

*Supplementary material*

**Effects of spatial resolution on WRF v3.8.1 simulated meteorology over the central Himalaya**

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**Evaluation metrics:** The following statistical metrics are used to evaluate the WRF model performance.

**Mean Bias (MB)**

$$\mathbf{MB} = \frac{1}{N} \sum_{i=1}^N (P_i - O_i)$$

**RMSE (Root mean square error)**

$$\mathbf{RMSE} = \sqrt{\frac{\sum_{i=1}^N (P_i - O_i)^2}{N}}$$

**Correlation coefficient (r)**

$$\mathbf{r} = \frac{1}{N-1} \sum_{i=1}^N \frac{(P_i - \bar{P})(O_i - \bar{O})}{\sigma_P \sigma_O}$$

Where:

$N$  = The total number of the total pairs of observations and model simulated values

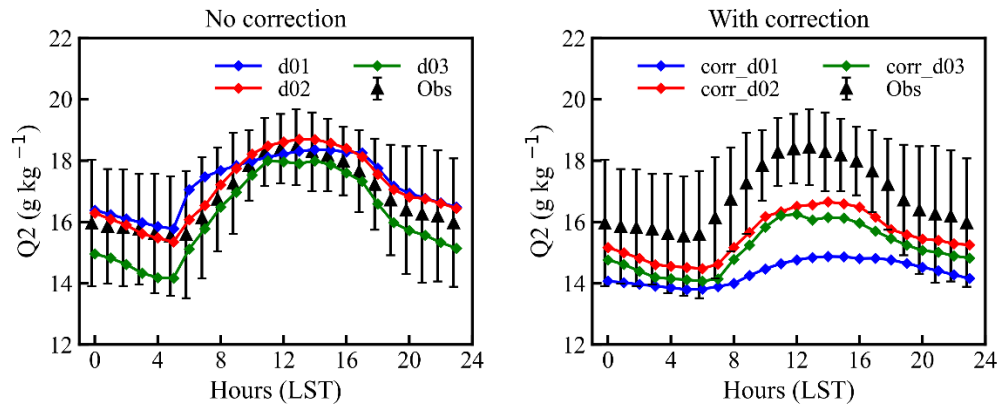
$P$  = The model values

$O$  = The observations

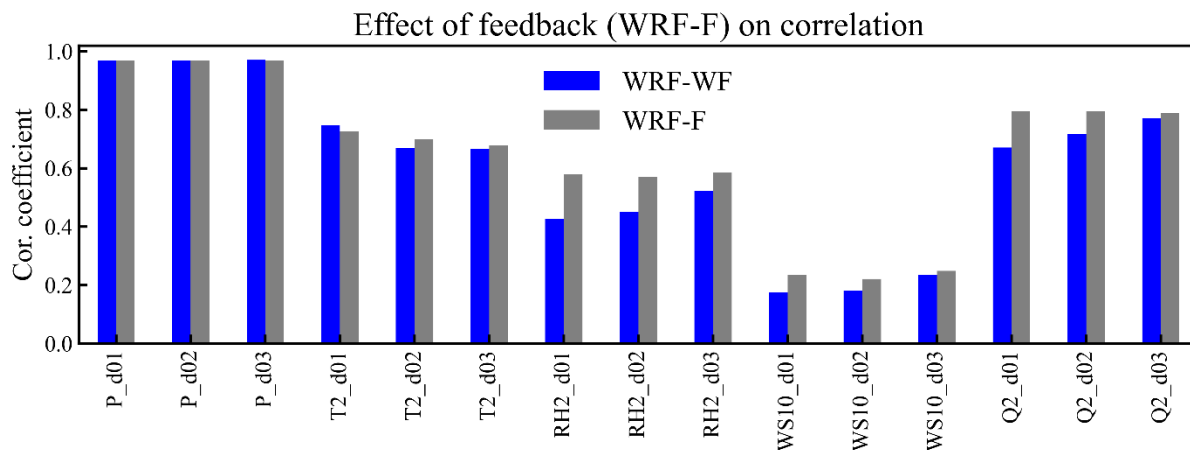
$\sigma_P$  and  $\sigma_O$  are the standard deviation of the and observations.

