



## Urbanization effect on groundwater quality (Paleohydrogeological study)

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Speleothem growing in caves usually contain hydrological information. Carbonates precipitation growing in tunnels under cities contain information about anthropological influence on water system.

Carbonate samples were taken from Roman tunnels in rural and urban area in Nablus district- Palestine. These laminated samples were analyzed for rare earth elements (REE),  $^{13}\text{C}$  and  $^{18}\text{O}$ . For REE, five samples were examined, each lamination was extracted and diluted with 0.1 ml 65%  $\text{HNO}_3$  and measured using ICP-MS. Yet, limited number of lamination was used for isotope analysis using Isotope ratio mass spectrometry.

Total concentration of rare earth elements were calculated for each of the five samples. In all examined samples, the newer laminations show higher peaks than the older one of each sample. On the other hand, one sample (8 measurements) of  $^{13}\text{C}$  show values between  $-31.6\text{‰}$  and  $-36\text{‰}$ . These values mean that the carbonate is from organic origin. In an urban area, wastewater infiltration into groundwater system can be the source of organic matter.  $^{18}\text{O}$  measurements show continues enrichments within the growth of the carbonate. This increase of the  $^{18}\text{O}$  values reflects drier weather.

Our results can be explained by the increase of water consumption in the household in the recent 100 years, rather than the increase of using detergents and cleaning products which have influenced groundwater quality as appeared in the carbonate samples. On the other hand,  $^{18}\text{O}$  results could be linked with the expansion of the building up area in the city and subsequently reduction of groundwater recharge