Response to Reviewer 3

We would like to thank the anonymous referee for reviewing our paper. These constructive comments are very important for improving the present version manuscript. In the following, we address all comments point-by-point according to the comments. All revisions are highlighted in the context.

This is an interesting piece of research that are focusing on downscaling temperature data for one mountainous region in China. The study is clearly written and the data/method is solid. I recommend a “minor revision” for this paper. Below is my comments and questions.

1. Needs a short introduction of the mechanism of the method mentioned in line 31, page 2.

-Answer: Thanks a lot for the comment. We agree that the method should be presented in more detail. We added more information in this part and also on the correction method in the section 3.3. An example on the internal lapse rate scheme was presented (**P6 L2-11**).

2. The labels for stations in figure 1 are not very clear, please use another color.

-Answer: Thanks a lot for pointing this out. We made the station mark and the labels to yellow color in Figure 1. It is clearer than the old one.

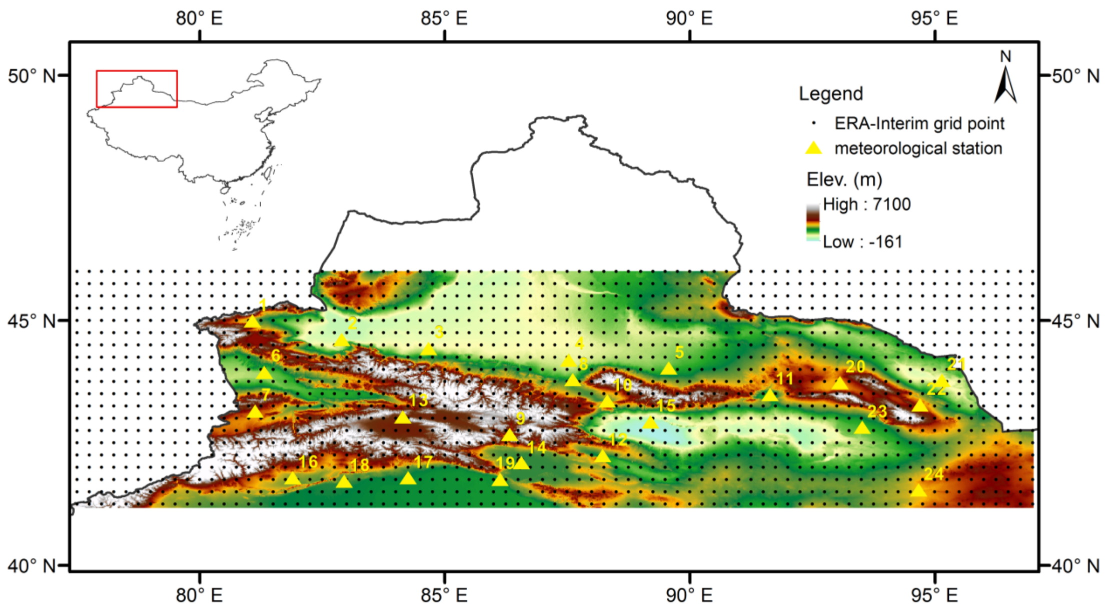

Figure 1: Location of the 24 meteorological stations (triangle) and ERA-Interim 0.25°×0.25° grid points (dot). The elevation ranges from -161 m to 7100 m a.s.l., with a DEM resolution of 1km.

3. In figure 2 and 4, why Nos.10, 24, 9 and 15 stations are chosen for comparison? Are they the most representative ones?

-Answer: Thanks a lot for the comments. Yes, in order to save the space of the paper, we selected four representative stations for examples. These stations represent different sub-climate regimes and topography situations in the north slope of the CTM, south slope of the CTM, eastern CTM and western CTM.

4. Although the author mentioned that the temporal resolution of the new dataset is 6 hours, non of the analysis is focused on the temporal variations of the temperature. Needs at least some analysis to address the temporal accuracy of the new dataset.

-Answer: Thanks a lot for the comments. The reviewer raises a very important issue. We added the analysis on the temporal variability of lapse rate in section 4.2 (**P8 L29-31, P9 L1-20**). We also compared the warming trends of observation against the original ERA-Interim and the correction temperatures over 24 sites in 1979-2013 in section 4.3. Furthermore, we added more analysis on the maximum temperature (Tmax), minimum temperature (Tmin) and diurnal temperature range (DTR) in section 4.5 (**P12, P13 L1-18**). These analyses address the temporal accuracy of the new dataset and also illustrate the limitations to potential users.

5. Page 9, line 23, delete "there are".

-Answer: Thanks a lot for pointing this out. We revised it.

6. How the comparison error statistics are sensitive to the "downscaling resolution" you have chosen? Why the final product is set to 1 km grids?