**Table S1.** The summary of the statistical metrics MB, RMSE and correlation coefficient (r) for different meteorological parameters, surface pressure (P), 2m temperature (T2), 2m relative humidity (RH2), 10m wind speed (WS10) and specific humidity (Q2) within all three domains d01, d02 and d03 without the altitude adjustment and after altitude correction

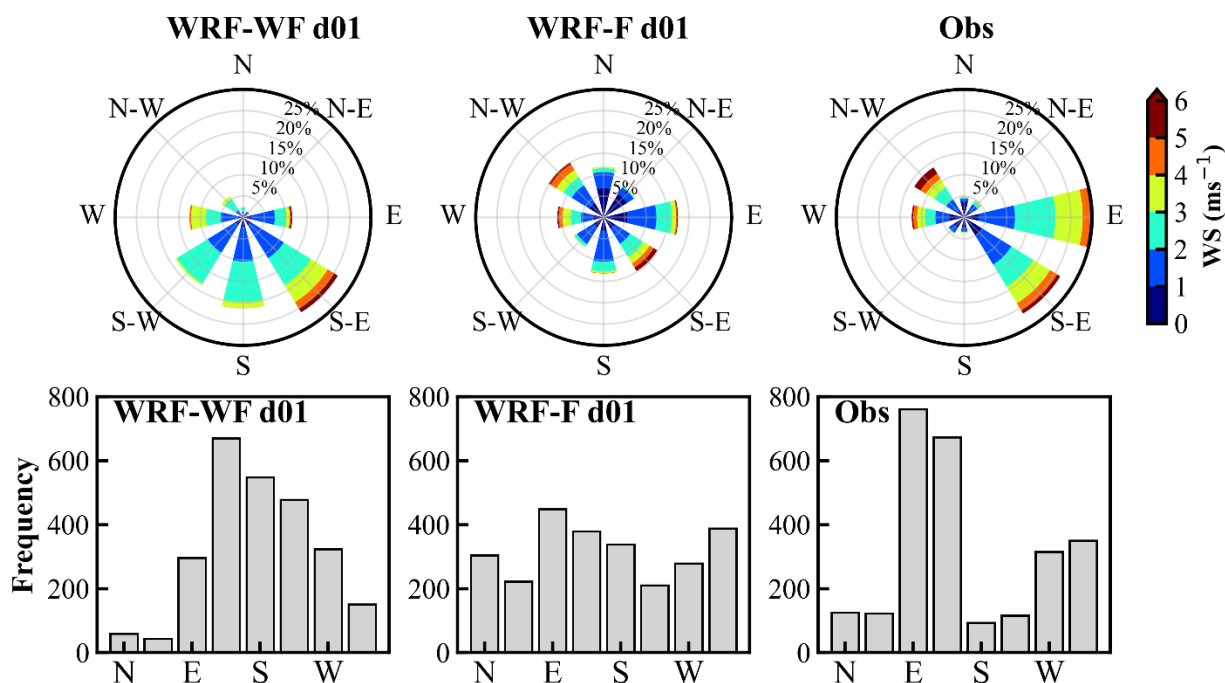
Parameters	MB						RMSE						Correlation Coefficient (r)					
	Without correction			With correction			Without correction			With correction			Without correction			With correction		
	d01	d02	d03	d01	d02	d03	d01	d02	d03	d01	d02	d03	d01	d02	d03	d01	d02	d03
P (hPa)	65.3	32.5	25.2	0.1	0.1	0.1	66.8	33.3	25.8	0.6	0.6	0.6	0.97	0.97	0.97	0.97	0.97	0.97
T2 (°C)	2.8	0.9	0.2	-1.1	-1.2	-1.2	3.2	1.6	1.3	1.9	2.0	2.0	0.75	0.67	0.67	0.35	0.34	0.36
RH2 (%)	-6.4	-0.4	-2.4	-8.4	-0.9	-3.1	12.1	8.8	8.9	12.8	10.0	10.4	0.43	0.45	0.52	0.56	0.39	0.46
WS10 (ms <sup>-1</sup> )	0.0	0.9	0.5	1.3	2.7	1.9	1.6	2.0	2.0	2.8	4.0	3.5	0.18	0.18	0.24	0.35	0.33	0.34
Q2 (g Kg <sup>-1</sup> )	0.4	0.3	-0.7	-2.4	-1.3	-1.6	1.6	1.5	1.6	3.0	1.9	2.2	0.67	0.72	0.77	0.63	0.68	0.72



