# Abiotic and biotic contribution in the formation of Al and Si rich iron-stromatolites (Tharsis, SW Spain)

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Iron-stromatolites are commonly found in creeks and rivers affected by acid mine drainage (AMD). These iron-stromatolites typically consist of a mixture of abiotic (neoformed iron mineral phases like schwertmannite-goethite and detritic minerals like quartz and clays) and biotic (e.g. leafs, insects, algaes, …) constituents.

This study is focus on the iron-stromatolites formation developed in the Agua Agria creek at the Iberian Pyrite Belt (Tharsis, SW Spain). Water composition of this creek shows a significant seasonal variation: 2, 015-1, 319 mg/L Al, 17, 052-12, 933 mg/L $SO_4^{2-}$, 207-176 mg/L Fe, 213-161 mg/L Zn, 164-98 mg/L Mn, 76-56 mg/L Si, dry-wet season respectively.

XRD and sequential extractions were employed to characterize the abiotic constituents of the iron-stromatolites while SEM and EPMA were used to study abiotic and biotic contituents morphology and to perform a compositional mapping (EPMA-mapping) of the different micro-levels in the stromatolite.

The mineralogical study exposed goethite and jarosite as the main iron mineral phases. These minerals showed an important concentration of Al, what is in agreement with the very high concentration of this element in the AMD. A clear alternation between levels with higher and lower iron composition was observed in the EPMA-mapping. The presence of diatoms also showed the same alternating pattern. Seasonal variations in the physic-chemical composition of the AMD at Agua Agria have been observed to be clearly involved in the alternation of levels with different diatoms densities and in the consecutive variations of the iron content in the mineral phases.

# Surface mass balance and geochemical constraints on the Laurentide Ice Sheet contribution to meltwater pulse 1A

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The Laurentide Ice Sheet (LIS) has long-been hypothesized as the dominant source for the abrupt ~20 m rise in sea level ~14.6 ka called Meltwater Pulse (MWP) 1A. During this event, North Atlantic climate warmed into the Bølling Warm Period in response to increased ocean overturning, opposite of the expected climate response to a large discharge of freshwater to the North Atlantic. Given uncertainties in the timing of MWP-1A, however, the abrupt Bølling warming could have forced this MWP. Because iceberg discharge decreased during MWP-1A, surface ablation had to provide the main mechanism for transferring ice to the ocean. To better constrain the LIS contribution, we use an energy-moisture balance model of LIS surface mass balance forced by climate output from the transient NCAR atmosphere-ocean general circulation model simulation across the Bølling warming. Results suggest a maximum LIS MWP-1A contribution of 3.4 m of sea-level rise over 500 years. This maximum LIS contribution agrees with marine runoff records that indicate a maximum LIS runoff to MWP-1A of less than 5.3 m of sea-level rise equivalent volume.