

## ***Interactive comment on “Climatic and extreme weather variations over Mountainous Jammu and Kashmir, India: Physical explanations based on observations and modelling” by Sumira N. Zaz et al.***

**Sumira N. Zaz et al.**

tkram@narl.gov.in

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Responses to the reviewer (Dr. H. Varikoden, hamza@tropmet.res.in) comments (interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-201>, 2018) of our manuscript (manuscript # acp-2018-201) titled “Climatic and extreme weather variations over Mountainous Jammu and Kashmir, India: Physical explanations based on observations and modelling” by Sumira Nazir Zaz, Romshoo Shakil Ahmad, Ramkumar Thokuluwa Krishnamoorthy, and YesuBabu Viswanadhapalli submitted for possible publication in the journal, Atmospheric Chemistry and Physics,

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an open access European Geophysical Union publication.

General response:

We express our sincere thanks to the reviewer for his invaluable comments on our manuscript, which helps us to improve the quality of it immensely. Below we have provided our one to one responses to his all queries and we hope that the reviewer will be convinced of our responses and make positive recommendations to this revised manuscript, written by taking into account of his as well as the other reviewer's short comment (Prof. Reyaz Dar), for its possible publication in the journal, Atmospheric Chemistry and Physics, an open access European Geophysical Union publication. We have also enclosed the revised manuscript with changes tracked version. Our responses following each of the comments are marked as bold faceted words.

One to one response to the reviewer comments: 1. First, I am not in favour of the current title of the manuscript because the variations of extreme weather events are not addressed properly.

Now the title is modified as Climate and the September 2014 flood event over Mountainous Jammu and Kashmir, India: Physical explanations based on observations and modelling

2. Throughout the manuscript, the authors highlight the data period of 37 years from 1980 to 2016. However, in the analysis they incorporated only from 1980 to 2010 (31 years). I suggest updating the figures and tables with updated results (1980-2016) and thus, the significance levels too. The WRF simulations are also to be updated accordingly. The NAO index is also available to date for your analyses.

In the revised manuscript, all the results (including WRF simulations and NAO index data), figures and tables have been updated to 36 years up to 2016 and we have not found any significant changes in trends.

3. Figure 1 can be updated with an inset figure of Jammu and Kashmir to properly

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identify the study region

Figure 1 has been updated. 4. The geographical settings can be summarized in a table and delete the corresponding explanations. The table should include station name, coordinates, amsl, and remarks about the stations. Corrections as suggested by the reviewer have been incorporated. 5. How the seasons are defined? The cited article did not mention anything about the seasons. Please do the classification of seasons promptly with the standard classification followed by India meteorological department or by any other classical monographs. In addition, the authors classified winter as Dec-Feb. However, in many places they considered the winter from Dec to March. This discrepancy must be corrected throughout the article. Remember, if you select the seasons differently, your interpretations and conclusions will also be affected. The reviewer can get clarified that with respect to NAO (Fig. 4) only it is considered December-March as winter months and in all other parts of the manuscript, December-February is considered as winter season as per the IMD definition. This is because, for the NAO index, normally December-March is considered as northern winter and we adopted the same definition here (Archer and Fowler, 2004; Iqbal and Kashif, 2013). Since the result of linkage between winter NAO index and Kashmir precipitation does not affect other results of this manuscript, we don't need to do any corrections for other places. This explanation is provided in the revised manuscript while discussing the Fig. 4 as well as in the section 2.

6. The temporal resolution of ERA-I is missing. The temporal resolution of ERA-I is monthly averaged, which is now mentioned in the revised manuscript.

7. The unit of pressure may be replaced with hPa instead of mb mb is now replaced by hPa.

8. The coordinates of second domain with 9 km resolution is not mentioned. Please update.

It is now updated.

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The dimensions of the WRF model domains are listed below

Domain -1 (18-km ) extends from Longitude from 24.8516 E to 115.148E and Latitudes from 22.1127S to 46.7629 N

Domain -2 (6-km ) extends from Longitude from 56.3838E to 98.5722E and Latitude from 3.86047 S to 38.2874 N

9. Tables 1 and 2 are not necessary, as the same information can be found in Tables 4 and 5. This suggestion is well taken and has been incorporated 10. Table 3 can be rearranged in ascending order of elevation and one more column with changes in rainfall can also be added. The table is arranged in descending order to show stations with higher increase in temperature. One more column of topography has been incorporated.

11. I suggest to overly the values of changes at the respective station positions in Figures 2 and 3. The significance levels may be given in the form of a superscript star (or any other appropriate symbol) and can be indicated in the figure captions. We are sorry that it is difficult now to do and we will surely attempt to do as suggested by the reviewer during the final phase of publication if it is recommended for.

