

Figure S1. Correlation between P and Mg/Ca and P and Ca for dripwater feeding SC4 stalagmite (Smiths Cave, Christmas Island) based on samples collected monthly from July 2005 to April 2007 (compare with Fig.2 in the main text). The correlation line between P and Ca excludes the November 2005 analyses (open circle).

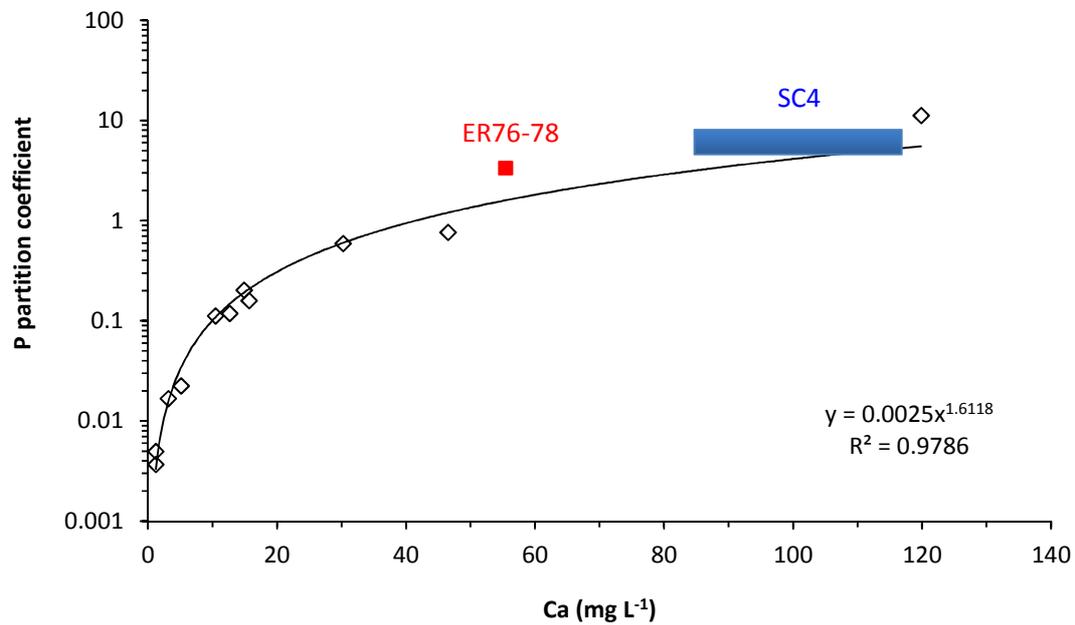


Figure S2. Partition coefficient of P in calcite versus Ca concentration in the solution. Open diamonds: experimental data from Ishigawa and Ichikuni (1981) at 20°C; red square: values for Grotta di Ernesto stalagmites ER76-78 (Huang et al. 2001; Fairchild et al., 2001; Borsato et al., 2007); blue bar: range of values for SC4 stalagmite.