-Answer: Thanks a lot for the comments. We selected the most common used statistics for error comparison. We compared the RMSEs of original and corrected ERA-Interim temperature using surrounding 9 grids as well as directly using station elevations. The RMSE differences between two approaches are small for all most of the sites (averaged RMSE only 0.05 °C). Only two stations (Nos. 20 and 24) show large differences. It is possible relate to the large elevation differences among 9 DEM grids. But the comparison illustrate the statistics are not sensitive to downscaling resolution in general.

Table 1 RMSE of original and downscaled ERA-Interim temperature using 9 grids as well as directly with station elevations.

ID	original ERA-Interim	corrected based on 9 DEM grids	corrected directly based on station elevations
1	3.61	3.07	2.99
2	3.89	4.32	4.27
3	3.47	2.95	2.94
4	4.23	4.75	4.83
5	2.81	3.01	2.91
6	3.86	2.25	2.27
7	2.58	2.32	2.25
8	4.57	2.61	2.53

9	7.76	4.47	3.30
10	2.35	1.83	1.83
11	3.68	2.82	2.25
12	3.33	2.32	2.32
13	6.65	7.80	7.81
14	3.39	2.27	2.28
15	7.69	3.45	3.45
16	2.61	3.14	3.10
17	2.53	1.53	1.54
18	3.17	1.63	1.66
19	3.39	1.78	1.81
20	3.19	2.32	3.98
21	4.19	2.02	1.99
22	2.49	2.03	1.95
23	2.56	2.00	2.08
24	2.05	1.60	3.16
Average	3.75	2.85	2.90

7. Have you considered the diurnal changes of the situation in mountainous areas. Since the data you have corrected is at 6 hour resolution. In mountainous area, you may expect temperature inversions during night time.

-Answer: Thanks a lot for the comments. It is a very important issue. Other reviewers also mentioned this topic. We added more analysis on the maximum temperature (Tmax), minimum temperature (Tmin) and diurnal temperature range (DTR) in section 4.5 (**P12, P13 L1-18**). The DTR trend also is explored based on the validation sites.

Figure 2 demonstrates the temporal variations of DTR over the 24 sites in 1979-2013. The original ERA-Interim has a more than 3 °C DTR bias compared to observations. The corrections reduce the DTR bias insignificant. The original ERA-Interim and corrections did not capture the significant decreasing trend of DTR. Table 2 shows the specific values on the trends for seasonal DTR over the 24 sites in 1979-2013. The decreasing trends are observed for annual and four seasonal DTR. Winter has the largest decreasing rate with the value of -0.384 °C 10a^{-1}. Spring has the insignificant decreasing trend (-0.001 °C 10a^{-1}). The original ERA-Interim and corrections capture the decreasing trends for summer and winter with smaller rates. However, they capture the opposite trends for spring and autumn, especially for spring (Table 2).

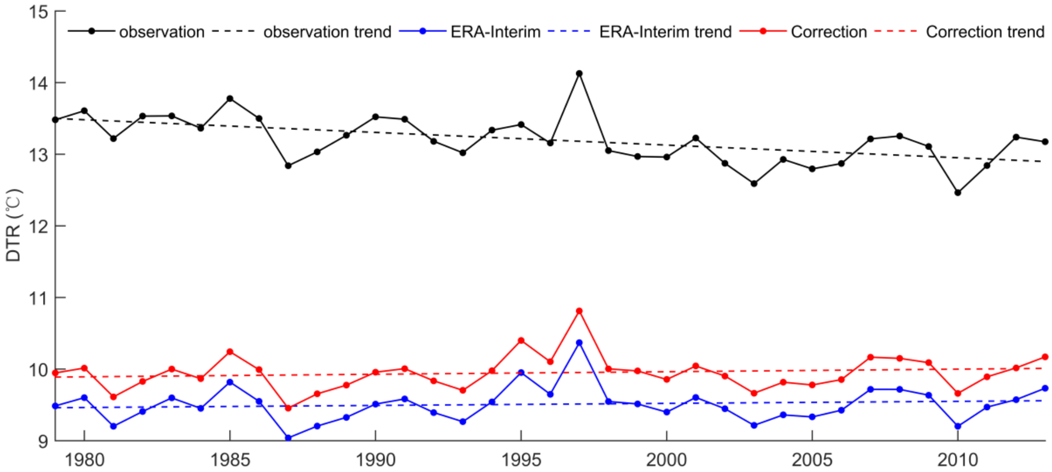

Figure 2 Temporal variations of DTR from observation, original ERA-Interim and correction temperatures over the 24 sites in 1979-2013.

Table 2 Trends (°C 10a^{-1}) of annual and seasonal DTR over the 24 sites in 1979-2013.

	Annual	Spring	Summer	Autumn	Winter
observation	-0.177	-0.001	-0.181	-0.132	-0.384
ERA-Interim	0.029	0.262	-0.052	0.069	-0.178
Correction	0.036	0.274	-0.044	0.068	-0.168