

Re-review of “Spatiotemporal variability of snow depth across the Eurasian continent from 1966 to 2012”

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Summary: In this paper, the authors develop a snow depth climatology across the Eurasian continent using ground-based observations over 1966-2012. A total of 1814 stations from 17 countries spanning Eurasia with snow data are used to assess mean annual and maximum snow depth and their trends for each site. The northern reaches of Eurasia typically have the greatest mean annual snow depth, revealing a latitudinal dependence on the results. Trends assessed from linear regressions show significant increases in snow depth poleward of 50°N. These trends are associated more so with increased snowfall rather than rising air temperatures.

This revised paper addresses in a satisfactory manner the issues raised in my previous reviews of the article. However, there are some minor technical issues that remain to be resolved as outlined in my report. I also note that the list of co-authors and their order has changed yet again, and so the authors must explain this change of co-authorship on their paper.

General Comments:

- 1) P. 4, second paragraph: Apart from remote sensing, numerical modeling is often used to obtain accurate and spatially-complete fields of snow depth and/or snow water equivalent (SWE) (e.g., Liston and Hiemstra, 2011). Is there any reason why model simulations of snow depth and SWE are not mentioned in this paragraph, as they form another important source of cryospheric information in data sparse regions such as northern Eurasia?
- 2) P. 20, Appendix A: I appreciate the authors’ consideration of the potential effects of serial correlation on their trend analyses. However, rather than the elaborate Durbin-Watson test, did the authors look simply at the lag 1 auto-regression (AR1) to examine if serial correlation was indeed present in their time series? How would those results compare to those obtained from the Durbin-Watson test?

Specific Comments:

- 1) P. 1, line 25: Replace “are huge” with “remain large” and replace “evening” with “even”.
- 2) P. 2, line 6: Change the verb tense to the present, i.e. “provides”.
- 3) P. 3, line 12: Insert “the” before “surface”.
- 4) P. 4, line 8: Insert “the” before “NAO”.

- 5) P. 4, line 9: Revise to: “fluctuations of snowfall amounts and snow depth”.
- 6) P. 4, line 12: Change to: “however, the NAO index was...”
- 7) P. 4, line 25: Clouds do not interfere with microwave remote sensing of SWE, so this statement is misleading.
- 8) P. 4, line 26: What are “perfect algorithms”? Is there such a thing?
- 9) P. 5, line 18: Change to: “to develop a climatology and investigate the variability”
- 10) P. 6, line 16: Why the tentative language in this sentence? The air temperature measurements either have or do not have accuracy of 0.1°C. If not, then specify the exact accuracy of those measurements.
- 11) P. 6, line 26, Equation (1): Do not italicize the units of °C.
- 12) P. 8, line 6: Insert a space in “than 20”.
- 13) P. 8, line 10: Replace semi-colon by a period at the end of the sentence.
- 14) P. 10, lines 6/7: The statement starting with “were mostly...” is incomplete – please rephrase.
- 15) P. 11, line 16: Replace “increased” with “increasing”.
- 16) P. 12, lines 1-7: There’s much repetition of ideas and text in this paragraph – please review and edit carefully.
- 17) P. 13, line 23: Delete “the” before “previous”.
- 18) P. 13, line 24: Elsewhere, the Tibetan Plateau is abbreviated as “TP” but not here.
- 19) P. 13, line 24: Delete “the” before “winter” and “the” before “precipitation”.
- 20) P. 13, line 25: Delete “the” before “winter”.
- 21) P. 13, line 28: Replace “accumulated” with “accumulation”.
- 22) P. 15, line 6: Insert a comma after “0°C,”.
- 23) P. 15, line 23: Insert “a” before “different”.
- 24) P. 16, line 5: “station” should be singular. Insert “a” before “critical”.
- 25) P. 16, lines 11-14: The journal may prefer superscripts for all units, i.e. “cm yr⁻¹”.
- 26) P. 16, line 13: Replace the comma after “Russia” with a semi-colon.
- 27) P. 17, line 4: Insert “Phase 5” after “Project”.
- 28) P. 17, line 5: Here and elsewhere, the long name for the Tibetan Plateau is used again.
- 29) P. 17, lines 5-6: Delete “the” before “forested regions”.
- 30) P. 17, line 24: The sentence starting with “Spring floods” is incomplete – please rephrase.
- 31) P. 17, line 29: Change to “forests”.
- 32) P. 17, line 30: Change to “plant”.
- 33) P. 20, line 22: Replace “anomalies” with “anomaly”.
- 34) P. 20, line 24: Change to “its estimate value r:”
- 35) P. 21, line 7: Insert “at” before “approximately”.
- 36) P. 21, line 14: See previous comment about the format for units.
- 37) P. 25, line 28: Note spelling mistake in “surface”.
- 38) P. 26, lines 20-22: Please update with the appropriate volume and page numbers.
- 39) P. 29, line 6, Table A2: Insert “the” before “Dikson”.
- 40) P. 31, lines 3-5, Figure 1: Replace “triangles” with “circles”. The figure caption should explain all abbreviations used for the names of countries on the map. What does the inset map on the bottom right show? Is this inset map shown here and on Figures 2, 3, 6, and 7 needed, as no results are shown on these?

- 41) P. 36, Figure 5: The caption needs to explain why linear regressions are shown only on a few panels for this plot.
- 42) P. 42, Figure 11: The caption should specify that the results in this plot cover only Russia/former USSR.