

Dear authors, your article is close to acceptance. Both reviewers agreed that the reviewed article should be accepted. There is a single technical correction needed:

The revision satisfied all the requests and suggestions of rev.#1 and the paper should be published now. The only remaining comments are:

**Comment 1:**

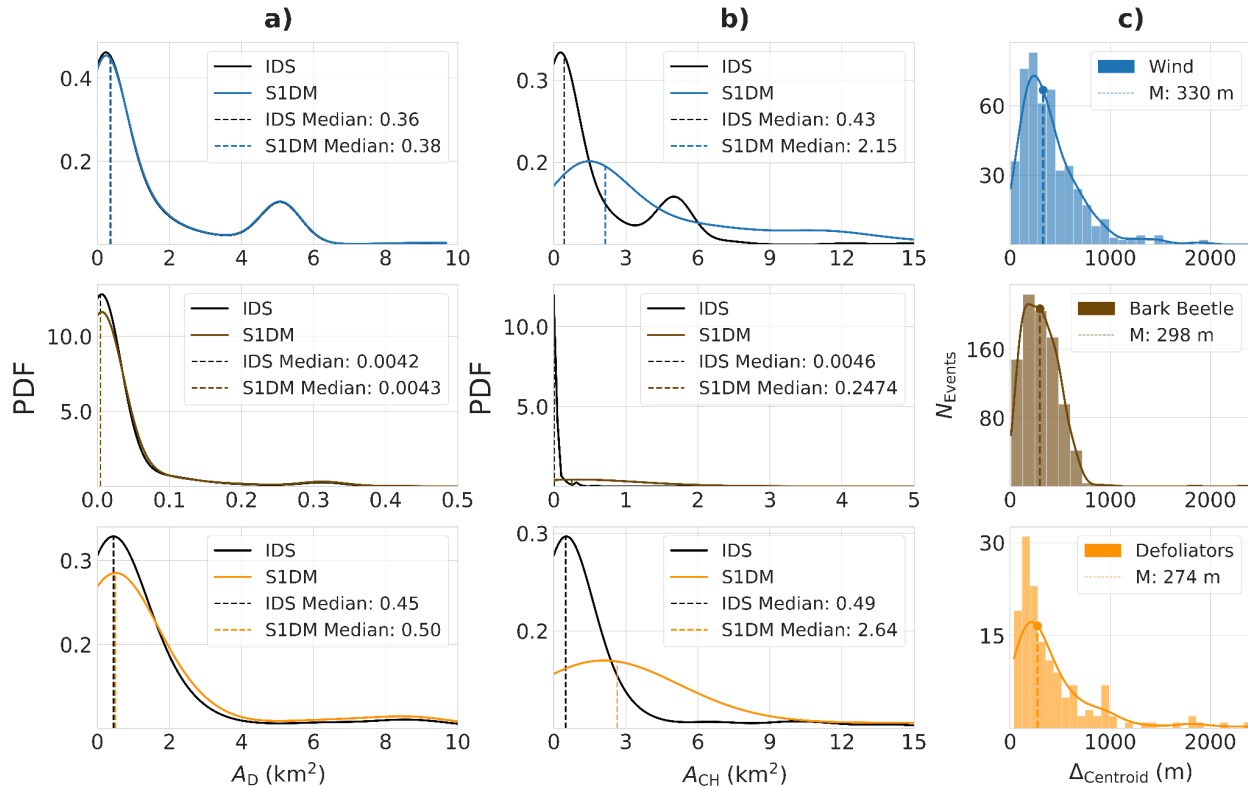
Figure 6: please stretch the x axis for the PDFs of bark beetle areas ( $A_D$  and  $A_{CH}$ ) so one can actually see the pdf properly. You did this in Fig. R1.3 in the Revisions document ( $A_D$  only to 0.5,  $A_{CH}$  only to 5 km<sup>2</sup>), this makes a lot of sense. This is for the TCC threshold of 10%, but, as results are very robust, you should also do this for the 30% threshold shown in Fig. 6.

Thank you for this suggestion. We agree that stretching the x-axis improves the visibility of the probability density functions (PDFs) for the bark beetle areas. We have therefore adjusted Fig. 6 accordingly, limiting the x-axis to 0.5 km<sup>2</sup> for  $A_D$  and 5 km<sup>2</sup> for  $A_{CH}$ .

In the process of revising the figure, we identified a minor inconsistency in the plotting routine affecting the calculation of median values. This issue has been corrected, resulting in slight adjustments to some reported values in Table 3 and Figure 6. The corresponding text, tables, and figures have been updated accordingly. The revised results are presented below in bold.

**Table 3.** Summary of disturbance area and centroid shift metrics for IDS and S1DM datasets. The table compares the median (50%) and 90th percentile of detected disturbance areas ( $A_D$ ) and convex hulls ( $A_{CH}$ ), as well as the centroid shift ( $\Delta_{Centroid}$ ) between the datasets.

| Disturbance Type | Dataset | $A_D$ 50% (km <sup>2</sup> ) | $A_D$ 90% (km <sup>2</sup> ) | $A_{CH}$ 50% (km <sup>2</sup> ) | $A_{CH}$ 90% (km <sup>2</sup> ) | $\Delta_{Centroid}$ 50% (m) | $\Delta_{Centroid}$ 90% (m) |
|------------------|---------|------------------------------|------------------------------|---------------------------------|---------------------------------|-----------------------------|-----------------------------|
| Wind             | IDS     | <b>0.36</b>                  | <b>5.02</b>                  | <b>0.43</b>                     | 5.06                            | 329.57                      | 755.78                      |
| Wind             | S1DM    | <b>0.38</b>                  | 5.03                         | 2.15                            | 11.31                           | –                           | –                           |
| Bark Beetle      | IDS     | <b>0.0042</b>                | <b>0.069</b>                 | 0.0046                          | 0.076                           | 297.85                      | 537.27                      |
| Bark Beetle      | S1DM    | 0.0043                       | 0.074                        | 0.25                            | 1.35                            | –                           | –                           |
| Defoliator       | IDS     | <b>0.45</b>                  | <b>3.10</b>                  | 0.49                            | 3.68                            | 273.58                      | 950.02                      |
| Defoliator       | S1DM    | 0.50                         | 6.33                         | 2.64                            | 15.27                           | –                           | –                           |