12. In many places, the authors quantified the changes by providing "less than" symbols. It is better to give exact values of the changes and discuss. Exact values at corresponding confidence levels are already provided in closed brackets. The reviewer may kindly look for it in the manuscript. The following italicised sentences are there already in the starting portion of the section 4.

"S in S=99%" indicates statistically significant. It is to be noted that hereafter it will not be mentioned explicitly about the period 1980-2016 and the statistical significance of derived values. All the results are subjected to statistical tests with confidence level of statistical significance at S=99% unless otherwise mentioned explicitly. Further, values denoting "less than" refer to S=99% and the confidence levels corresponding to given

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values are provided within closed brackets.

13. First statement in section 4.3 can be rephrased to avoid confusion. The statement has been now rephrased

14. Figure 4e and f show a prediction line and are in good agreement with the observed line too. Please give the corresponding regression equation for the predicted line of temperature and rainfall. The following algorithm from Microsoft Excel defines the forecast method applied here and this is now included in the revised manuscript. The forecast algorithm calculates or predicts a future value by using existing values. The predicted value is a y-value for a given x-value. The known values are existing x-values and y-values, and the new value is predicted by using linear regression.

The syntax is as follows

FORECAST(x, known\_y's, known\_x's)

X is the data point for which we want to predict a value. Known\_y's is the dependent array or range of data. Known\_x's is the independent array or range of data. The equation for FORECAST is  $a+bx$ , where: and where x and y are the sample means AVERAGE(known\_x's) and AVERAGE(known y's Figure 4 labelling is also not correct. It is now corrected

15. You already discussed the skills of WRF temperature simulations in Figure 5 (please provide the station names in individual panels). The reference simulations of WRF model is for the Kokarnag station which is now mentioned in the revised manuscript.

16. In addition, the precipitation simulations can also be compared with observation to assess the performance of WRF, to complete the study. It is now compared the WRF precipitation data also (Fig. 6 now) and the results are discussed. 17. The change point of temperature and rainfall is given as 1995. What is the criterion for this turning point selection? This has to be stated and substantiated with valid reasons. The

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turning point in temperature and precipitation as already mentioned in the manuscript is calculated using the Cumulative Deviation (parametric test for step jump in mean), however to validate the results distribution-Free CUSUM (non-parametric test for step jump in mean) has also been used in this study. We followed this reference in this regard.

Ahmad Reza Ghasemi, Changes and trends in maximum, minimum and mean temperature series in Iran, DOI: 10.1002/asl2.569 , Atmos. Sci. Let. 16: 366–372 (2015).

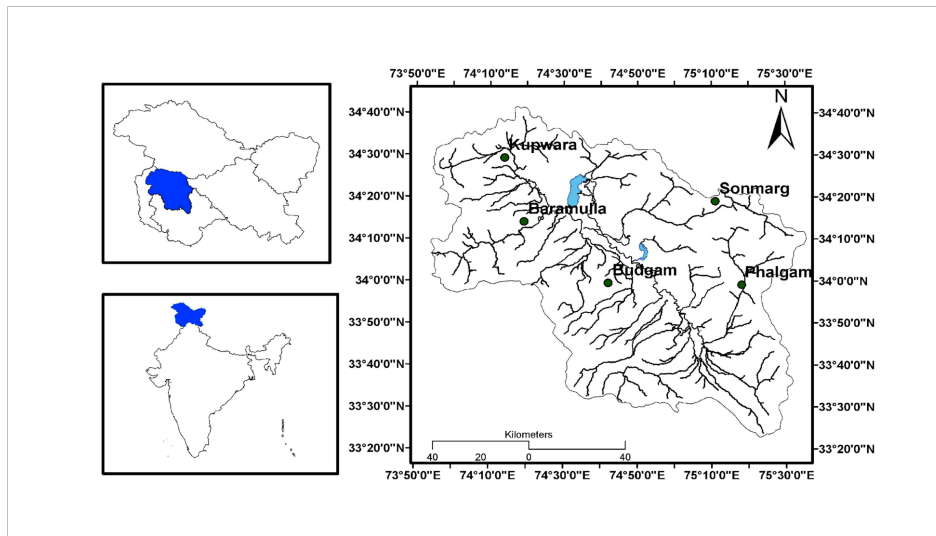
Please also note the supplement to this comment:

<https://www.atmos-chem-phys-discuss.net/acp-2018-201/acp-2018-201-AC2-supplement.pdf>

