# Distribution of Rare Earth Elements between cave-drip water and speleothem calcite

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Speleothems are among the most robust paleoclimatic archives because of the conditions in which they are formed. The use of minor and trace elements in the calcite, such as Mg, Sr, Ba, has been used to trace hydrogeochemical processes in the karst, associated with the climatic conditions. However, these proxies are not sensitive to changes in redox conditions in the karst, or to the changes in the percolation route, or water-rock interactions.

In this work, we present the results form the ongoing long-term calibration taking place in 'Grutas Las Karmidas', a cave developed in volcanic tuff, located in Zapotitlan de Mendez, Puebla, Mexico (N 20° 00′ 01.19″ and W 97° 42′ 58″). The current climatic conditions of the cave are been monitored (temperature, humidity, $PpCO_2$), percolating and stagnant water, as well as calcite precipitated from them have been collected every three months for the last 26 months, and analyzed for their trace element composition, including REE.

# Discrepancy between measured and modelled behaviour of aerosol as cloud condensation nuclei

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The hypothesis that aerosol water content can be represented by a single hygroscopicity parameter has been evaluated against measured cloud activation potential and sub-saturated hygroscopicity of aerosol in a number of environments. A comparison between model-measurement reconciliation in the marine, tropical forest, temperate clean continental and polluted continental environments has been made. It was found in certain environments that the simple hygroscopicity parameterisation consistently and systematically led to over-prediction of the threshold supersaturation for cloud activation.

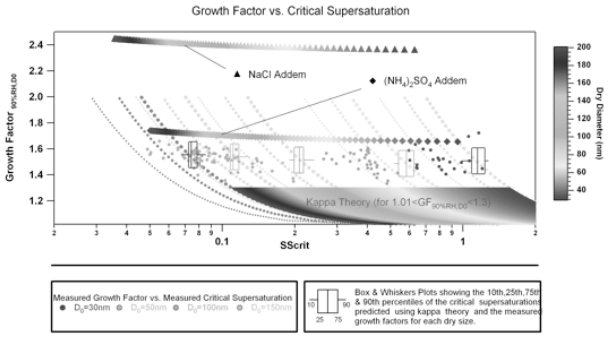


**Figure 1**: Measured & predicted marine CCN behaviour

In other environments, the degree of measurement / prediction discrepancy was size dependent. However, the discrepancies, where they exist, are always such that the particles are easier to activate into CCN than would be expected from the measured sub-saturated hygroscopicity. The differences in measured and predicted threshold dry diameter for cloud activation will be presented, along with the corresponding difference in cloud condensation nuclei number across the range of supersaturations for the average measured aerosol distribution.