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Multidecadal climate variability in the northwest Iberian Peninsula during the last millennium based on speleothems records

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Multidecadal Variability has significant impact on Iberian Climate. Because of its latitudinal situation, Iberian Peninsula is sensitive to the North Atlantic Oscillation and the Atlantic Multidecadal Oscillation. However, instrumental records are too short to identify the influence of these climate variability modes correctly. Here we present speleothem proxies from several caves located in the Cantabric Region (NW Iberia) with different geomorphological characteristics which can offer seasonally resolved climate records, suitable for extracting information of past decadal to centennial climate variability during last millennia. These stalagmites from low elevation caves in Asturias, dated with U/Th method with growth rates from 50 to 250 micrometers/yr, provide us accurate information of the climate conditions near the cave. Trace elements are analyzed at 7 micrometers intervals by Laser Ablation ICP-MS which resolves seasonal cycles during the last 1300 yr. We compare trace element data with stable isotope d13C and d18O variations. To identify and characterize significant periodicities in all of the proxy records, we use wavelet analysis. With this mathematical method, we can identify a high frequency cycle in Sr and Mg content at special scales compatible with the annual deposition rate determined by U/Th dating which we interpreted as the annual cycle. The periodicity of a strong lower frequency signal can be identified as a multiple of the annual cycle independent of error in absolute chronology, which gives us very useful information about Iberian multidecadal variability and its possible relationship with other modes of variability in the north hemisphere. Finally we use I-STAL process model to simulate speleothem Mg/Ca, Sr/Ca and Ba/Ca variations and to identify which climatological variables govern these geochemical processes, so that we are able to robustly interpret speleothem proxy records.