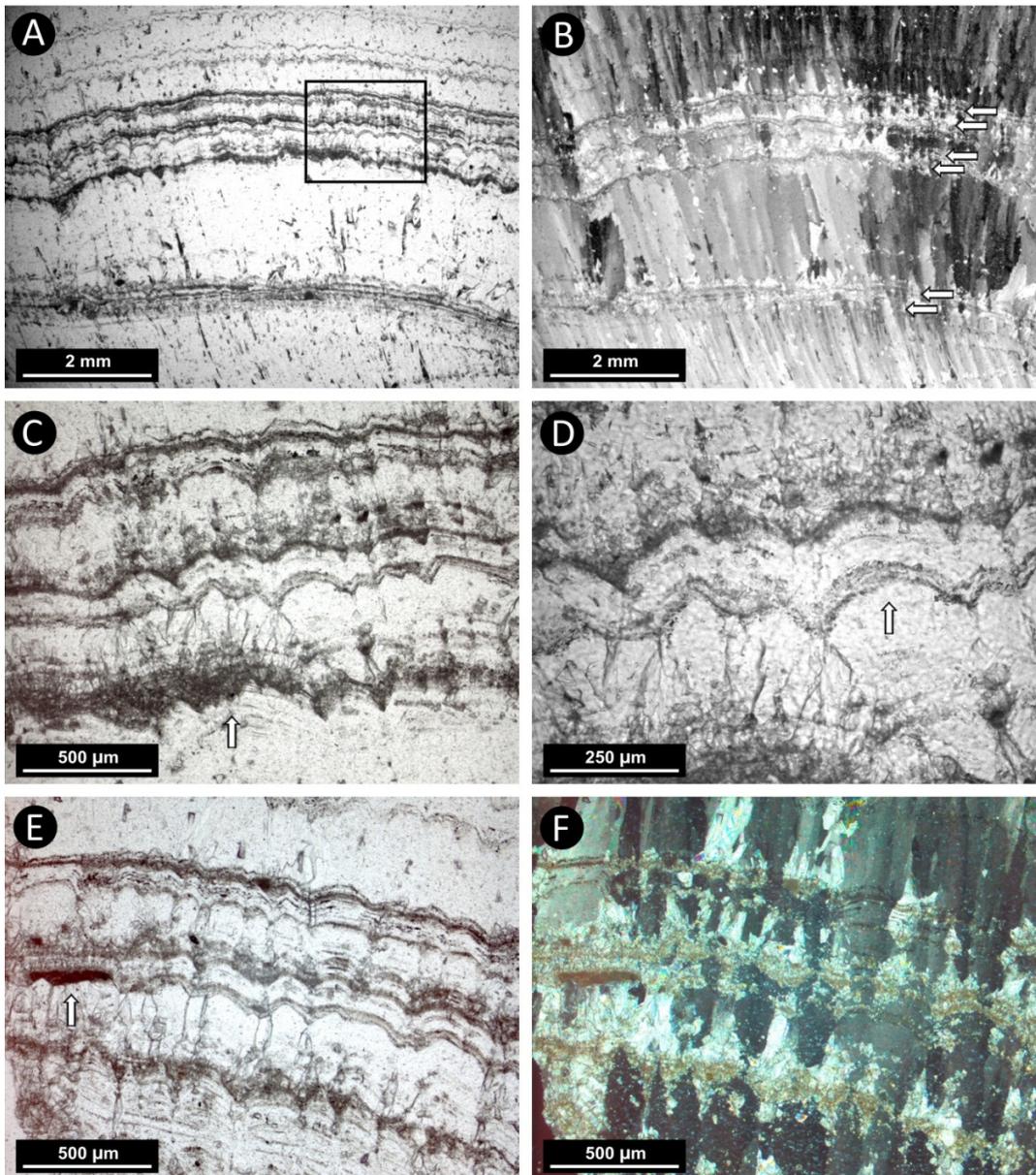


Figure S3. Thin section micrographs for 645-FS04. Typical fabrics: A). Compact, elongated columnar calcite and two stromatolite-like layers. The upper layer is highlighted by the box and enlarged in C. B) Same as A, at crossed polars. Note the elongated columnar crystals layers which are “interrupted” by thin layers of micrite, where dissolution of the columnar crystals is highlighted by micrite. Re-nucleation and competitive growth may occur on the micrite. C) Enlargement of the box in S3A. Arrows points to dissolution of columnar crystal tips, which are replaced by micrite. The dark, micrite layers show rounded morphologies, which are more apparent in D), where peloids composed of micrite are also evident. The peloids may act as nuclei for columnar calcite crystals. E) Another micrograph of the stromatolite-like layers showing a large “peloidal” structure composed of micrite aggregate. Under crossed polars (F) the dissolution (corrosion) of columnar crystals is evident, and the micrite replacing calcite spar appears as a mosaic of brown microcrystals within the extinct (dark grey) columnar individuals. Micrite and micrite aggregates (peloids) acted as nuclei for columnar calcite.



Figure S4. Epifluorescence micrograph of the stromatolite-like layer in Fig. S3A (top layer). Width of photomicrograph 2.5 mm. The micrite lamina has a light opaque fluorescence.