Reconstruction of regional humidity variations during the Younger Dryas - Holocene transition in NW Iberia using lipid biomarker stable isotope ratios

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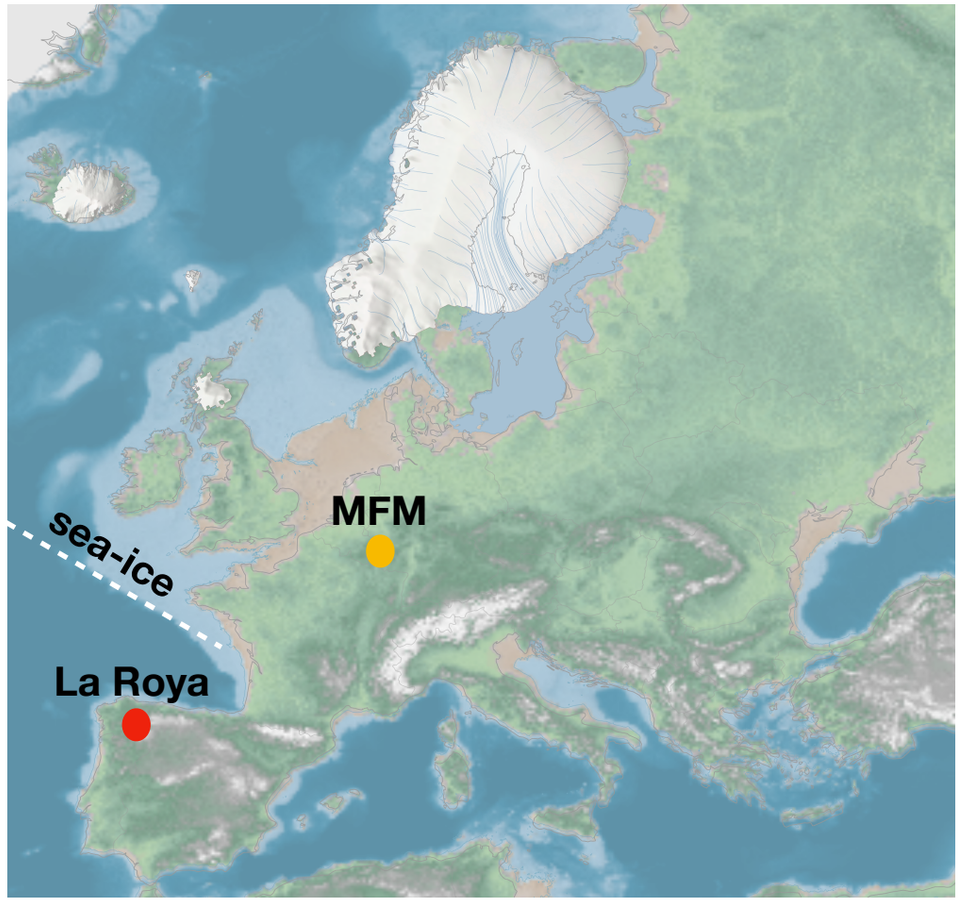
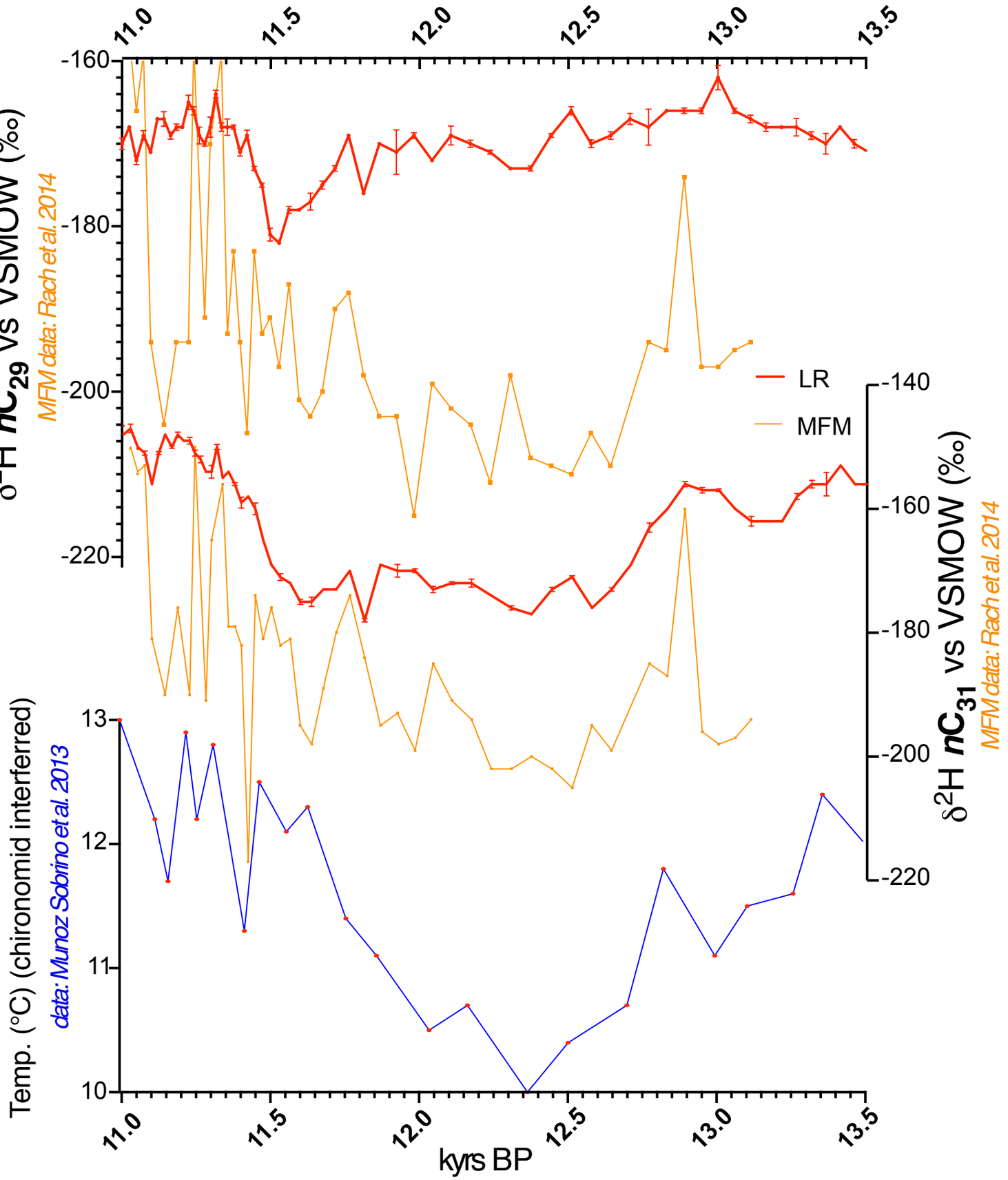
Introduction

