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An ancient underground water tunnel as a proxy for environmental change

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Carbonate samples taken from a Roman water tunnel in Nablus, Palestine, were investigated with respect to geochemistry and mineralogy. This tunnel runs under the Roman Cardo of Neapolis and dates back to the 2nd century. Carbonate deposits samples were taken from the sidewall of the tunnel. Thin sections of the deposits were made along the growth axis and were analyzed using optical microscope and scanning electron microscope (SEM) and showed alternated lamination with dark and light zones. The microstructures of the deposits show a range of change of crystal formation change. It is also obvious that at one layer the crystals are pure with columnar fabric while the next layer has many impurities with mosaic fabric. This means, that the columnar layer had a sufficient time to grow, where the mosaic layer had only limited time. On the other hand, thirty seven points in the carbonate deposits around 40mm along the growth axis were measured using SEM. The measurement showed that C, Ca and O value fluctuates between each two measurement points. Si, Cl and Mg values also fluctuate but with reduced intensity and unpredicted pattern. The high fluctuation can be referred to seasonal change of the water quantity and quality. On the other hand, the low fluctuation values are referred to extreme events.