

1 General comment

This manuscript addresses an important and timely topic, namely the development and evaluation of SAR-based approaches for monitoring changes in snow mass and snow depth in Alpine terrain. Accurate monitoring of these variables is particularly important in Alpine regions, where snow represents a key component of seasonal water storage and where increasing variability in snow accumulation, together with the occurrence of snow-drought conditions, strengthens the need for robust monitoring techniques. However, in its current form, the manuscript is excessively long and, in several sections, overly descriptive. This tends to obscure the main findings and reduces the overall effectiveness of the presentation. I therefore recommend a substantial revision aimed at streamlining and restructuring the text, with particular attention to reducing unnecessary detail and repetition and to highlighting the key scientific messages more clearly.

2 Specific comments

- The Introduction provides a useful overview of the available radar-based approaches, but the specific knowledge gap addressed by this study could be stated more explicitly. The reader would benefit from a clearer formulation of the main research questions, objectives, or hypotheses at the end of the Introduction. This would also help to better structure the subsequent presentation of the results.
- Section 2.1 contains a considerable amount of descriptive information, some of which is not sufficiently used later in the interpretation of the results. For example, differences in vegetation cover and surface characteristics among the RoIs are described in detail, but their role in explaining the observed differences between the sites is only partly discussed. Similarly, some information on the evolution of the snow season appears rather detailed relative to its subsequent use in the analysis. I suggest shortening this section and retaining only the information that is directly relevant for interpreting the SAR observations and retrieval performance. The tables could also be used more effectively to summarize site characteristics and avoid repetition in the main text.
- There appears to be a repetition of the word “also” in the sentence referring to C-band changes in snow microstructure and stratigraphy. This sentence should be revised for clarity.
- **Lines 86.** The study area and the locations of the measurements are introduced before Figure 1 is explicitly referenced. I suggest referring to Figure 1 at this point, as it would help the reader to immediately locate the study area, RoIs, measurement transects, and flight tracks.
- Please use a consistent format throughout the manuscript when referring to figures and tables (e.g., “Figure 1” / “Fig. 1”, and similarly for tables).

- **Lines 45-51.** Please ensure that the relevant statements are adequately supported by the cited literature.
- The manuscript is strongly focused on the technical performance of the different SAR-based retrieval approaches. While this is clearly the core of the study, the discussion could benefit from a broader perspective on how these results may translate into operational and application-oriented contexts. The manuscript already refers to current and future satellite missions and to some of the associated technical challenges; however, these links could be developed further. In particular, it would be useful to briefly discuss the potential relevance of the proposed retrieval approaches for hydrological applications and water resources management. Given the increasing occurrence of snow-scarcity and snow-drought conditions in Alpine regions, reliable information on snow mass and its temporal evolution is becoming increasingly important for assessing seasonal water availability. Connecting the methodological findings to such broader applications, while also discussing how the identified limitations may affect their transfer to satellite-scale monitoring, would strengthen the overall relevance of the paper and make its contribution more accessible beyond the remote-sensing community.