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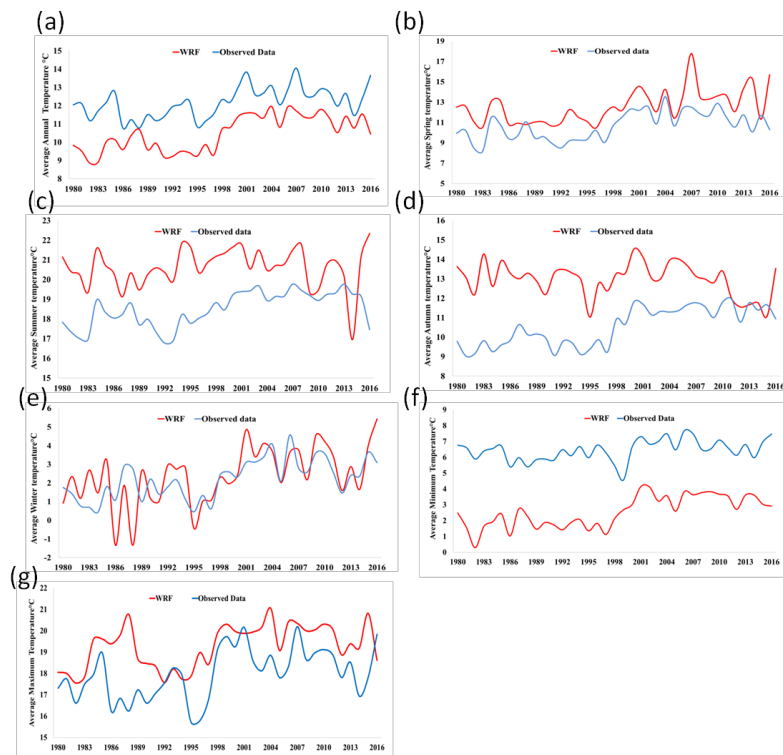
Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-201>, 2018.

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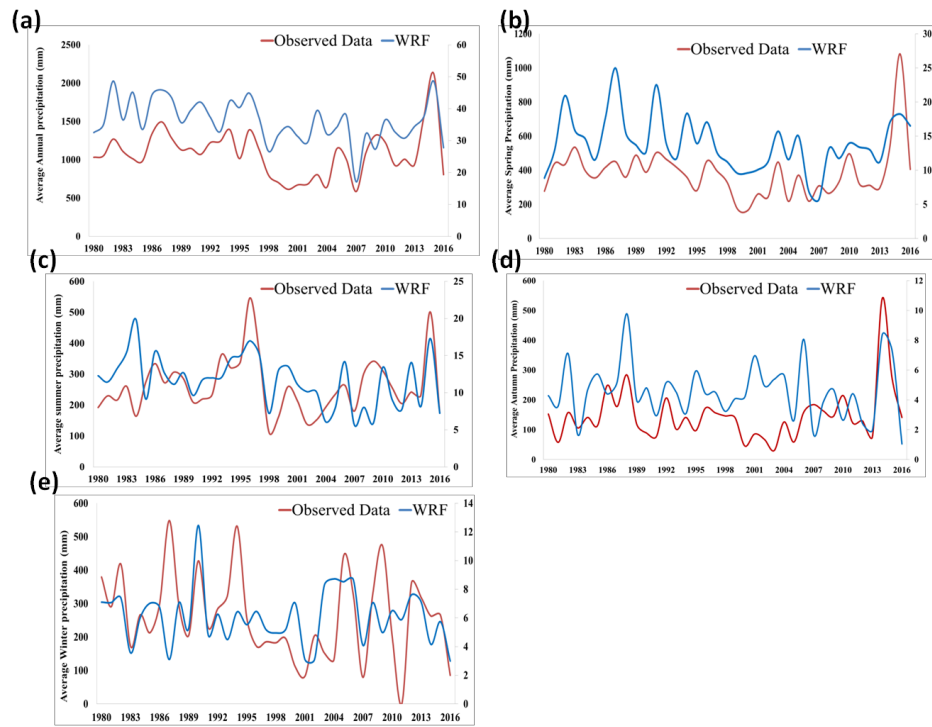
**Fig. 1.** Fig. 1. Geographical setting and topographic map (elevation in meter is above mean sea level) of the Kashmir Valley along with marked locations of six meteorological observation stations: Srinagar, Gul

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**Fig. 2.** Fig. 5. (a). Comparison between observed and WRF model (location of Kokarnag is considered) simulated annually averaged temperature (averaged for all the stations) variations for the years 1980-2016,

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**Fig. 3.** Fig. 6. Same as Fig. 5 but for precipitation. Here the minimum and maximum precipitation are not considered because it cannot be defined them properly in a day.