**Figure 6.** Comparison of disturbance size (in km<sup>2</sup>) and spatial bias (in m) between the IDS and S1DM datasets. The figure consists of three vertical panels, each displaying the results for three disturbance types: wind (top, blue), bark beetles (second, brown), and defoliators (third, green). a) shows the probability density function (PDF) of disturbance patch areas for IDS (black lines) and S1DM (colored lines) across the four disturbance types. b) presents the PDF of the *convex-hull* (CH) areas, representing the spatial spread of the disturbance polygons, using the same color scheme for S1DM and IDS as in the left panel. c) displays histograms and corresponding PDFs of the spatial distance between IDS and S1DM centroids for each disturbance type.

**L. 429-450:** We find that wind disturbances tend to be the largest events, with 50% of events having a size of **0.36 km<sup>2</sup>** or smaller (90% smaller than **5.02 km<sup>2</sup>**), followed by defoliators with a median area of **0.45 km<sup>2</sup>** (90% below **3.10 km<sup>2</sup>**) and bark beetles with the smallest patches, with a median value of **0.0042 km<sup>2</sup>** (90% smaller than **0.07 km<sup>2</sup>**).

Bark beetle disturbances show the strongest agreement, with nearly identical median areas (IDS: **0.0042 km<sup>2</sup>**; S1DM: **0.0043 km<sup>2</sup>**) and 90% of events in both datasets smaller than 0.08 km<sup>2</sup>. For wind disturbances, median S1DM events are slightly larger than IDS (**0.38 vs. 0.36 km<sup>2</sup>**), while the 90th percentile areas are nearly identical (**5.02 vs. 5.03 km<sup>2</sup>**). [...]

Defoliator disturbances tend to be larger in S1DM than in IDS, with similar median values (0.50 vs. **0.45** km<sup>2</sup>) but substantially larger upper-tail events, where the 90th percentile in S1DM is nearly twice that of IDS (6.33 vs. **3.10** km<sup>2</sup>). [...]

The median convex hull area of S1DM polygons is 5.3 times greater for defoliators (0.49 (IDS) → 2.64 (S1DM) km<sup>2</sup>) and **5** times greater for wind (**0.43** → 2.15 km<sup>2</sup>) than for the respective IDS polygons.

#### Comment 2:

I. 390: you seemed to have overlooked the comment providing the reason why the reviewer deleted "Jaccard similarity". That comment (I. 387 in the original pdf) was "you don't mean or calculate the Jaccard similarity. That applies to finite sets of discrete elements, where [...] denotes the cardinality of the set. You are comparing areas, and the quantity in eq. (2) is the Intersection over Union, or IoU. Confusingly, the IoU is sometimes also called Jaccard INDEX". So, please use Intersection over Union, or IoU, instead of Jaccard similarity.

Thank you for pointing this out and for the clarification. We agree that the metric implemented in Eq. (2) corresponds to the Intersection over Union (IoU) rather than the previously used term *Jaccard similarity*. While the formula is mathematically equivalent to the Jaccard index, the latter term is typically used for finite sets of discrete elements. Since we compare continuous spatial regions (polygon areas), we adopt the terminology commonly used in spatial analysis and remote sensing and refer to this metric as Intersection over Union (IoU) throughout the manuscript. We have therefore updated the terminology in the main text, figures (Fig. 9 and A3), and tables (A6) accordingly, while the equation remains unchanged.

#### Comment 3:

Revision document: sorry, but the fact that a 10% canopy cover of 0.5 ha corresponds to 500 m<sup>2</sup> within this 0.5 ha, and the fact that this area is larger than 400 m<sup>2</sup> seems to be unrelated to the rest of the argument why you are working with no lower spatial limit, but with a canopy cover threshold of 30% instead. What did you wanted to say here exactly?"

Thank you for the opportunity to clarify. Our intention was to relate the FAO minimum mapping unit (0.5 ha) and canopy cover threshold (10%) to the spatial resolution of the Sentinel-1 data used in this study. A 10% canopy cover over 0.5 ha corresponds to approximately 500 m<sup>2</sup> of vegetated area, which is comparable to the area represented by a single Sentinel-1 pixel (20 × 20 m = 400 m<sup>2</sup>). Applying this FAO-based threshold directly at pixel scale would therefore correspond to very small vegetated fractions

within a Sentinel-1 pixel (40m<sup>2</sup>), which is not robust given pixel-level variability and mixed-pixel effects. Because we operate at a different spatial scale than the FAO definition, we cannot directly adopt this thresholding approach. Instead, we use a higher canopy cover threshold (30%) to ensure that only more reliably vegetated pixels are included, resulting in more stable detection of forest disturbance patterns.

Please consider this technical correction and respond with a tracked-changes version of the manuscript.

We would like to sincerely thank the reviewers and the editor for their time, careful evaluation, and constructive feedback, which helped improve the clarity and quality of the manuscript.

On behalf of all authors

Franziska Müller