Clim. Past, 6, 83–84, 2010
www.clim-past.net/6/83/2010/

Climate of the Past

Corrigendum to

"Climate reconstruction from pollen and δ13C records using inverse vegetation modeling – Implication for past and future climates" published in Clim. Past, 5, 147–156, 2009

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In the manuscript "Climate reconstruction from pollen and δ^{13}C records using inverse vegetation modeling – Implication for past and future climates" by C. Hatté et al., a figure has been omitted in the final published manuscript.

The section "3.4 Application on Eemian of La Grande Pile" on page 153, last paragraph, should refer to the missing Fig. 7.

3.4 Application on Eemian of La Grande Pile

Considering our previous geochemical results and the assumption that for time periods under similar climatic conditions degradation can be assumed to be roughly constant, we decided to apply a -1 degradation isotopic shift throughout the studied period (estimated original δ^{13}C = measured δ^{13}C + 1). Nevertheless, to account for this induced uncertainty, the LH threshold was set at -0.5 (corresponding to a δ^{13}C deviation of on average 0.7) instead of -0.2.

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Results are shown in Fig. 6. Mean annual temperature and annual precipitation reconstructed by biome(s) and δ^{13}C inverse modeling are presented bracketed by the combined domain of potential climatic niches of both of the most likely pollen-derived biomes. This figure clearly demonstrates the added value of the double constraints inverse vegetation model. Precipitation reconstruction would have remained constant and not informative ([-600; +200 mm yr^{-1}] in precipitation anomaly) for the whole studied period with biome as the single constraint. Precision increases by more than a factor of two and even reaches a factor of four by considering both isotopic fractionation and biome as combined constraints. Furthermore, reconstructed temperature ranges are often specified by a factor two for the same period.

This improvement within paleoclimatic reconstructions allows us to highlight important climatic shifts that have previously been recognized in marine records (McManus et al., 1994, 2002; Shackleton et al., 2002) but have been only poorly documented in continental records. Figure 7 illustrates some cooling events identified in both oceanic and continental records. Heinrich Event 11 (Heinrich, 1988) is then marked by a very dry (about 300 mm yr^{-1}) and relatively

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cold period (mean annual temperature of 2°C). An initial 5°C cooling event at 117–116 ka can be linked to the sea surface cooling C26 recorded in the central North Atlantic. This cooling is contemporaneous with a 200 mm yr^{-1} precipitation decrease. After 115 ka, a progressive cooling in mean annual temperature is recorded, followed 1000 to 2000 years later by a decrease in precipitation by ca 400 mm yr^{-1}. A sudden cooling at 109 ka followed 2000 to 3000 years later by a sharp decrease of mean annual precipitation of ca 500 mm yr^{-1}. Decreased temperature with a stationary precipitation regime leads to longer wet winters. For the middle latitudes, this conjunction of low temperature with high precipitation likely mirrors a similar situation further north that would have been favorable to ice-sheet extension. Ice build-up agrees with climate modeling that shows northern hemisphere ice volume growth starting ca 115 ka with a maximum at ca. 108 ka (Sanchez-Goni et al., 2005). A climatic improvement is recorded as 108 ka by a sharp increase of mean annual precipitation by ca 500 mm yr-1 and a slight warming. This milder climate, which lasted until 104 ka, was recognized as a Brörup period. This is in agreement with travertine growth that very rapidly accumulated in Germany around 106–105 ka (Frank et al., 2000). Paleoclimatic interpretation in a global context is further developed in Rousseau et al. (2006a).

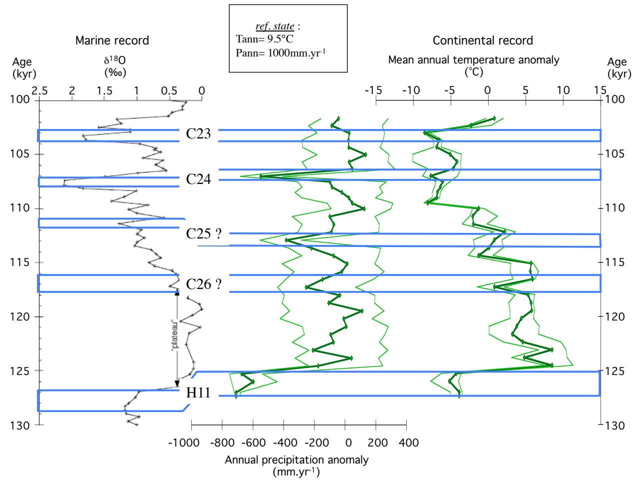

Fig. 7. Atlantic and Grande Pile Eemian paleoclimatic records. The left panel shows N. pachyderma sδ^{18}O recorded in the MD95-2042 core (37′48° N 10′10° W 3146 m) for the Eemian period (Shackleton et al., 2002). The middle and right panels present the mean annual precipitation and annual temperature in La Grande Pile during the Eemian period, reconstructed by biome(s) and δ^{13}C inverse modeling. Median values are bracketed by their 95%-confidence intervals. Bars underline cold events recognizable in both marine and continental records. Data are presented versus the age model described in Rousseau et al. (2006b).