

Evidence for aragonite deposition in flood plumes of the Dead Sea

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Several studies demonstrated that authigenic aragonite precipitates from the Dead Sea (and Lake Lisan) in response to mixing between flash-floods and lake brine. However, the exact timing of the aragonite precipitation was not robustly established. Here we addressed this issue by measuring the chemical composition (pH, Na⁺, K⁺, Ca²⁺, Mg²⁺, Sr²⁺, Cl⁻, Br⁻, B), alkalinity, DIC and $\delta^{13}\text{C}$ of flood plumes. In total seven cross shaped sampling transects were conducted and 47 samples were collected. Our results indicate that (a) in the holomictic conditions of the modern Dead Sea flood plumes mix entirely with the underlying brine within a few days, (b) aragonite precipitates within flood plumes of the modern Dead Sea, and (c) Boron adsorption facilitates aragonite precipitation. The amount of aragonite deposition is estimated between 0.2-4.4 mole·m⁻². This value is surprisingly close to the 0-2.8 mole·m⁻² estimate of Barkan *et al.* [1] that was calculated following the extreme winter of 1992. This observation indicates that the amount of aragonite deposition is not a direct measure of flood discharge. In order to further validate this hypothesis, sediment traps were deployed in flood plumes of the modern Dead Sea. Furthermore, our results suggest that the convention of summer precipitation of aragonite laminae should be reevaluated. We propose that the deposition of aragonite laminae requires flood alkalinity values that are much higher than those observed in modern floods of the Dead Sea drainage basin. This scenario may occur during periods of high dust loads and high vegetation cover.

[1] Barkan *et al.* (2001) *Geochimica et Cosmochimica Acta*, 65 (3), 355–368.