Hydrol. Earth Syst. Sci. Discuss., 8, C607–C610, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C607/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "

Snow cover dynamics and hydrological regime of the Hunza River basin, Karakoram Range, Northern Pakistan" *by* A. A. Tahir et al.

A. A. Tahir et al.

uaf_adnan@hotmail.fr

Received and published: 23 March 2011

Dear Bodo Bookhagen, Your comments really helped us to increase the scientific quality of manuscript. We agree to take into account your comments/suggestions in the revised manuscript submission. Please find below the reply to your comments step by step.

RC: As an additional (very interesting) analysis, the authors could separate the snow-cover data into elevation slices and then compare the fit. My prediction is that low-

elevation, high-relief areas have a larger mismatch than lower slope, higher elevations.

Author reply: We will do this analysis and will add the results accordingly in the revised submission.

RC: There have been recent reports that underline the importance of snowmelt processes in this part of the Himalaya [Bookhagen and Burbank, 2010] and indicate growing cryospheric reservoirs through advancing glaciers [Scherler et al., 2010].

Author reply: We will add these references in the revised manuscript. Some references are already added as Hewitt (2003, 2007) etc.

RC: I am somewhat uncertain about performing a trend analysis on a 9-year long precipitation record (Figure 8). There are several monsoonal oscillations and large-scale atmospheric circulation systems that have longer periodicities. If the authors want to retain this analysis, it should be justified with either published, longer records or other arguments.

Author reply: We have just 9 years precipitation records of these high altitude climate stations within the basin. Monsoonal rain system does not influence the hydrological regime of Hunza River because the high mountain ranges of Karakoram resist the monsoon system to enter in the Hunza catchment. Moreover, the maximum precipitation in Hunza basin is brought by westerly circulations in winter in the form of snow as cited by other authors like Hewitt, 2005.

RC: Table 1: No need to mention ArcMap. If you mention a software package, the correct reference is ESRI ArcGIS (ArcMap is just a subset of ArcGIS). Please correct subsequent reference in tables and text, too.

Author reply: We agree and we will modify it in the revised manuscript.

RC: Table 5: This contains a lot of information, but is not easy to read. It would be really instructive to have a figure showing these correlations in graph form (chose only the most important ones). This table can be retained.

Author reply: We will try to present the asked information in a graph. Actually, we wanted to control the length of the manuscript.

RC: Figure 5: It is hard to distinguish between the colors of Ziarat and Gilgit.

Author reply: We will change the colors. We intend to present the figures in color in revised manuscript.

RC: Figure 7: In the caption, you have to list the data source for the snowcover data (MODIS). It may be instructive to add it on the Y axis. Change label Lineaire and increase size and width of line.

Author reply: We will modify the figure according to referee suggestion in revised manuscript.

RC: Figure 8: Change label Lineaire (also in all other figures, too). In the caption, briefly indicate how snowmelt or snow-water-equivalents were included in precipitation records.

Author reply: We will change the labels in all the figures. We presented the precipitation data as it is observed at the automatic climate stations of WAPDA.

RC: Figure 9: This graph contains too much information and needs to be simplified. First, add a moving average line for all years. Second, choose the max and min snowcover years and show their moving average to give a sense of the inter-annual variability.

Author reply: We will try to add the suggested analysis on the same figure in revised manuscript.

RC: Figure 11: Show uncertainties for fit. Is this a weighted fit line? It is likely that large snow cover difference has a larger impact on discharges, because larger snowcover may also results in higher snowdepths (at least in low-slope areas).

Author reply: It is a linear fit. We will try to show the uncertainties.

RC: Figure 12: Again, what is the uncertainty of the Runoff trend? There appears to be a decreasing trend, but how certain can you be? Change label rain to precipitation, as I assume you is merging rainfall and snowfall, right?

Author reply: We will add the uncertainty for this trend. It is rainfall data observed at Gilgit situated outside the Hunza basin at lower valley elevation and was used by many authors to relate it with Hunza discharge. Actually We used here Gilgit rainfall record because the climate data within the Hunza basin is not available for the period before 1999.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2821, 2011.