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A Rapid Wet–Dry Climate Transition at ~6 ka BP in Western Europe

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The mid-Holocene was characterized by centennial-scale hydroclimatic variability in the North Atlantic region, yet the mechanisms driving these fluctuations remain debated. A distinct shift in diameter, $\delta^{18}O$, $\delta^{13}C$, and trace element ratios of the Père Noël (PN) stalagmite, which is 1 m long from Southern Belgium, revealed a rapid dry-wet climate change at the Millennium ~6000 yr BP (before present = before 1950 AD). The record reveals a pronounced shift in stalagmite growth rate, $\delta^{18}O$, $\delta^{13}C$, and trace element ratios, indicating a rapid dry-wet transition. A ~400-year drought episode, from (6057 ~ 6440 yr BP) is identified, characterized by synchronous enrichment in $\delta^{18}O$ and elevated Mg/Ca ratios. A distinct double-peaked structure is observed in $\delta^{13}C$, suggesting variability in soil/vegetation processes during this prolonged dry period. The co-variation of $\delta^{18}O$ and trace elements indicates enhanced prior calcite precipitation under reduced effective moisture conditions. These patterns suggest enhanced prior calcite precipitation under reduced effective moisture conditions. Ongoing comparison with North Atlantic sea surface temperature records aims to evaluate a potential link with AMOC variability. These findings provide new insights into the sensitivity of western European hydroclimate to North Atlantic dynamics during the mid-Holocene.



