

# Molybdenite occurrences in Greece: mineralogy, geochemistry and depositional environment

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Molybdenite occurs mainly in three mineralization types in Greece: (a) porphyry Mo-Cu-(±Te-Ag-Au), (b) reduced intrusion-related Mo-W systems (skarn, intrusion-hosted) and (c) shear zone-related Cu-Au-Bi-Mo. In porphyry-Mo-Cu prospects the molybdenite is the main ore constituent together with pyrite in quartz stockworks crosscutting sericite±carbonate altered porphyry stocks (dacite at Pagoni Rachi/Kirki, Myli/Esymi, Konos/Sapes, Melitena/Rhodopi and Stypsi/Lesvos; microgranite at Ktismata/Maronia; monzonite at Sardes/Limnos, Fakos/Limnos and Skouries/Chalkidiki). Reduced intrusion-related systems are characterized by the presence of molybdenite, pyrite and wolframite-scheelite in intrusion-hosted sheeted quartz veins and/or dissemination (granodiorite at Kimmeria/Xanthi, Plaka/Lavrion and leucogranite at Pigi/Kilkis and Seriphos) and skarn-hosted ores (Kimmeria/Xanthi). Finally in the shear-zone Stanos prospect molybdenite accompanies chalcopyrite, native Bi, Bi-tellurides and sulfosalts. The studied molybdenites display a wide spectrum of their rhenium content ranging from almost Re-free molybdenites at Stanos, to very low-Re molybdenite in the intrusion-related systems (Lavrion, Serifos, Pigia and Kimmeria), and high to ultrahigh-Re molybdenites in the northern Greek porphyries. The rare mineral rheniite (ReS<sub>2</sub>), occurs along with Fe-Cu sulfides, Pb oxides, and native Sn in Pagoni Rachi and Konos prospects. Rheniite and high-Re molybdenite precipitated under oxidizing conditions and from relatively acid hydrothermal solutions, whereas Re-poor molybdenites are indicative of reduced conditions mostly dominant in the intrusion-related systems. At the northern Greek porphyry-Mo prospects, magmas previously enriched from their mantle source rocks were responsible for extreme contents of rhenium in molybdenite.

## Sulfate redistribution in the convective clouds

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Clouds and precipitation play an important role in cycles of various tropospheric chemical species, especially sulfur and nitrogen. This is very complex problem that has to include many processes, such as cloud dynamics, microphysics and tropospheric chemistry.

In this paper, an aqueous chemistry module was incorporated into complex 3D cloud-resolving mesoscale ARPS (Advanced Regional Prediction System) model developed in the Center for analysis and prediction of storms (CAPS) at the University of Oklahoma. The goal of this paper was to examine the sensitivities of vertical redistribution of sulfate to the physical processes that take place in cloud. Six water categories were considered: water vapor, cloud water, rainwater, cloud ice, hail and snow, and five chemical species: gases H<sub>2</sub>O<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, and aerosols SO<sub>4</sub><sup>2-</sup> and NH<sub>4</sub><sup>+</sup>. Each chemical constituent in each microphysical category was represented by differential equation for mass continuity, so there are 30 new prognostic equations. The absorption of a gas phase chemical species in the cloud water and rainwater is calculated either by the equilibrium according to Henry's law and by real kinetic