The Cryosphere Discuss., 6, C121–C124, 2012
www.the-cryosphere-discuss.net/6/C121/2012/

The Cryosphere Discussions

Interactive comment on "Statistical adaptation of ALADIN RCM outputs over the French alpine massifs – application to future climate and snow cover" *by* M. Rousselot et al.

Anonymous Referee #2

Received and published: 15 March 2012

Statistical adaptation of ALADIN RCM outputs over the French alpine massifs. Application to future climate and snow cover

This paper modeled snowpack in the French Alps under present and projected climate scenarios. The authors used a statistical approach to characterize meteorological conditions from a regional model (ALADIN) and ERA40 data. These data were then used to develop detailed meteorological conditions using the SAFRAN dataset. These conditions were used as forcings for the CROCUS snow model. The work included weather patterns (direction, location of pressure system) and shifts due to projected climate. The research does an excellent job of leveraging existing datasets to provide more

detailed climate projections than can be obtained by Global Circulation Models.

The strength of this study is the improved method of statistical downscaling using existing data resources, and contributes to the climate and cryosphere community. The methods developed by the authors are relevant. However, the snow-modeling component was underdeveloped, especially considering that it was the main objective of the study. The presentation of results was often difficult to interpret. Also there was minimal discussion regarding the importance of snowpack in the French Alps and what the impacts of a significantly reduced snowpack would include. I would recommend this research for publication, with revisions.

Overall comments –

In section 2.2 the descriptions of the models used in the study did not provide sufficient detail. A table with a brief description would suffice (ALADIN, ERA40, SAFRAN).

The CROCUS model is introduced and is a major component of the study, but there is minimal description of it in the paper.

The methods used in the statistical downscaling (section 2.2) hard to understand as presented in the methods section. However in the discussion section, the methods were described quite clearly.

The overall presentation of your work could be greatly improved with better maps and figures. Consistent graph sizes, label sizes and y-axis are much easier to interpret. Similarly the maps really do not represent the quality work that was completed.

More needs to be said about the importance of snowpack to people and ecosystems. Not sure if hydropower is a factor, but if so it should be mentioned.

Specific comments –

Page 173, line 8 -9: "Simultaneously, temperature has largely increased, at a rate often much faster than on the global scale" Provide rough estimates of both rates.

Page 174, line 18: 2km is not very fine resolution. Perhaps it should be changed to higher resolution.

Page 175, First paragraph could be restructured. Put the objective of the paragraph first, not in the middle.

Page 177, The Mahalanobis distance is an obscure value and warrants a 1-sentence explanation of what it represents.

Page 177, This page described a bulk of the methods, but it was not very clear to me. Perhaps an improved version of Fig 2 and text revisions would help.

Page 179, Excellent approach to include weather patterns!

Page 180, Were other elevations evaluated? If so which ones? If not why not?

Page 181, lines 5 -20: I had a hard time with this paragraph. It was not totally clear to me.

Page 181 and 182, You all discuss mean SWE. Is this for the watershed? What does this represent. It is unclear as no description of CROCUS was given.

Also please define the winter months.

Page 183, line 13 -15: The differences in the A1B, B1, and A2 are significant, and merits more discussion both here and in section 4.3.

Page 184, lines 15 – 16: "...despite likely more frequent anticyclonic situations." Is awkward and should be rephrased.

Page 185, Section 4.4: How much less SWE? A summary table with quantities and values would help.

Page 186, Section 4.4: No mention of shifts in timing of SWE accumulation or melt.

Page 186, Discussion section, first paragraph: A much better way to explain the downscaling! Move to the methods.

Page 187, lines 10 -15: This is a great point but is in the middle of a paragraph. Move to earlier in a paragraph.

Page 189, lines 5 – 8: This concept is important and should be developed in greater detail.

Figures:

Figure 1: This map is hard to interpret. All I can see are the grid lines. I would suggest making these much lighter. Also if you provide a hillshade underneath the elevation model it will the Alps stand out.

Figure 2: Important conceptual diagram. Perhaps provide spatial and temporal resolutions of data sets.

Figure 3: Keep the scales on the y-axis the same. All the grid lines are distracting.

Figures 4 and 5: These figures are too small and hard to interpret. Make bigger and there will be no need for insets.

Figure 6: You can use one scale bar and it would simplify things immensely. Also a sequential color scheme is cartographically correct (www.colorbrewer.org).

Figure 7: Use the same y-axis and provide the weather type reference table from fig 2.

Figure 8 -11: Much to small to read.

Figure 11 is important, make sure that this is highlighted.

Figure 12: Use a sequential color map with one legend.

Figure 13: The graphs are fine, but the error bars are too small.

Interactive comment on The Cryosphere Discuss., 6, 171, 2012.