Reviewer 1

This preprint introduces a geolocation method, occasionally referred to as a tool, designed for application to EarthCARE. This method draws upon the experience gained from the observations and methods developed for CloudSat and CALIPSO. The geolocation method previously applied to CloudSat was based on a Digital Terrain Model (DTM) that was coarser than the ASTER DEM/WBD products used in this preprint. When applied to the CloudSat/CALIPSO datasets, the proposed method demonstrates strong performance, and the quantification of the pointing error is more precise. Examples of the application for EarthCARE geolocation are provided, though a more stringent performance indication likely requires actual data. Nevertheless, optimal areas for applying the geolocation methods within EarthCARE are defined. The manuscript is well-written and easy to understand, though some points require clarification.

We thank the reviewer for taking the time to read the manuscript and provide comments that will help improve the clarity and overall quality of our work.

Specific Comments:
1. Fig. 1: It would be beneficial to include a comparison with the Digital Elevation Model (without convolution) in Fig. 1c.

    The original DEM (without convolution) has been added to Fig 1c and the legend has been updated accordingly:
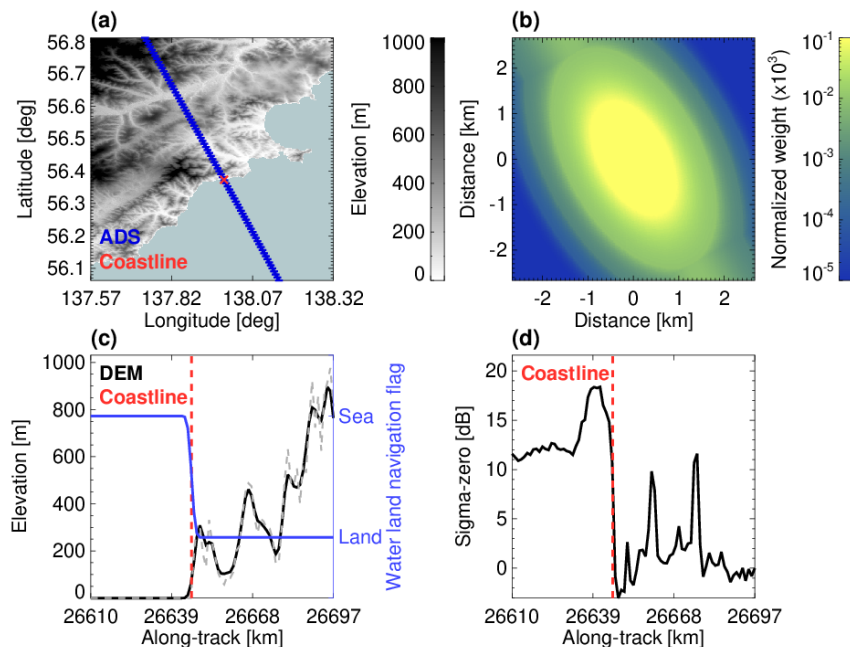

    Figure 1. [..] Panel (c) shows the original DEM (grey dashed line), the simulated DEM using the satellite's footprint (black line), the coastline location (red dashed line) and a simulated water land navigation flag (blue line). [...]

2. Line 175: Figure 3 displays the points suitable for applying EarthCARE geolocation. The selection criteria are vaguely described in the manuscript. A more detailed description of the

criteria used for selecting these points, along with their quantity, is recommended.

Thanks to the reviewer for requesting clarification on this. The criteria used to select the scenes depicted in Figure 3 are thoroughly described in the manuscript, specifically in lines 144 to 155 and 168 to 175. We believe these sections cover all necessary details regarding the selection process, ensuring that no critical information has been omitted. However, we have added clarification on the quantity of scenes selected.

"The results of the normalized overlapping areas using the distributions of the 2ºx2º gridded maps shown in Fig. 2, are used to select the most suitable regions for the coastal detection. The best 100 candidates are initially selected, considering this number a solid basis for statistical analysis. After individual visual inspection, focusing on the behavior of the σ_0 measurements from the CloudSat dataset, 30 scenes are discarded."

The same process was applied in the significant elevations approach:

"Similar to the coastline analysis, 100 scenes are initially selected, with 30 discarded after visual inspection."

3. Line 281: Please provide the number of overpasses that will be available during the 3-month period.

Thanks to the reviewer for raising this point. The number of overpasses depends on the region and the configuration of the orbit. We have included this information in the text for clarity:

"While the number of overpasses depends on the region and the configuration of the orbit, initial tests using one of the simulated EarthCARE TLEs estimated that the number of monthly overpasses per scene ranged from 2 to 7."

4. Line 400: Please specify the name of the processors in the EarthCARE processing system that utilize the geolocation tool.

The processors will not directly utilize the geolocation tools described in the manuscript. Instead, the analyses presented here will be conducted using the ATLID FeatureMask (A-FM) L2a product (Zadelhoff et al., 2023) and the JAXA L1b CPR data product (called C-NOM). The geolocation results will be shared with ESA to assist in correcting the attitude data if necessary.

This information has been added to the text, more precisely in the introduction.

5. Line 404: The text mentions the application of EarthCARE co-registration, which is not described in the preprint. Is there a reference that describes the co-registration to be used in EarthCARE?

Thank you for this comment. In our manuscript, 'co-registration' refers to the alignment of datasets from different sensors, which is a critical requirement for the synergistic algorithms—this definition is provided in the introduction. There are no other references describing co-registration in EarthCARE. The methodologies presented in the manuscript are

intended for both geolocation and co-registration assessments of the active instruments. As mentioned in the summary, the co-registration between ATLID and CPR will be based on a statistical comparison of their individual geolocation assessments (line 407).