappe thrusting in the Neotethys realm. The depositional area could be interpreted to have been a deep-water trough in front of advancing nappes.

Of special interest is the overlying mélange sequence which consists of different carbonate blocks of Triassic age, of both deep-water and shallow-water origin deriving from an outer carbonate shelf. The carbonatic mélange in the Sirogojno area is relatively matrix-free, only in some fissures in lagoonal Dachstein Limestone blocks remnants of the matrix are preserved. This resembles the situation in Krš Gradac near Sjenica, where Middle to early Late Jurassic radiolarite matrix with Triassic radiolarite components occur between blocks of lagoonal Dachstein Limestone. The derivation source of the carbonate blocks should be the Drina-Ivanjica Unit high further to the east. We consider therefore westward transport of the ophiolitic mélange and the ophiolite nappes as well as westward transport of the carbonate