**Final response : Factors controlling Slope Environmental Lapse Rate (SELR) of temperature in the monsoon and cold-arid glacio-hydrological regimes of the Himalaya by Thayyen and Dimri**

**Thayyen and Dimri**

We thank the reviewer for his/her comments. The comments are marked 'C' and followed by our response.

C: In their paper, Thayyen and Dimri present an interesting analysis of the changes in surface air temperature with elevation in a high mountain environment. They correctly point out that this has important implications for hydrologic and glaciological modeling. This is an important topic; however, the current paper does not go into enough detail on the observational methods used. In particular, difficulties in measuring precipitation, and local spatial variations in temperature, or microclimates, pose particular problems. The latter is most concerning, as it has direct impacts on the results of the paper.

Response: The methodology section will be strengthened by providing more detailed information of station characteristics and instrument details. Section 4.2 on precipitation variations will be replaced by discussion on specific humidity variations as suggested by other reviewers as well. Data presented shows the overwhelming impact of meso - scale weather systems and associated orographic uplift on temperature distribution along the mountain slopes rather than micro-climatic influence. Comparable winter SELR of cold-arid and monsoon systems under extremely different topography and surface conditions underline this aspect. The regional response of monsoon lowering as presented by Kettle et al. 2013 clearly suggests that the process described in the paper have a regional validity. Existence of 227 small glaciers in the Ladakh and Zanskar ranges is testimony to the steep lapse rate prevailing over a large area owing to summer aridity leading to cooler mountain tops.

C: The SELR values >9.8K/km suggest local surface heating, cold air pooling, or other effects influencing one or more of their measurements. This means that the SELR values they derive are unlikely to be regionally relevant, and thus any analysis based off of these results is problematic. While only one station is particularly affected by this, the authors need to provide a measure of how well all of their measurements represent the surrounding regional air temperature.

Response: Ladakh is a unique land mass with large expands of barren mountains. Vegetation is constrained only along the foothill region along the stream. We believe this conditions leads to regional surface heating (Not local surface heating) and it is a characteristics of regional climate and glacio-hydrological regimes as mentioned in the above response.

C: In addition, the paper is lacking a bit in its review of the relevant literature and theoretical description of the effects that influence temperatures both at their measurement sites, and on important cryospheric locations such as permanent snow fields and glaciers. Because their measurement sites may not be representative of the sites of hydrologic interest, this topic needs more discussion. Finally, if the authors can contact a native english speaker to review their paper for grammatical corrections, that would be a great help.

Response: Please note that we have given all necessary equations governing the lapse rates. More discussion and references are added in the introduction to cover previous modelling attempts. The data presented in the paper is collected as part of a glaciology programme and the measurement strategy and location is determined with great care. Hence, the new insights presented in the paper is highly relevant to understand and model hydrology and glaciers of higher Himalaya. Please note that the previous studies also suggested that the near surface temperature lapse rate is not influenced by the ground conditions significantly (Kirchener et al., 2013). Present study also support that observation. Consistency in the SELR response year after year in the both regimes under different ground conditions underline this fact.