**Fig. S1** The diurnal variation of the 2m specific humidity (Q2) in different domain. The left panel for without altitude adjustment and right panel after the correction of the altitude.

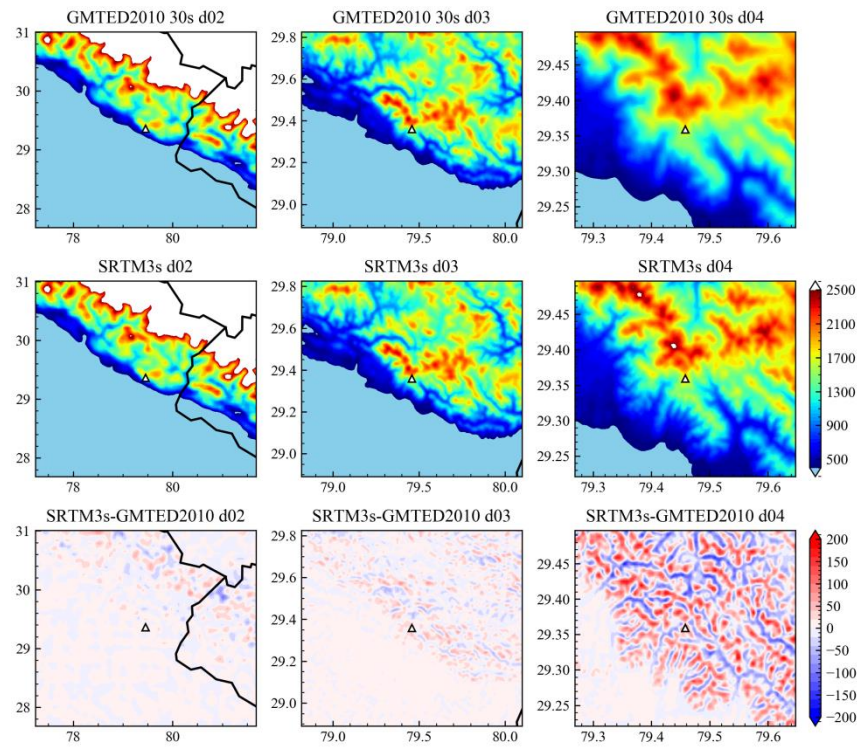


**Fig. S2** The comparison of the correlation coefficients without feedback (WRF-WF: blue) and with feedback (WRF-F: gray) for different meteorological parameters; Surface pressure (P), 2m temperature (T2), 2m relative humidity (RH2), 10m wind speed (WS10) and 2m Specific Humidity (Q2) for the different domains d01, d02 and d03

