



Climate during the Roman and early-medieval periods in North-western Europe: a review of climate reconstructions from terrestrial archives

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High-resolution palaeoclimate reconstructions are essential to identify possible influences of climate variability on landscape evolution and landscape-related cultural changes (e.g., shifting settlement patterns and long-distance trade relations). North-western Europe is an ideal research area for comparison between climate variability and cultural transitions given its geomorphological diversity and the significant cultural changes that took place in this region during the last two millennia (e.g., the decline of the Roman Empire and the transition to medieval kingdoms). Compared to more global climate records, such as ice cores and marine sediments, terrestrial climate proxies have the advantage of representing a relatively short response time to regional climatic change. Furthermore for this region large quantity of climate reconstructions is available covering the last millennium, whereas for the first millennium AD only few high resolution climate reconstructions are available.

We compiled climate reconstructions for sites in North-western Europe from the literature and its underlying data. All these reconstructions cover the time period of AD 1 to 1000. We only selected data with an annual to decadal resolution and a minimum resolution of 50 years. This resulted in 18 climate reconstructions from different archives such as chironomids (1), pollen (4), Sphagnum cellulose (1), stalagmites (6), testate amoebae (4), and tree-rings (2).

The compilation of the different temperature reconstructions shows similar trends in most of the records. Colder conditions since AD 300 for a period of approximately 400 years and warmer conditions after AD 700 become apparent. A contradicting signal is found before AD 300 with warmer conditions indicated by most of the records but not all. This is likely the result of the use of different proxies, reflecting temperatures linked to different seasons. The compilation of the different precipitation reconstructions also show similar trends. Dry periods are indicated by all records around AD 400 and 600, although precipitation records do not show the same spatial continuity as the temperature proxies. This study shows that clear climate changes occurred over North-western Europe in the period between AD 300 and 700, which are partly reflected by changes in seasonality.