Fluids related to remobilization of Mesozoic sulfide mineralization in the Eptadendro-Rachi region in Eastern Rhodope, Thrace, Greece

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The copper sulfide mineralization in the Eptadendro and Rachi areas is hosted in the Upper Tectonic Unit of eastern Rhodope in Thrace. The orebodies are found along the contacts between granitoid intrusions and meta-ultrabasic-basic rocks, as well as within meta-ultrabasic-basic rocks. Two stages of mineralization have been identified: an initial stratabound stage which is considered to be of submarine volcanosedimentary origin and a later vein-type stage formed during a hydrothermal episode, related to the intrusion of the granitoids (trodhjemites and pegmatites), during Upper Cretaceous-Early Tertiary. It consists of pyrite, chalcopyrite, sphalerite, galena, hessite, bismuthinite, emplectite, tetradymite, aikinite, wittichenite, siegenite, millerite, bornite, pyrrhotite, covellite, magnetite, hematite and goethite, with chlorite, quartz, calcite and sericite being the main syn-ore gangue minerals. The mineralization has been affected at least by a greenschist facies metamorphic episode during Eocene-Oligocene. Although the sulfide mineralization is partly deformed and shows recrystallization textures, the data obtained from fluid inclusions demonstrate well the physical and chemical parameters of ore-forming environment during the latest hydrothermal event, caused by intrusion of the granitoids. Microthermometric studies showed three groups of fluid inclusions, corresponding to the distinct fluids involved in the mineral deposition and the pegmatite formation. The first group of fluid inclusions hosted in syn-ore quartz is characterized by relatively high homogenization temperatures (300° to 380° C, with a peak at 330° C) and low salinities (1.6 to 7.2 wt% NaCl equiv) and corresponds to the fluids of the main ore stage. The second group is distinguished by a drop in T_h (210° to 260°C) corresponding to the late ore stage associated with calcite formation, and salinities (3.2 to 6.3 wt% NaCl equiv) similar to the first group. The third group of fluid inclusions in the pegmatite is characterized by temperatures ranging from 300° to 390°C, and variable salinities (6.9 to 8.9 wt% NaCl equiv and 34.7 to 58.5 wt% NaCl equiv) suggesting a magmatic origin. The composition of these fluids is dominated by NaCl+KCl. Most probably these fluids were not related to the ore mineralization process.

Palaeoavian remains from the Late Miocene localities of Pikermi, Chomateri and Kerassiá; palaeoecological implications

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The Late Miocene avian record of Greece is rather poor. Three Late Miocene Greek localities have yielded palaeoavian remains until now: Pikermi, Samos and Perivolaki. In the present paper we describe some additional specimens from Pikermi (Attica), as well as some from the Late Miocene localities of Chomateri (Attica) and Kerassiá-4 (Euboea).

Among the aforementioned localities, the classical Pikermi locality is the most diverse taxonomically and has yielded the greatest number of specimens. However, the precise systematic position of some Pikermi avian taxa needs to be further explored. For example, Mlíkovský in 1996 reported seven different genera, while in 2002 he recognized five species belonging to five genera. Boev and Koufos recognized six species distributed in five genera. *Struthio karatheodoris* and *Ciconia gaudryi* are generally accepted to be present in Pikermi, even if the Pikermi struthioniform is sometimes assigned to the oospecies *Struthio*

chersonensis. *Grus pentelici* is also an accepted name for the Pikermi gruiform, even though it is sometimes referred to the poorly defined *Pliogrus*. Most problems concern the taxonomic status of the galliforms. Gaudry (1862-67) recognized two size groups of galliforms, and referred the smaller specimens to *Gallus aesculapii* and the larger to *Phasianus* ? *archiaci*. *Gallus aesculapii* was included to *Pavo* by Jánossy and was followed by Boev and Boev and Koufos. Mlíkovský combined *G. aesculapii* and *Phasianus archiaci*, introducing the name *Pavo archiaci* adopted also by Boev and Koufos. The latter, also reported the presence of *Pavo bravardi* in Pikermi. Finally, Mlíkovský and Boev and Koufos also reported *Phoenicopterus* sp. in Pikermi.

The new specimens described herein are tentatively assigned to five species. The species recognized in Pikermi include *Struthio karatheodoris* (lateral tarsometatarsal trochlea), *Grus pentelici* (proximal humerus, two distal ulnae), *Pavo archiaci* (proximal femur, distal tibiotarsus), *Pavo* sp. (distal humerus), and *Gyps* sp. (distal ulna). Within the Pikermi findings, *Pavo* sp. is much larger than *P. archiaci*, approaching the size of *P. bravardi*. The recognized Chomateri palaeoavian remains are assigned to *Pavo archiaci* (proximal humerus, distal humerus). Finally Kerassiá-4 has yielded a tibiotarsus assigned to *Pavo archiaci*.

Extant representatives of *Struthio* are adapted to open environments and a similar ecological adaptation can be inferred for *Struthio karatheodoris*. The presence of *Gyps* sp. in Pikermi is important, as scavenging bird finds are relatively rare. Paleoecologically, an open environment is further supported since vultures depend on a large supply of carcasses, a condition met primarily in such environments. *Grus pentelici*, being a wading bird, requires the presence of bodies of water. Extant *Pavo* species live in open forests, often along watercourses, conditions that would have been preferred by the *Pavo* species found in Pikermi, Chomateri and Kerassiá-4.

Deformation phases and ophiolites emplacement in the Hellenides

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The terms ophiolites, ophiolite nappes and ophiolite bearing sedimentary formations in Greece, refer to outcrops of mainly peridotites, but also of basaltic rocks with eventual sedimentary formations. Based on the present-day scientific knowledge, the ophiolites as a whole are characterized by high variability regarding: a) their petrological signature, from their petrography, their mineral chemistry up to their alterations, b) their deformation pattern ranging from plastic to brittle, including both compression and extension phases, c) their emplacement characteristics, involving extensive nappes, lithostratigraphic alternations and melanges. Detailed analysis of a large number of ophiolite outcrops demonstrated their occurrence in different geotectonic conditions (tectonic windows, nappes and clastic sedimentary complexes), in variable geometric forms (isolated bodies, lenses and interlayers), in various composition and deformation configurations (harzburgites, lherzolites, meta-gabbros and amphibolites, basalts and sedimentary formations). The ophiolites experienced a continuous deformation from the Late Jurrasic phase (EoHellenic) up to the Eocene-Oligocene alpine orogeny (HoHellenic). Their evolution involved different emplacement mechanisms, producing a significant thickening in the oceanic and the surrounding environments and an extensive thinning in the continental margin environment.