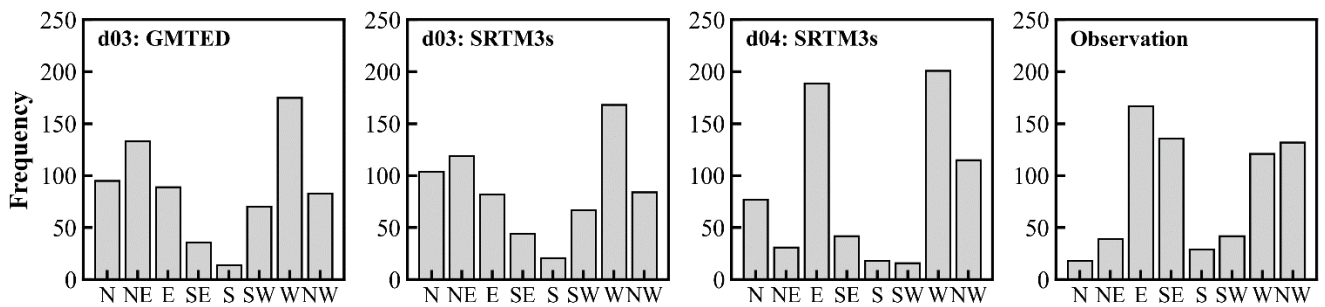


**Fig S3:** Comparison of the wind speed and direction is shown by the windrose diagram (first row), and frequency distribution of the wind direction (second row) for d01 without feedback

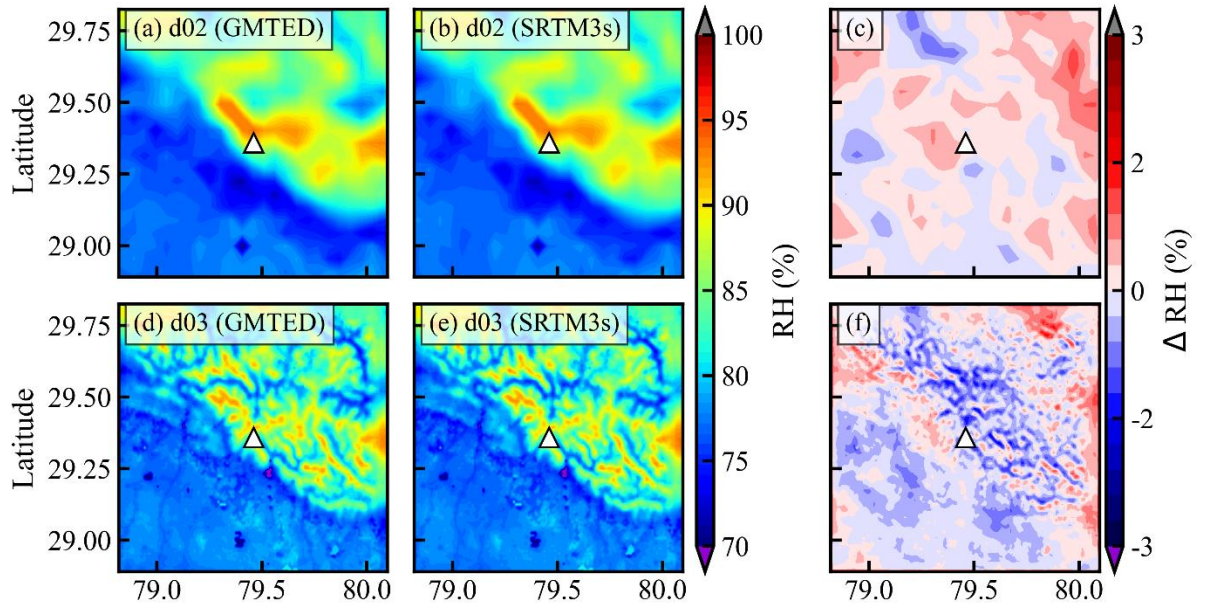
(WRF-WF) and with feedback (WRF-F) along with the observation for the time period June-September 2011. The different colours of windrose show the wind speed and the radius of windrose show the percentage frequency of counts for particular direction.



**Figure S4:** The topography from GMTED2010 (first row) at 30s and SRTM (second row) at 3s in three different domain d02, d03 and d04 while third row shows the difference between SRTM and GMTED2010.



**Figure S5:** Frequency distribution of wind direction



**Figure S6:** Mean distribution of relative humidity (RH; %) during 1–30 September 2011 simulated by WRF model (a) d02 from GMTED, and (b) d02 using SRTM3s; (c) the difference between (a) and (b) while in d03 is shown from (d-f). The triangle shows the observation station.