Compliance of comments of the reviewers

The authors thank the reviewers for their thoughtful comments. These have been incorporated in the manuscript as follows. The point wise replies of the comments of the Reviewer#3 are given below.

Comment	Response of the authors
Anonymous Referee #3, Received and published: 26 April 2017 **General Comments**	
1. Although the paper addresses issues of importance regarding the need for hydrological studies in the NW Himalaya, the paper in itself does not address any relevant scientific questions. 2. As a result, the paper lacks novelty and simply appears as a hydrological modeling exercise for this region. 3. Most of the paper also focuses on the model details and parameterization rather than any scientific question. 4. The paper also lacks references to major studies conducted in the Himalayan region that have advanced our understanding of the hydro-climatology of the region. 5. I suggest the authors to go back and formulate specific scientific questions they want to address regarding the high-altitude hydrology in the NW Himalaya. As it stands, the paper needs a complete revision and would suggest the authors to perhaps resubmit as a new submission.	In the present study, hydrologic modeling for the Upper Ganga catchment located in Himalayas has been carried out. This basin is snow and rain fed and has varied topography. We had limited spatial and hydrologic data and due to this, satisfactorily modeling the entire hydrograph was quite difficult and was not a trivial task. We have purposefully dealt with parameterization in great details since hydrologists have to frequently grapple with such problems and our experience might be useful to the hydrologic community. While modeling the Ganga catchment, we have attempted to answer several scientific questions, e.g., contribution of snow and glacier melt to river flow at the outlet of the study area, and impact of climate change on catchment response, which has been studied through a few plausible climate change scenarios. A sensitivity analysis of model parameters was carried out. Precipitation data from India Meteorological Department and Aphrodite have been used in modeling and the results have been compared. As suggested by the reviewers, impact of climate change on runoff has been studied and results will be included in revised paper. Specifically, the impact on stream flow dueto change in temperature and rainfall have been studied. To the best of our knowledge, this paper will be the first published work on modeling of the Upper Ganga catchment. We hope that it will encourage more modeling studies

	for the Himalayan catchments whose results will be of immense value.
Specific comments	
1. The title of the paper is too generic.	We propose to modify the title to: Hydrologic modeling of a rain- and snow-fed Himalayan catchment in changing climate.
2. The first paragraph in the introduction section is lacking any citation or reference.	A few references have been added in the introduction part and it has been further edited.
3. Line 116. At the same time, there has been a number of studies that have used spatially distributed hydrological models in the context of Himalayan regions to simulate streamflow (Immerzeel et al., 2013; Lutz of al, 2013). Lutz, Al., Immerzeel, W.W., Shrestha, A.B. and Bierkens. M.F.P., 2014. Consistent increase in High Asia's runoff due to increasing glacier melt and preeipitation.Nature Climate Changc,A54(7). pp.587-592 Immerzeel, W.W., Pellicciotti, F. and Biorkens, M.F.P., 2013. Rising river flows throughout the twenty-first century in two Himalayan glacierized watersheds. Nature geoscience, Aa6(9), pp.742-745.	The suggested references have been reviewed and their key findings have been included in the paper. Please see our response to suggestions of reviewer #2 on similar suggestion.
4. Line 255. APHRODITE tends to underestimate high-altitude precipitation. It might be important to use station data where appropriate and valid. Underestimation of monsoon in Figures 9 and 10 are probably as a result of using APHRODITE data.	In the revised paper, IMD data have been used along with the APHRODITE data and the results have been compared. Some authors have carried out studies to find which data best represents precipitation in mountains. We agree that it is best to use the station data provided the network has adequate number of stations and these are located in valleys as well as ridges. It is difficult to conclusively say that underestimation is due to use of APHRODITE data. Figure 11 shows that the spatial variability of precipitation input is not adequately captured by the data used in this study.

5. A majority of the results and discussion is spent on calibration/validation and model parameterization and performance. Only the last paragraph discusses some of the model outcome which I find the most interesting part of the entire study. Further discussion detailing these results would shed more light on perhaps the more interesting scientific questions of this study.	The impact of climate change on stream flow have been studied and incorporated in the revision. Calibration and validation of the models has been discussed in detail because the modeling results and subsequent inference critically depend upon how carefully the model has been calibrated. As stated earlier, we have purposefully dealt with parameterization in great details since the hydrologists have to frequently grapple with such problems.
6. I am not certain if Figures 2-4 are completely necessary by themselves are necessary. These can be combined into one figures.	The figures have been combined into a single figure.
Figure 9 compares the average monthly simulated and observed streamflow. Why not plot the observed and simulated monthly streamflow for both the calibration and validation period?	This could be done.