

**In order to reply to the second anonymous referee, we scrupulously annotated the supplement that he uploaded. The referee contribution is in black color and the author replies in red color.**

**However, we want sincerely thank the referee for his very constructive comments, that will help us to improve the scientific content of the final version of our paper.**

This paper attempts to analyze the hydrological situation in six basins in the Pamir Alay mountain range in Central Asia. The analysis is based on a long-term dataset between 1940 and 2000 and a short-term one covering the 2-year period between May-2000 and May-2002. The hydroclimatological parameters that were considered in this study include surface temperature, precipitation, snow cover, glacier extent and river discharge. The paper confirms the IPCC's fourth assessment report in that this region is a sensitive one and that temperatures are increasing in this mountainous area. It reports some differences in the snow dynamics between the basins, and claims that snow cover dynamics and increasing temperatures play the major part in the changes in the river flow regimes.

The subject of the paper is important and suitable for the publication in the HESSD journal, however, the way it is presented is quite confusing. There are many inconsistencies throughout the paper regarding the subject, objectives, data length and quality and the analyses. Take, for instance, the subject/objective of the paper. The title of the paper is "Trends for snow cover and river flows in the Pamirs (Central Asia)"; the subject of the paper is expressed as "to analyze the hydrological situation in six benchmark basins" in the abstract; the aim of paper is given as "to analyze the trends of the snow cover extent and of the river flow regimes" in the introduction part; the subject is stated as "to analyze the current hydrological situation and to reply to the objective of the research, six benchmark basins were chosen in the Pamir Alay range" in section 3.2 entitled "Hydroclimatology"; and finally, the topic of the paper is referred as to study "the state of the cryosphere in the Pamir Alay mountain range" in the conclusion section. These highly inconsistent statements are reflected to the outline of the paper as well. The paper starts with an analysis of a relatively long period, and suddenly, switches to an analysis of a comparatively very short period, and then, back again to the long period of interest. The results associated with the latter, which are based on the figures 10 and 11, are only given in Discussion section. The lengths of the data are different, and they have so many gaps, but they are treated as are in the analyses. Some analyses include all basins, some others include a few of them. All these inconsistencies make it hard to justify the results and conclusions of this study. I think that the results and conclusions are not robust enough as argued in the Conclusion section; I think they are not adequately justified by the data.

I suggest the paper should address the following related questions clearly: What is the "punch line" of this study? What are you really trying to show us by this study? And, what is new in this study?

I would also suggest you to describe the methodology thoroughly. I understand that the data are scarce for this region, but please do not go beyond (in your conclusions) what the available data could really justify.

Regarding the inclusion of the analyses of long term vs short term data, I think you should give one of them more weight in the paper and treat the other as minor contribution. The similar weights as in the present version of the paper are counterproductive, in my opinion.

**Author reply concerning the general comment of the second referee:** Many thanks to the referee for these frank comments. As he underlined, the job on this topic was very complex, constrained by the requests of the FP6 European project on the one hand and by the sparse available information on the other hand. It led to a paper where the uncertainties are still important and the questions without replies remain numerous. We agree that, considering these points, the presentation could appear a little confuse in some parts of the text. However, this region is an irreplaceable source of water for the emblematic Aral See basin and the population of its countries and the poor number of scientific results and analysis do not must hide their huge importance.

As a consequence, we will scrupulously take into consideration the remarks of the referee and explain more clearly that the paper is really focused on the river flow regime and their future. The title of the paper will be modified in this sense.

Regarding the mixture between the long term and the short term approaches, they are already shared in the section 4 "results" (4.2 for the short term, and 4.3 for the long term), but it is not sufficiently explicit. In the section 5 "Discussion", they must be more clearly exposed and we will present them in two different subsections.

Considering the other comments, some of them are analyzed in the below detailed points. Others were considered in our reply to the first referee. May-we invite the second referee to consult them?

Some other points:

1. The title does not properly reflect the content of the paper.

**Author reply:** We agree. The title will be replaced by "Snow cover and river flow regime in the Pamirs (Central Asia)".

2. Page 31, Line 5: "In this region, the cryosphere, glaciers, and snow cover significantly..." Isn't "cryosphere" a general word including the glaciers and snow cover?

**Author reply:** Yes, "cryosphere" means "snow and ice". The name of the corresponding section of the International Union of Geodesy and Geophysics is "International Association of Cryospheric Sciences". However, we understand that the sentence is not completely clear and we will modify it.

3. Page 31, Line 18: "Finally the expected changes in the flow river regime..." What do you mean by "the expected" in this sentence? Also, "flow river regime" should be "river flow regime".

**Author reply:** Ups! We will swap the words "river" and "flow". The word expected is remaining from a cut/paste operation not correctly achieved. Thanks for the comment!

