

A study on the beach sediments of The Gulf of Fethiye (SW Turkey), focus on geochemical data

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This study is carried out to investigate sedimentary transport and depositional processes, heavy mineral distribution and possible economically important placer potentials of coastal beaches of the Fethiye Gulf. Investigation also forms part of a Project supported by the Ankara University Scientific Research Projects Office. To perform this, in September 2009, a large number of sediment samples were collected along the shoreline (A) and backshore (B) parts of coastal beaches of Fethiye and subjected to well-known sedimentary petrographic methods.

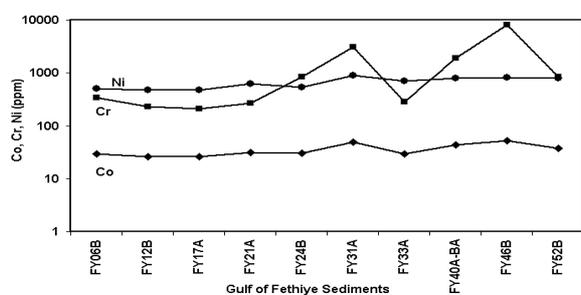


Figure 1: The distribution of Co, Cr and Ni concentrations in the beach sediments of Fethiye.

According to multielement analysis of sediments, Ni (657 ppm), Co (35, 5 ppm) and Cr (1605 ppm) contents are found to be higher than average values of Earth's crust and sandstones values. Earth's crust averages (ppm) for Co 25, Cr 100 and Ni are also given for comparison [1]. High concentrations of the elements can be related to the occurrences of ophiolites and bearing chromites on the coastal hinterland of the Fethiye Gulf. The total heavy mineral contents of the sediments showed parallel trend with an some element contents.

[1] Mason & Moore (1982) *Principles of Geochemistry*.

Experimental tests for the origin of Archean sulfur mass-independent fractionation during SO₂ photolysis

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The signatures of Archean sulfur isotope mass-independent fractionation (S-MIF) provide critical constraints on the redox evolution of the early Earth's atmosphere. Although S-MIF is likely to be sourced from SO₂ photolysis, the physical origin of this unique isotope effect is yet to be identified. Recent studies suggest 1) selfshielding [1] or 2) isotopologue specific photoexcitation [2, 3] as the origin of observed S-MIF signatures. These two models imply the pattern of S-MIF is sensitive to the UV spectrum, and thus, the atmospheric components that absorb UV region between 190 to 220 nm, potentially providing significant new constraints on the chemical compositions of early atmosphere.

A series of laboratory experiments are in progress to test above two hypotheses during UV photolysis of SO₂ ($3\text{SO}_2 + h\nu \rightarrow 2\text{SO}_3 + \text{S}$). A flow-through photochemical reactor is used to examine S-MIF as a function of SO₂ mixing ratio. Two broad band light sources (D and Xe arc lamp), with or without 200 nm bandpass filter, are used to test the effect of light spectrum. Detailed photochemical model using available rate constants suggests that S is formed by SO bimolecular collision ($\text{SO} + \text{SO} \rightarrow \text{SO}_2 + \text{S}$), and the photolysis of SO ($\text{SO} + h\nu \rightarrow \text{S} + \text{O}$) is a minor channel.

Experiments with D and Xe lamp produced similar MIF patterns ($\delta^{33}\text{S}/\delta^{34}\text{S}$ and $\Delta^{36}\text{S}/\Delta^{33}\text{S}$ ratios), suggesting S-MIF is not sensitive to the detailed shape of the UV spectrum. Although large $\delta^{34}\text{S}$ isotope effect is consistent with [2], their cross section predicts the opposite signs of $\Delta^{33}\text{S}$ for D and Xe lamp experiments. This suggests that the photoexcitation step itself may contribute relatively little to S-MIF. Instead, S-MIF may be originating from the isotope-sensitive quantum yield, such as curve crossing among various excited states SO₂. We will also report the results from a newly constructed dual-flow cell system designed to test the SO₂ selfshielding model at optically thin conditions.

[1] Lyons (2007) *Geophys. Res. Lett.* **34**, L22811

[2] Danielache *et al.* (2008) *J. Geophys. Res.* **113**, D17314

[3] Ueno *et al.* (2009) *Proc. Nat. Aca. Sci.* **106**, 14784