The standard of therapeutic waters in the Polish Carpathians have those found in Andrzejówka, Dębowiec, Głębokie, Leluchów, Lubatówka, Łomnica, Iwonicz-Zdrój, Jastrzębik, Krościenko on the Dunajec, Krynica-Zdrój, Milik, Muszyna, Piwniczna-Zdrój, Polańczyk, Powroźnik, Rabka-Zdrój, Rymanów-Zdrój, Szczawa, Szczawnica, Szczawnik, Tylicz, Ustroń, Wapienne, Wysowa, Złockie, Zubrzyk and Żegiestów. The Carpathian mineral, thermal and therapeutic waters have been utilized in 12 statutory spas in balneotherapy (medicinal and recreation bathing), crenotherapy, production of CO_2, and also are bottled in several plants.

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"Rootless" ophiolites above the Pelagonian core complex of north central Greece

Rassios A.[1], Kostopoulos D.[2], Nance R.[3], Batsi A.[4] and Ghikas C.[5]

[1]*Institute of Geology and Mineral Exploration, Lefkovrisi Kozani 50100, Greece, blather@gre.forthnet.gr*
[2]*National and Kapodistrian University of Athens School of Science Faculty of Geology and Geoenvironment Department of Mineralogy and Petrology Panepistimioupoli, Zographou Athens 157 84 Greece, dikostop@geol.uoa.gr*
[3]*Department of Geological Sciences, Ohio University, Athens, Ohio 45701, U.S.A. nance@ohio.edu*
[4]*Giouleka 1, Siatista 50300, Greece, annampatsi@gmail.com*
[5]*Fillipou 44, Grevena 51100, Greece, notconstandina@hotmail.com*

More than twenty ophiolitic fragments ranging in size from meter-scale to several tens of km^2 occur strato-tectonically above the Pelagonian continental massif (mid-Neoproterozoic and Permo-Carboniferous crystalline basement plus Triassic-Jurassic platform carbonate cover) in the region between the mid-late Jurassic Mesohellenic ophiolites (rooted within the Mesohellenic Trough in the west) and the Vardar Zone ophiolites (rooted in the Vardar Zone in the east). Formerly presumed to be part of a single, initially continuous mid-upper Jurassic ophiolite nappe, we have begun documentation of these fragments within the context of their role in the exhumation model of Pelagonia.

A "rootless" ophiolite is a piece of oceanic lithosphere that is no longer contiguous with an ophiolitic complex emanating and emplaced from a plate suture zone. The Rodiani complex has long been considered tectonically continuous to the Vourinos massif, but rather appears to be more alike to Aspropotamos-Pindos lithosphere. Extension from Vourinos would require tectonic thinning of about eleven km of ophiolitic lithosphere, and rotation of the Rodiani section that cannot be explained by a simple antiformal structure between Vourinos and Rodiani within the interceding Triassic-Jurassic Pelagonian platform carbonates. Zindani, also apparently tectonically continuous with Vourinos, is severely altered to a massive serpentinite (predominantly antigorite) body, imbricated with Pelagonian schist. The Livadi ophiolite, once included as part of the Paleozoic (Pelagonian), crops out as a nappe above the Pelagonian gneissic core complex. The contact comprises a metamorphic discontinuity with the much lower T-P lithologies of the ophiolite. Primary ophiolitic fabrics and ridge-crest structures are still recognizable in the Livadi complex. The smallest ophiolitic fragment that includes a complete Steinmann Trinity occurs near Lefkovrisi, Kozani (the "IGME" ophiolite): less than three meters of section including serpentinite, pillow lava, and Upper Jurassic oceanic sediments crop out over a pebbly mudstone mélange similar to that of the Vourinos ophiolite, and beneath the Lower Cretaceous lateritic rocks to Upper Cretaceous reefal limestone and flysch.

Most of these "rootless" bodies are overlain by Upper Cretaceous transgressional limestone that allows rotation to their pre-Upper Cretaceous orientations. This aids in delineating older constrictional structures from exhumation structures. The pre-Upper Cretaceous interval includes formation of laterite deposits and extensively striated cobble formations (olistolithic or tectonic in origin). The provenance of supra-ophiolitic sedimentation is consistently "towards the east," that is, towards the area of the Pelagonian core complex. Structures within the ophiolitic fragments themselves are generally too highly

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

Reicherter K.[1], Papanikolaou I.D.[2,4], Roger J.[3], Grützner C.[1], Stamatis G.[2], Mathes-Schmidt M. and Papanikolaou D.[5]

[1]Inst. of Neotectonics and Natural Hazards, RWTH Aachen University, Germany, k.reicherter@nug.rwth-aachen.de
[2]Laboratory of Mineralogy & Geology, Department of Geological Sciences and Atmospheric Environment, Agricultural University of Athens, 75 Iera Odos Str., 118 55 Athens, Greece
[3]Laboratoire de Géologie, Ecole Normale Supérieure, 4, rue Lhomond, 75231 Paris CEDEX 5, France
[4]Benfield-UCL Hazard Research Centre, University College London, UK, i.papanikolaou@ucl.ac.uk
[5]Laboratory of Natural Hazards, National and Kapodistrian University of Athens, Greece

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-