4. Page 31, Line 21: "4rd" should be "4th".

**Author reply:** Re-Ups! Another inadvertently in the rereading process! Of course it will be corrected.

5. Page 33, Lines 20-: Most of the precipitation stations are outside of the basins of interest. Few of them are located in these basins. Given the fact that the region is mountainous, do they give us adequate and reliable information about the spatial

distribution of precipitation in these basins (not the outside)?

**Author reply:** That is right! Moreover, the monitoring of the precipitations in the mountains is widely perturbed by the amount of solid precipitation, which is generally highly underestimated. A sentence will be added. See also the reply to the referee #1.

6. Page 35, Line 13: What does METI stand for?

**Author reply:** That is the official requested formulation for quoting these data. METI means "Ministry of Economy, Trade and Industry" of Japan. We will find a manner to express that more clearly in the final version of the paper.

7. Page 36, Line 6: The example should be given before the preceding sentence?

**Author reply:** That is right! We will swap both sentences.

8. Page 36, Line 17: Since you have daily discharge data, why don't you study whether there are temporal changes in the timings of the peak flows, which may be an indication of climate change in this region?

**Author reply:** It is an excellent suggestion. We will examine it and add a paragraph commenting this point, if it appears significant.

9. Page 37, Line 20: It is not clear how you took average of the data since their lengths are different. It is also not clear how you calculated the trend line and the gradients.

**Author reply:** That is right. The analysis is too brief and partly not consistent. This section will be completely re-written and the Fig. 6 modified. A new approach using a reconstructed continuous data series will be developed. A trend analysis will be added using the Mann-Kendall criterion. We already made the computation and it confirms more rigorously our statement.

10. Page 38, Line 11: "...Kudara basin (2000)..." Is "2000" indicating the year?

**Author reply:** That is right! However, we will add also the value for 2001, which is showed in the Fig. 7.

11. Page 38, Lines 13-15: If that is not entirely true, then what might be the problem? Could it be resolution? And also, Figure 8 indicates that Obighingou behaves differently from Kudara Basin!

**Author reply:** The referee #1 underlined also this point and we made the following reply. "It is impossible to assess the concerned volumes and to verify if they are negligible or not. The main consequence or the avalanche is the accumulation of snow in the valley bottom at the lowest altitude, with a high density and a high thickness, with delay considerably the melting process, resulting in the observation that we made in late July 2007. We will explain better this point."

12. Page 38, Line 26: "(same as the left side of..." It should be right side.

**Author reply:** That is correct! We made also a right/left confusion p41, line 10. Both will be rectified.

13. Page 39, Lines 3-21: What is the source of precipitation amounts? Figure 2 does not give that much detail.

**Author reply:** We used the NSIDC-NOAA data base, quoted in the caption of the Figure 2. However, we will add the reference also in the text.

14. Page 40, Lines 2-4: Why did you use precipitable water data from NCEP/NCAR? It should have precipitation rate data. Have you checked other datasets including CRU?

**Author reply:** During the FP6 funded project, we only use the NCEP-NCAR reanalysis data, essentially for an issue of limited time. The CRU data were not used because of their monthly time step. However, we worked more recently with the Aphrodite precipitation grids, available daily over the Asian continent with a lower resolution (25 km). Unfortunately, this new source of data presents also many inconvenient, but it could be better than the NCEP-NCAR values. We will verify this last point and modify the paper if it improves it.

15. Page 41, Line 23: "Except on the Kyzylsu basin,..." Does this mean that you didn't take Kyzylsu into account while calculating the regression line? What happens if you take out the MUK data? Also, no information for the line is given in the caption.

**Author reply:** We agree that the explanations concerning the Fig. 10 are too short and must be more developed, including the differentiation between the basins. A careful attention to this point will be given in the final version of the paper.

16. Page 42, Lines 5-12: There are too many missing data periods in these series. How did you calculate the trend lines? They seem to cover the missing data periods.

**Author reply:** We agree that the trend analysis is too concise. A Mann-Kendall statistical approach will be included taking into account the lacks of data in the time series (see the reply to the referee #1). The Fig. 11 will be completed or replaced by a table, including the values of the test criteria and their significance.

17. Page 42, Lines 24-25: How do we know that the precipitation regime in volume remains almost stable?

**Author reply:** That is right! This point is not sufficiently explained. Explanations and trend tests will be added probably in the "results" section.

18. Page 42, Line 25: How can you make such an assumption?

**Author reply:** It is correct. The referee #1 made the same comment. This sentence is not convenient at this place of the text. We will remove it entirely.

19. Page 43, Line 17: What do you mean by "naturalist" approach? And, why do you chose this approach?

**Author reply:** We mean that the lack of data in this region, which cannot be solved, led us to consider simultaneously several sources of information, with several levels of accuracy. It is obviously the origin of the confusions that you underlined in your general introduction. A sentence will be added to clarify this point.