Response to Michel Fontugne's Reviewer Comments

gchron-2023-5 Marine reservoir ages for coastal West Africa by Soulet & al.

The article by Soulet & al presents the 14C reservoir age measurements of seawater for the western coast of Africa, from Morocco to Angola. This type of data is lacking in the community and therefore deserves to be published. The calculation of reservoir ages and ΔR does not require any additional comment. Nevertheless, some points remain obscure and therefore call for further clarification.

We would like to thank Michel Fontugne for his constructive comments. We reply in details to each of them below. "LXX" refers to the lines in the revised manuscript with tracks.

Sampling.

As for the results published by Ndeye (2008), a large number of samples come from the MNHN Paris collections and more particularly from the Gruvel missions. Soulet & al. classify five results as aberrant, in particular those from Guinea and the Ivory Coast which were collected by dredging (see Dautzenberg, Annales Inst. Océanogr.). This method of collection is not the most appropriate for this kind of study….

We agree that dredging is not the best appropriate way to collect live samples for reservoir age reconstruction. However, we have to deal with this limitation as we rely on museum samples older than AD 1950.

However, here specifically, not all samples from Guinea and Ivory Coast were collected through dredging. Please, have a careful check at the reference you cite. We also used and cited this reference to check the provenance and collection method of each sample from the Gruvel mission. Actually, only one sample out of 30 used here was collected through dredging and it was from Cotonou (Benin) (sample MNHN-IM-2022-4600), and it is not an outlier. The information was already mentioned in our original submission.

Ndeye had obtained 6 aberrant results including 4 for samples from the MNHN.

Well, that is not a strong evidence to disqualify samples from the MHNH collections. Instead, we would like to emphasize that the reservoir age reconstructions for the Pacific Ocean (Southon et al., 2002), for the French Coast (Tisnérat-Laborde et al., 2010), for the Black Sea and Mediterranean Coasts (Siani et al., 2000), from Kerguelen Islands (Paterne et al., 2019) are from the MNHN and yielded good results despite there were certainly some outliers.

The sample from Jacqueville and Ile de Roume come from the shell of B. ringens, which could encourage us to requalify this species for this type of study.

Owing to P Reimer' comments and yours, we balanced our discussion about *B. ringens*. Thanks. Please, see L23-24 and L580-586.

Outlying samples.

The other so-called aberrant samples are collected on coasts subject to the influence of deep water rises (upwelling) whose CID is depleted in 14C. The values obtained from Morocco to

Dakar are compatible or characteristic of these upwelling zones. For comparison, the authors can refer to the reservoir ages calculated for the Peruvian upwelling (Kennett & al, 2002; Fontugne & al, 2004; Jones & al 2007, 2010; Owen, 2002, in Radiocarbon Ortlieb & al QR 2011; Etayo -Cadavid et al Geology 2013). Surprisingly, these references are absent when the authors mention the zones of deep water upwelling (see in Outlier specimens). The works cited above demonstrate the extreme variability of the values of the reservoir ages depending on the position of the upwelling cells, the intensity of the winds but also a variability during the period of life of the mollusk.

Indeed, we did not cite these papers and we will do so in the revised manuscript. Thanks. Please, see L597.

The sample from Lake Ahémé (Benin) with a ∂13C of -4.76‰ seems to have been marked by a strong contribution of carbon of continental origin likely to reduce the reservoir age value. As this lake is located 10km from the coast with narrow communication with the coastal lagoons, it cannot really be considered as representative of the Atlantic Ocean. It would be better not to take it into account but the result can be published in the table S1.

Right, we will remove this sample from the regional averaged value, and write a note in the sample description stating why. Please, see L335-337.

This sample comes from the Gruvel mission. Given the number of aberrant samples provided by this mission to the authors as well as to Ndeye (2008), it would be desirable to verify the harvesting conditions for all these samples.

Ndeye (2008) reported 6 outliers. However, only one was from the Gruvel mission.

We have already checked each provenance. We had 5 outliers out of 30 samples, among which two could have been influenced by upwelling conditions. So, we had only 3 outliers out of 30 samples. Right, they are all from the Gruvel mission, but the vast majority of our samples comes from the Gruvel mission… But, what is important is to flag and discuss the potential outliers. We feel it is exactly what we did in this manuscript.

References.

Not all bibliographic references are adequate: Stuiver et al 1986, Stuiver & Brasiunas 1993 (both in Radiocarbon) would be more justified for the definitions of R and ΔR (as mentioned later in the text). Stuiver and Pollack (1977) only specify that reservoir age corrections should not enter into the calculation of conventional 14C dates.

Thanks, we will modify the main text accordingly. Please, see L28-29.

As with ocean/atmosphere CO_2 exchanges, it would be more accurate to mention the pioneering works of Revelle & Suess, 1957 and Craig, 1957 (both in Tellus). Brocker & al., 1985 and Stuiver 1980 (both in JGR) could also have been mentioned; these studies giving the distribution of 14C in the ocean and highlight the equatorial upwelling (or divergence) characterized by low 14C water. Of course, Bard et al 1988 can be added.

Fair. We will modify the main text so that these references are cited. Please, see L34-35.

The reference to the Black Sea, which is a lake occasionally connected to the Mediterranean Sea, is not the most judicious. A reference to the Baltic Sea (see Lougheed & al Clim. Past 2013) would reinforce this point. These remarks are not exhaustive, I think that the authors will be able to complete the bibliographical references with more precision.

We added the Baltic Sea reference to the manuscript. Please, see L518.

Stable Carbon Isotopes and reservoir ages uncertainties.

The authors indicate reproducibilities of ±0.04‰ and ±0.02‰ for the values of δ18O and δ13C, respectively. These are occasional measurements integrating a seasonal variability of 0.5 to 1‰ recorded by the growth rings of the shell (see among others Carré & al, 3P 2005, Jones & al RC, 2007, 2010.

Right, we do indicate that this is only the instrument reproducibility. Although our stable isotope measurements are not intended to discuss any seasonal variability, we will add a sentence in the revised manuscript indicating that seasonal environmental variability can impact the stable isotopic value over a range larger than the instrument reproducibility, citing the relevant literature. Please, see L120-122.

Jones' work also shows a seasonal variation of about 100 years in marine reservoir age. Perhaps, the authors could comment on the evolution of reservoir ages between 1890 & 1950 by reconsidering this new level of uncertainty.

Similarly, we can add a sentence indicating the extent of variability observed in Jones' work. However, we do not have clear results to firmly state this, and it could be seen as an over-interpretation of the results. Regarding the evolution between 1890 and 1950, the averaged values have already uncertainties larger than 100 ^{14}C yrs, still showing a clear decreasing trend in the reservoir age.

We still used these results in the section outliers: Please, see L580-586.

In detail Table S1. Columns F and G should simply be labeled Latitude and Longitude, the minus sign indicating S and W respectively.

Modified accordingly.

The authors wrote "*Upwelled waters can be depleted in 14C relative to the sea surface*" ; but upwelled water are always depleted in 14C. The upwellings areas are the atmosphere's largest natural source of CO2 (see among others Takahashi & al Deep Sea Res., 2002).

We reworded the sentence accordingly. Please, see L595.

To conclude, this paper needs more precisions. Nevertheless, its data are needed.

Thanks, we hope we have lifted most of the reviewer's reservations concerning our work.