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Automatically collected drip water data reveals daily-scale variability in cave drip water trace element concentrations

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Daily-scale drip water data collected by an automatic water sampling device characterises seasonal shifts in hydrochemistry for a drip site in an Irish cave. A broad suite of trace elemental concentrations of the collected water samples were determined, and as well as flow rates. These data were used to quantify elements most prone to incorporation into drip water colloidal material. During a summer water deficit, alkali and alkali earth metals decreased in concentration, whereas colloidally-associated element concentrations increased. Increased bioproductivity may have induced increased soil organic material breakdown during this time period, leading to a pulse in colloidal material. Alternatively, we proposed that the increase in colloidally-associated element concentrations may have coincided with increased rates of dry deposition from cave air. Drip water Sr and P concentrations are anticorrelated and resemble seasonal variability observed in stalagmites elsewhere. In this case, Sr and P data reflect different phenomena (hydrology and soil productivity, respectively). Consequently, the polarity of these two trace elements may yield important insights into past seasonality changes as inferred from the speleothem archive.