

# Response to Reviewers

Manuscript ID: **ESSD-2024-451**

*Insights into the North Hemisphere daily snowpack at high resolution from the new  
Crocus-ERA5 product*

Dear Dr. Thornton,

Thank you for forwarding the reviewer's further remarks and for managing the review process. We are grateful for the reviewer's careful re-reading.

We have carefully addressed all remaining comments, revised the text accordingly, and updated figures where needed. Our detailed, point-by-point responses to each reviewer's comments are provided below.

We would also like to thank the reviewer for their thoughtful and constructive feedback, which has helped improve the clarity and quality of the manuscript.

Sincerely,

Silvana R. Buarque,  
Bertrand Decharme,  
Alina L. Barbu,  
Laurent Franchisteguy

# Summary of Revisions

The structure of the manuscript has changed considerably during the revision process. Several paragraphs have been moved to Section 2 (Data and Methods) to improve clarity and organization. Because these modifications involved large text block relocations rather than isolated edits, a point-by-point explanation of each movement would not be informative. For this reason, we provide below a structured summary of the main revisions rather than detailed explanations of each textual change.

- **Abstract & Introduction**

- Clarified model limitations in low-vegetation areas (e.g., tundra) and potential biases.
- Rewrote part of the introduction to highlight the novelty of the Crocus-ERA5 product.
- Improved justification for using snow depth instead of SWE, with added methodological explanation.

- **Methods Section**

- Expanded description of observational datasets (uncertainties, scale mismatch).
- Clarified methodology for SCF calculations.
- Added discussion of model limitations in boreal forest.
- Enhanced description of statistical methods and evaluation criteria.

- **Figures & Data Presentation**

- Revised Figures 1 and 7 to include anomaly difference plots and adopt the water year for climatology.
- Improved clarity of Figures 2 and 4 (labels, legends, standardized anomalies, added difference panel for biases).
- Updated Figures 9: diverging color scales for biases.

- **Text Revisions**

- Revised or removed statements about boreal forest applicability.
- Expanded discussion on snow ablation (melting + sublimation).
- Clarified anomaly calculation and standardization rationale.
- Added several references throughout Introduction and Methods.

- **SCF Handling**

- Corrected description of SCF calculation: Crocus-ERA5 uses quasi-binary SCF derived from SWE.
  - Updated text to explain SCF bias computation and rationale.
  - **Statistical & Uncertainty Treatment**
    - Clarified p-value interpretation.
    - Added details on MAE calculation for standardized vs non-standardized anomalies.
    - Acknowledged uncertainties in IMS satellite data and in-situ representativeness.
  - **References & Citations**
    - Added missing references in key sections.
    - Explicitly cited NOAA Arctic Report Card 2024 and Callaghan et al. (2011).
  - **Conclusion**
    - Clarified distinction between temporal (interannual) and spatial (land cover) variability impacts.
    - Emphasized scope: Crocus-ERA5 is robust for open-field conditions, not for forested areas.
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## Total of revisions involved

- Abstract + 3 major sections revised.
- Figures: 1, 2, 4, 7, 9 updated.
- Clarifications on SCF calculation and biases.
- Improved methodological transparency and references.
- Strengthened text regarding limitations and applicability