Major geochemical and mineralogical characteristics of Turkish VMS deposits (NE Turkey)

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Most of the massive sulfide deposits (VMS) occurring from Paleozoic to Cenozoic throughout the world has been subsequently metamorphosed at various grades. Thus, all the original textures have been either completely destroyed or strongly altered. However, representative and original ore textures of the Late Cretaceous Turkish VMS deposits are well preserved.

The Turkish VMS deposits occur throughout the Eastern Pontide tectonic belt and show strong similarities with each other. They are all hosted by felsic volcanic rocks of Upper Cretaceous age. The deposits consist largely of the Cu-Zn-Pb-type, but Cu- and Zn-Pb-types are also present in the region. These deposits show very similar textural and mineralogical characteristics and almost all of the VMS deposits exhibit very high Cu/Cu+Zn ratios. The sulfur isotope compositions for all the investigated deposits lie within very a narrow range (-0.5 - +6) suggesting a very homogeneous source and deposition temperature. T_H of the investigated deposits ranges between 320°C and 160°C. The salinities of the fluid inclusions ranged between 0.5 and 6 wt. % equivalent NaCl. Gold and silver in the Turkish VMS deposits are present in submicroscopic forms. Gold occurs mainly associated with the yellow-ore. Silver, however, rarely occurs as discrete minerals. However, the major silver association is with tetrahedrite and bornite.

Variations in the magnitude of non mass dependent sulfur fractionation in the Archean atmosphere

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Recent experimental data have enabled quantitatively meaningful computations of the non-mass dependent fractionation of sulfur's isotopes ($\Delta^{33}S$) that exemplify the Archean rock record. The $\Delta^{33}S$ signal originates as a result of fine structure in the absorption cross-section of SO_2 isotopologues [1], which only undergo significant photolysis in reducing atmospheres [2]. The $\Delta^{33}S$ signal produced by SO_2 photolysis varies significantly between 190 and 220 nm, and thus is strongly dependent on any other atmospheric gases which absorb photons in this range [3]. A model that is capable of resolving the altitude-dependent radiative transfer through a realistic self-consistent reducing atmosphere is therefore essential when making direct comparisons between atmospheric $\Delta^{33}S$ production and the rock record. In this work, we investigate how the magnitude of $\Delta^{33}S$ might vary as function of atmospheric composition, which in turn allows the rock record to constrain the Archean atmosphere.

Other recent work on this topic has implicated large concentrations of SO_2 [5] and OCS [3] as being responsible for the variations in Archean $\Delta^{33}S$. We use our enhanced 1-D model of Archean photochemistry [4] to show that while increased concentrations of these gases certainly affect $\Delta^{33}S$ in an unconstrained model, the atmospheric conditions required for OCS or SO_2 shielding are unlikely to occur in an Archean atmosphere constrained by reasonable expectations of volcanic and biogenic fluxes. Within the context of plausible Archean atmospheres, we investigate how shielding due to changing amounts of CO_2, N_2, and O_2/O_3 affect the magnitude of $\Delta^{33}S$ produced in the Archean atmosphere.

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