

## ***Interactive comment on “Evidence for spring mountain snowpack retreat from a Landsat-derived snow cover climate data record” by C. J. Crawford***

**C. Crawford**

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The author appreciates Anonymous Reviewer #1's time and effort to review this manuscript. The review provided was thoughtful, helpful, and certainly improved the overall quality and clarity of the manuscript. Please find the author's responses to specific reviewer comments below including changes to the manuscript where appropriate.

Reviewer: However, the paper has some issues that must be addressed before publication. The spring SCA data reconstruction approach only used in a regional scale, could it extend to a grid scale (e.g., 0.50 x 0.50) corresponding to the CRU surface temperature and precipitation grid? It is anticipated that the author can analyze and

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discuss it.

Author Response: This is an excellent suggestion. The author chose to construct regional temperature and precipitation fields from the CRU grid in order to cover the same geographic area as the snow cover CDR. In the author's view, scaling down to a grid point level introduces a scale mismatch because the satellite data is continuously observed in time, and the instrumental climate data is discretely observed in time. More importantly, most of the instrumental climate stations in this mountainous region are located in valley settings, which may not represent the vertical temperature field well under certain environmental conditions. At this point, the author feels as though a regional temperature estimates is more justified due to the coherency in temperature over space. Precipitation is spatially variable across this mountainous region, and therefore, single grid points may not accurately reflect the domain sum, especially regional snow cover patterns. Principal components analysis was used to identify the dominant precipitation mode in time, as well as the intra-regional spatial patterns that could possibly influence snow cover patterns locally. That said, once the snow cover CDR for this region has been expanded to cover a greater geographic area, the author plans to examine grid point verses domain average results in terms of this type of analysis per reviewer comment.

Reviewer: Minor revisions: In section 2.3, the author should clearly demonstrate how many pairs of Landsat SCA-SNOTEL SWE comparisons were utilized in the study.

Author Response: Section 2.3 has been revised for clarity of information per reviewer comment.

Reviewer: In figure 6A, it might be better for spring SCA reconstruction model verification to show the scatterplots, linear fits, and correlation coefficients between Landsat SCA and reconstructed SCA using instrumental spring mean temperature.

Author Response: The verification test only includes 7 years because of the short calibration and missing years with no snow cover estimate. Scatterplots and linear

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fits through 7 data points to the author, does not portray a strong point or illustration. While more data is always desirable and would provide a better comparison between observed vs. reconstructed, the bar plot in the author's view is an accurate representation with the 7 years of data.

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Interactive comment on The Cryosphere Discuss., 7, 2089, 2013.

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