

Strontium Concentration Profiles as Recorders of Carbonate Dissolution: An Example from Syros, Greece

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Strontium is commonly employed as a monitor of fluid flow in geologic settings [1,2], but it has yet to be widely used as a tracer of carbonate dissolution, which has been implicated as a potential major contributor to subduction zone carbon fluxes [3,4]. Here, we present an example of a partially altered carbonate layer in a *mélange* block from Syros, Greece, which has previously been shown to have undergone carbonate dissolution [3]. A mass balance profile across the carbonate dissolution front indicates loss of Sr from the altered rock behind the front and gains in Sr just ahead of the front, tapering off toward a baseline value in the unaltered marble [3]. As carbonate is the primary host of Sr in the unaltered marble, we attribute this profile shape to carbonate dissolution behind the front having stripped Sr from the altered region, while the rock ahead of the front that has undergone little dissolution experiences Sr gains due to diffusion across the front and subsequent Sr deposition. Furthermore, we suggest based on mass balance calculations that this particular feature is a result of 2D flow with advection perpendicular to the diffusive front. A diffusion-reaction model of this scenario successfully reproduces the observed profile shape. Our results indicate that such features may aid in identifying and monitoring carbonate dissolution processes in subducted carbonate lithologies.

[1] Bickle (1992), *AJS* 292, 289-316.

[2] Ague (2003), *AJS* 303, 753-816.

[3] Ague & Nicolescu (2014), *Nat. Geosci.* 7, 355-360.

[4] Frezzotti et al. (2011), *Nat. Geosci.* 4, 703-706.