

Review of M.Chazette et al., “Assessment of aboveground carbon mass in a Mediterranean downy oak ecosystem using airborne lidar and NASA GEDI measurements”

This paper from Chazette et al. presents some interesting results on the carbon trap in the biomass of a downy oak forest in Southern France. The method presented by the authors draws on already published results applying lidar techniques to forest monitoring. This transdisciplinary approach falls into Biogeosciences scope. It is worth noting that the authors demonstrate here a relatively robust and reproducible way of monitoring the carbon mass trapped within forest ecosystem and its evolution with time in a changing climate.

Overall, the paper is well written and easy to read through. The structure is adequate and balanced with thorough method and uncertainty sections followed quantitative results. Although this study focuses on a case study, including a comparison with the NASA GEDI mission advocates for a more systematic use of this approach. I have only minor comments relative to the paper editing and figures aspect. I recommend this paper for publication in Biogeosciences after the following proposed corrections.

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.

Abstract line 14: “making up” → constituting

Abstract line 20: “and that its”, please clarify. Is it “and” or “indicating”.

Intro line 39: double IPCC reference

Intro line 43: “~~in the functioning~~”

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).

2.1 line 103: on → within the O3HP area

2.1 line 113: ~~the~~ regional droughts

Figure 1a: Please add markers to precise locations of highlighted cities and OHP.

2.2.1 line 141: lidar forest → forest lidar profiles

2.2.2 line 149: depending → accounting for

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

Figure 3a: the sloping plot in red contours is hard to see.

3 line 159: in three stages → following three stages

3 line 161-162: carbon trapped in both the aboveground biomass and roots, ~~respectively~~.

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.

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.

3.2 line 190: ~~vegetative~~

3.2 line 193: problem with equation reference, please check them in thorough the manuscript

3.2 line 195: Are the sessile oaks values used in this study? Please make this clear.

3.3 line 222: ~~markedly~~

4 line 226: ~~realistic~~

4.1 line 229: therefore → found

4.2 line 240: figure reference issue.

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.

5.3 line 340: small footprint of only 355nm, please correct.

5.3 line 341: relative statistical errors

5.3 line 341 and onward: please refer to the figure 10 curves when commenting on the uncertainties to ease the understanding.

Figure 11: AGC from eq.4? Please specific in the legend. Also, in the caption, explain what the grey shading represents.

5.4 line 361: ~~spaceborne station~~

5.4 line 362: aims at characterizing

5.4 lines 363-365: This long sentence should be cut in half.

5.4 line 367: available from 18 April 2019 through 22 December 2022.

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?

5.4 line 382: building ~~on~~ of the OHP site.

Figure 12b: Correct TTHmax to AGC in the legend.

6 Conclusion, line 387: ~~in terms~~ ... biomasses

6 Conclusion, line 391: studied site.

6 Conclusion, line 393: error ~~study~~ budget.

6 Conclusion, line 403: ISS’s.

6 Conclusion, lines 406-407: We are not addressing any validation effort of the level ... but rather ...