- **The Younger Dryas (YD)**, 12.000 years BP, was last major abrupt climate change in the Northern Hemisphere
- Temperature change, communicated through atmospheric changes caused abrupt local ecosystems change
- **Knowledge gap*:*** regional expression of change distinct, regions at the boundary between major moisture sources, like NW Iberia which is situated between Atlantic and Mediterranean moisture sources.

- Here we use lipid biomarker (*n*-alkane) stable hydrogen (δ^2H_{wax}) and carbon isotope ($\delta^{13}C_{wax}$) data from Lake Laguna de La Roya (LR) (NW Iberia), covering the YD to understand hydroclimate change
- Since LR is located close to Atlantic Ocean and reconstructed max. sea-ice extent, we are interested in *amplitude* and *variability* of local hydroclimatic changes compared to more continental sites like Meerfelder Maat (MFM).
- Available other local proxy data: chironomid temperature data, pollen data.



Results



- During YD, LR δ^2H_{wax} values were ~6‰ more negative compared to the preceding Allerød.
- MFM data showed ~12‰ more negative values (twice as strong as in LR) during YD.
- LR δ^2H_{wax} values were in general more positive compared to MFM.
  - Allerød by ~27‰
  - YD by ~33‰
- In the Holocene both records converge to an average difference of 15‰.

- Max. reconstructed temp. drop of 2.5°C at LR during YD.

Interpretation

- Stronger change in MFM δ^2H_{wax} compared to LR δ^2H_{wax} during YD (resulting in a 30‰ difference in δ^2H_{wax} among sites) can be attributed to several factors:
  - A to stronger temperature drop in continental Europe (4-6 °C), but account for only roughly 4‰.
  - A different moisture source area (Mediterranean) for LR during Allerød/YD period and/or
  - increased air mass transport distance from LR to MFM compared to Holocene conditions.
- Convergence of LR and MFM δ^2H_{wax} values at YD-Holocene transition (which is close to modern 10‰ difference in $\delta^2H_{precipitation}$) implies a shared Atlantic moisture origin and subsequent Rayleigh rainout towards the East beginning with the onset of the Holocene

Conclusion

- Our new δD_{wax} dataset from LR and MFM of the Allerød/YD and YD-Holocene transition suggest significant changes in the atmospheric circulation, in particular at the YD-Holocene transition at LR. The results imply a shift within the major hydrological regime in NW Iberia to more Atlantic moisture influence in the Holocene than before.

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