Hydrothermally altered basalts at high water-to-rock ratio at Skouriotissa VMS (Cyprus): an analog site to constrain condition formations of Fe-Mg-Al phyllosilicates on Noachian Mars

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Abstract

The Skouriotissa (SK) massive sulfide deposit (VMS) formed on top of the extrusive sequence of a fossil spreading ridge at Cyprus. At SK mine, we have sampled outcropping metabasalts along a 200 m-long cross section ranging from the fossil seaflloor to the VMS envelop.

- **Quartz-chlorite rocks** of metasomatic origin outcrop at the seafloor. They formed from deep hot fluids which reacted *in situ* with extrusive basalts and mixed with seawater. The NIR spectrum of SK Fe-Mg clinochlore has a higher reflectance than that of FRT000033C Nili Fossae chlorite (Carter *et al.*, 2013); 0.35- 0.7 compare to 0.12-0.25, respectively). By its overall reflectance and spectral properties in the 2-2.6 μm range, the Martian chlorite is closer to the Al-poor Fe-Mg-Ti prochlorite SMR14 (Clark *et al.*, 2007).

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- **Pyrite-bearing quartz-smectite and corrensite** (ordered S/C mixed layer) rocks characterize the VMS envelop. They are deeply leached and metasomatic.

-**Saponite zeolite metabasalts** are found inbetween the fossil seafloor and the VMS. Bulk rock analyses and advanced DRX studies allow discrimination of two groups among these metabasalts. A former group, still showing primary basaltic minerals**,** i**s** less argilllized and less affected by medium temperature zeolitization (analcime stage). It shows limited growth of a C/Sm saponite with dominant chlorite over Ca-rich smectite. Group 2 saponite metabasalts have undergone both advanced argillization and long lived zeolitization from medium to low temperature (analcime-philipsite association). Group 2 saponite contains Sm/c mixed layer with Mg-rich smectite and subordinate chlorite. The IR spectrum of a Group 1 metabasalt, interpreted in terms of 80% Mg-chlorite-20% Ca-Fe smectite, is similar to that of Tyrrhena Terra CRISM 1 phyllo (Loizeau *et al.*, 2012).
- SK basalts are presently altered to **illlite-smectite-bearing rocks** due to the flow of acidic drainage waters (17○