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# Using high-resolution monitoring data to identify the effects of cave and surface conditions on cave drip water hydrochemistry

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Hourly-scale cave air $PCO_2$, temperature, barometric pressure, and drip water electrical conductivity and discharge rates were used to demonstrate the effects of prior calcite precipitation (PCP) on drip water chemistry within Crag Cave, Ireland. Lower cave air $PCO_2$ caused more $CO_2$ degassing from drip water and subsequently more PCP, and higher cave air $PCO_2$ reduced PCP, although these effects were minor compared with dilution effects caused by variability in recharge. Calcite growth over the interval of the study was quantified by using an Iceland Spar calcite rhombohedron as a substrate; the total observed calcite growth compared very favorably to values calculated using theoretical calcite growth equations. To our knowledge this is the first study that compares actual and theoretical calcite growth rates calculated using all growth determining variables at a high temporal resolution, and it suggests that equations used to calculate calcite growth rates are valid. The study also demonstrates that PCP is an active process in caves, and is potentially important in modulating drip water chemistry, stalagmite growth rates, and consequently geochemical proxy records contained within stalagmites.