Can we estimate catchment-scale biomass production from sedimentary biomarkers? An attempt with miliacin in Late Bronze Age levels from Lake le Bourget (French Alps).

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IMOG Abstract Template

Title only (not Authors & Affiliations)	**Can we estimate catchment-scale biomass production from sedimentary biomarkers? An attempt with miliacin in Late Bronze Age levels from Lake le Bourget (French Alps).**

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The evaluation of demography for proto- and prehistoric times remains complex due to the rareness of human remains. Here we propose an original approach based on the combination of geophysical and organic geochemical techniques applied to the Late Bronze Age sedimentary infill of Lake le Bourget. Deep sediments were mapped and their volume estimated by sub-bottom seismic profiling calibrated (accoustically and chronologically) on piston cores. Multibeam bathymetry combined to a subaquatic archaeological survey allowed to precisely identify the extension of Late Bronze Age palafittic stations in shallow waters and to determine the volume of the associated organic rich deposits.

The concentrations in miliacin, a molecular biomarker of cultivated millet preserved in sediments (Jacob et al., 2008), were determined in Late Bronze Age levels both in deep sediments (on piston cores) and in organic levels developed under palafittic stations (short cores). Miliacin concentrations were very similar (ca. 300 ng/g) in two piston cores drilled at 4 km distance, revealing the homogeneity of concentrations over the basin. Miliacin concentrations are ten to hundred times higher in shallow organic deposits. By applying concentrations in miliacin to the respective volumes of deep and shallow sediments, and considering sediment density, we estimated the total amount of miliacin deposited at this time. The analysis of ancient millet cultivars showed that miliacin is essentially concentrated in seeds and allowed us converting the total amount of miliacin into total weight of millet

seeds produced in the catchment, assuming that miliacin was entirely transported to the sediment and was not affected by early diagenesis.

Future work will focus on the carbon isotopic analysis of human and animal remains is order to determine the amount of millet in their respective diet (millet being the only C4 plant at that time). The comparison of our results with demography data estimated from habitat density will allow identifying methodological biases in our approach.

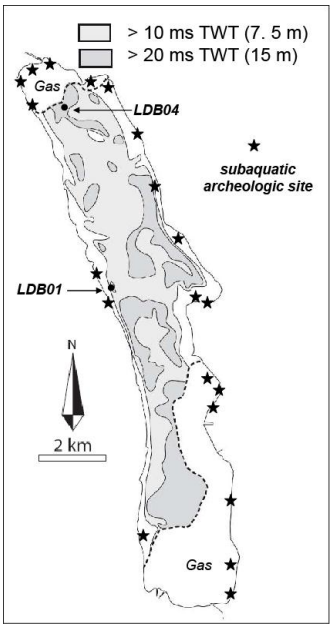

Figure 1: Isopack map of the Holocene lacustrine drape identified in Lake Le Bourget by high-resolution seismic reflection profiling (ms TWT are milliseconds two-way-travel times). Using P waves velocity measurements on two long piston cores (LDB01 & LDB04) with a Geotek multisensor core logger (mean values of 1.5 km/s, cf Chapron et al., 2005), the thickness of holocene sediments can be determined.

References

Jacob, J., Disnar, J.R., Arnaud, F., Chapron, E., Debret, M., Lallier-Vergès, E., Desmet, M., Revel-Rolland, M. 2008. Millet cultivation history in the French Alps as evidenced by a sedimentary molecule. Journal of Archaeological Science 35, 814-820.