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Is this an event? - Detecting abrupt changes in palaeoclimate records

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Abrupt shifts in a certain climate state is a pertinent question in palaeoclimate studies and is crucial for determining leads or lags between spatially disperse observations. Such events have also a direct bearing on the vulnerability of society to drastic – and possibly difficult to mitigate – changes. Determining whether or not, and when exactly, abrupt changes in climate occurred is made challenging by temporal resolution and uncertainties associated with determining the age of climate proxy measurements.

In this study, we present a robust, 'uncertainty-aware' approach to determine periods of abrupt change from palaeoclimate proxy records. Our method is based on a new representation of time series and it utilises the recurrence properties of the proxy record to distinguish time points of abrupt climate change. We first validate our approach with a synthetic example, and thereafter, we apply our approach to speleothem records from China and India. Our results reveal a highly non-trivial spatio-temporal pattern of the detected events in the Asian monsoon domain.