Responses to Review #2

The authors would like to thank the reviewer for his valuable comments which helped improving the quality of the manuscript. Our point-by-point responses to the reviewer's comments appear in bold below.

Minor comments:

Title: The paper both assesses the above- and underground carbon, why only stating aboveground carbon in the title. Total carbon mass would sound appropriate.
The reviewer is right. We have removed the reference to above-ground biomass as we are also dealing with the root part: "Assessment of carbon mass in a Mediterranean downy oak ecosystem using airborne lidar and NASA GEDI data".

Abstract line 14: "making up" → constituting
The correction has been made.

Abstract line 20: "and that its", please clarify. Is it "and" or "indicating".
The sentence has been clarified.

Intro line 39: double IPCC reference
The repetition has been removed.

Intro line 43: "in the functioning"
This part has been rephrased.

Intro line 46-47: 3.3 Mha y-1, a quick example of a reference size would help the reader understand the magnitude of the forest lost (e.g. 5% of France surface).
Indeed. We have added such a reference size.

2.1 line 103: on → within the O3HP area
The correction has been made.

2.1 line 113: the regional droughts
The correction has been made.

Figure 1a: Please add markers to precise locations of highlighted cities and OHP.
The figure has been improved according to the comment.

2.2.1 line 141: lidar forest → forest lidar profiles
The correction has been made.

2.2.2 line 149: depending → accounting for
The correction has been made.

2.2.2 line 150: is the flight speed of 26 m/s an average, if yes precise this. Laser repetition rate of 20Hz.
Yes, this has been clarified.

Figure 3a: the sloping plot in red contours is hard to see.
The figure has been improved according to the comment.

3 line 159: in three stages → following three stages
The correction has been made.

3 line 161-162: carbon trapped in both the aboveground biomass and roots, respectively.
The correction has been made.

3.1 line 181: The operation has been repeated in June 2023 but it is not clear in that paragraph when was the first time such measurements happened.
The precision was added in the sentence.

Figure4: The figure is blurry. Higher quality is requested. The regression would obviously look different for the non-downy oak species as suggest by the green dots. It is clear in later in the manuscript that the point is to assess the ecosystem as a whole instead of characterizing solely downy oaks. It might worth make that clear at this stage. Otherwise, we would think why not disregarding the dots known to be different species in the regression.
The figure is indeed blurred in the pdf because it was copied in low resolution by mistake. The correction has been made.
In this figure we have separated the downy oak from the other species, but the regression has been performed on the whole because it is difficult to know which tree species was sampled by the airborne lidar. In addition, Montpellier maple trees have densities close to those of downy oak trees, so we can include them, even though they are in the minority in terms of numbers.
For the sake of clarity, we have added the sentence: "It should be noted that Montpellier maples have been retained in the regression because they can also be sampled by airborne lidar without being identifiable by this measurement."

3.2 line 190: vegetative
Vegetative is the term used to designate the aboveground apparatus of a plant. It was used to make the sentence shorter.

3.2 line 193: problem with equation reference, please check them in thorough the manuscript
The reviewer is right, the correction has been made.

3.2 line 195: Are the sessile oaks values used in this study? Please make this clear.
The sessile oak values are indeed to one used. The sentence was rewritten to make it clearer.

3.3 line 222: markedly
The word was changed to make the sentence clearer.

4 line 226: realistic
The word was removed in order to aid comprehension.

4.1 line 229: therefore → found
The sentence was rewritten to make it clearer: "It is due to shallow depth of the soil, but also due to strong competition between individuals that trees are therefore undeveloped compared to other areas (Di Iorio et al., 2005)." .

4.2 line 240: figure reference issue.
The issue was due to the conversion in PDF. We shall ensure it doesn't happen again.

Figure 6f: It looks from 6e that the std on TTHmax maxes out around 4, but the histogram does not show any values greater than 3.
The maximum value on the color scale is indeed 4, however none of the dots reach this value, which is why there are no data in the histogram. We chose this scale because lowering it under 4 leads to more saturation that disturbs comprehension.

5.3 line 340: small footprint of only 355nm, please correct.
Thank you, this does not belong here and has been removed.

5.3 line 341: relative statistical errors
The correction has been made.

5.3 line 341 and onward: please refer to the figure 10 curves when commenting on the uncertainties to ease the understanding.
We have referred to the fig. 10 for each curve.

Figure 11: AGC from eq.4? Please specific in the legend. Also, in the caption, explain what the grey shading represents.
The reviewer is right, this legend needs to be more explicit. It has therefore been amended: "Figure 11: Root UGC and AGC both derived from allometric laws against TTH. UGC is computed from Eq. 6 and 7 whereas AGC is computed from Eq. 5. The shaded area between the two root UGC curves represents the possible zone for the carbon density for downy oaks. It is bounded by the estimate on Quercus pubescens trees (blue curve) and Quercus ilex trees (red curve).".
Note that we have also replaced RC by UGC in equations 6 and 7. We have modified the previous sentence accordingly: "The two possible laws that link the amount of root underground carbon stock (UGC) in tC.ha^{-1} to CBH are then given for each tree by the respective relationships: ".

5.4 line 361: spaceborne station
Spaceborne designates the fact that the station is in space. It is a way to shorten the sentence.

5.4 line 362: aims at characterizing
The correction has been made.

5.4 lines 363-365: This long sentence should be cut in half.
The sentence was cut in half as per your demand.

5.4 line 367: available from 18 April 2019 through 22 December 2022.
The correction has been made.

5.4 line 373: the sentence "the operational biophysical …" seems misplaced. It cuts into the explanation for why taller trees in the GEDI product. It would be better placed earlier in the paragraph. Also, could a mismatch in timing (GEDI later 2010's vs airborne lidar early 2010's) a possible reason for the observed discrepancies?

We agree, the sentence has been moved to an earlier part of the paragraph. As mentioned in the text, the differences are mainly for the tallest trees that GEDI finds higher up. This is therefore more likely to be due to a slope effect.

5.4 line 382: building on of the OHP site.
The correction has been made.

Figure 12b: Correct TTHmax to AGC in the legend.
The correction has been made.

6 Conclusion, line 387: in terms … biomasses
The sentence was rewritten to make more sense.

6 Conclusion, line 391: studied site.
The correction has been made.

6 Conclusion, line 393: error study budget.
The correction has been made.

6 Conclusion, line 403: ISS's.
The correction has been made.

6 Conclusion, lines 406-407: We are not addressing any validation effort of the level … but rather …
The correction has been made.