Response to Reviewer 1 Comments (RC1):

This paper reports a new approach to the establishment of reliable age models for very recent marine sediment cores (last 200 years). This is often a difficult and sometimes intractable problem for very recent cores and core-tops, because of the problems inherent in offsets between, for instance, radiocarbon, which has very poor precision for the last few hundred years, and age models based on Pb and Cs isotopes. This problem becomes significant because this is exactly the time period for which precise and accurate age models are required to calibrate proxy with instrumental data. These problems are rehearsed and explained well in this generally very well written contribution. In practice, most age models for recent marine sediments bring any data into play that might help construct and refine an age model and these data typically augment ^{14}C and Pb/Cs (notably tephra). This article – which is a case study - focuses on two additional approaches, using the oceanic ^{13}C Suess effect and spheroidal carbonaceous fly ash particles (SCP). The section on the Suess effect outlines an approach that will be of interest and use to many in the community, and the approach is novel; the section on SCP is included here as an accessory technique and is of less novelty. I have major concerns over the approach used to determine the age of the core-top.

We thank Prof. James Scourse for his positive feedback and helpful suggestions. We address the specific comments below.

Specific comments

1. I wonder whether the title should highlight/reflect the Suess effect approach? I think this is the most significant part of the paper and reference to this in the title would help flag this significance.

Thanks for this suggestion. In the revised MS, we will adjust the title accordingly to highlight the Suess effect approach. The new title will be: *"Revising chronological uncertainties in marine archives using global anthropogenic signals: a case study on oceanic ^{13}C Suess effect"*.

2. Lines 47-48: the ^{14}C bomb-spike is introduced here as a confounding factor that increases uncertainties but it can provide a useful additional basis for assessing age if sufficient serial samples are available to define the spike.

We agree. This will be included/clarified in the revised MS.

3. Line 193: This sharp decline is only present in the final, single, 0.5 cm sample so the sampling resolution here could be problematic. Having higher resolution to define this decline more clearly would make the argument stronger. This issue is exacerbated considering the certain impact of bioturbation in the sediments, and the likely lateral variability in signals generated by bioturbation. Although in lines 321-322 the authors state that there were no visible signs of bioturbation, they acknowledge that bioturbation is common (actually ubiquitous) and that this will likely influence age distributions in the top 10 cm of the core. If there was no bioturbation the core would be laminated. I'm therefore more concerned with this somewhat over-interpreted approach to estimating core-top age than with the age-depth modelling. The authors should either consider strengthening this argument or deleting this section of the MS.

We fully appreciate and agree with the reviewer's comments on bioturbation. Strong bioturbation limits the application of our approach—a caveat we will highlight in the revised MS.

4. Line 423: The term “ultra-high-resolution” should be reserved for archives that have annual to subannuual resolution.

This will be corrected and changed to “high-resolution” in the revised MS.