



Supplement of

Leveraging normalized data to improve point-scale estimates of precipitation–temperature scaling rates

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Comparison of the Quality-Controlled Hourly and Daily Datasets

Both the hourly (GHCNH) and daily (GHCND) datasets used in this paper are taken from larger datasets, which contain global coverage. Here, we can provide some comparisons which draw upon data from these larger datasets for the UCRB, in addition to data from the broader contiguous United States (CONUS). In Figure S1, we show how well the datasets align with one another given the same period of temporal aggregation. Using the hourly dataset, we compute Rx1day (i.e., maximum aggregated precipitation over 24 hours, found for each station/month). Then, for each station in the hourly (GHCNH) dataset, we find the closest daily (GHCND) station. We can then compare the normalized quantities (by applying Eq. 2 from the paper) over the 74 years and 12 months for all stations in the GHCNH dataset. In Fig. S1a, we plot the relationship between all of the normalized Rx1day values computed from the hourly dataset, and the Rx1day values from the closest daily stations. This is shown for CONUS and the UCRB. We can next look at the relationship between the daily data itself. We can plot in Fig. S1b the relationship between the normalized Rx1day at each GHCND station and its closest neighboring GHCND station. We find good agreement between the two quality-controlled datasets, with a correlation coefficient between all of the values in Fig. S1a is 0.86, and a value of 0.78 for Fig. S1b. However, this decrease in correlation can be explained by the fact that the average distance between the stations is 4 km in Fig. S1a, while it is 8 km in Fig. S1b. Next, we compare in Fig. S1c the average monthly dew point temperature anomalies from the GHCNH dataset to the nearest grid cell of average monthly dew point temperature anomalies from ERA5 (which is used as our predictor of Rx1day). Again, we find good agreement between the two datasets with a correlation coefficient of 0.90.

Another way that we can see whether there are any unrealistic statistical outliers in the datasets is to plot all of the normalized dew point temperature anomalies versus normalized Rx1hr or Rx1day. We do this using all stations and all months in the UCRB for the hourly (i.e., average monthly GHCNH dew point temperature anomalies versus Rx1hr precipitation anomalies) and daily (i.e., average monthly ERA5 dew point temperature anomalies versus Rx1day precipitation anomalies) datasets. This is shown in Figure S2. We do not find the presence of any unrealistic outliers, in either the hourly or daily datasets, when considering the associated covariance between our two variables.

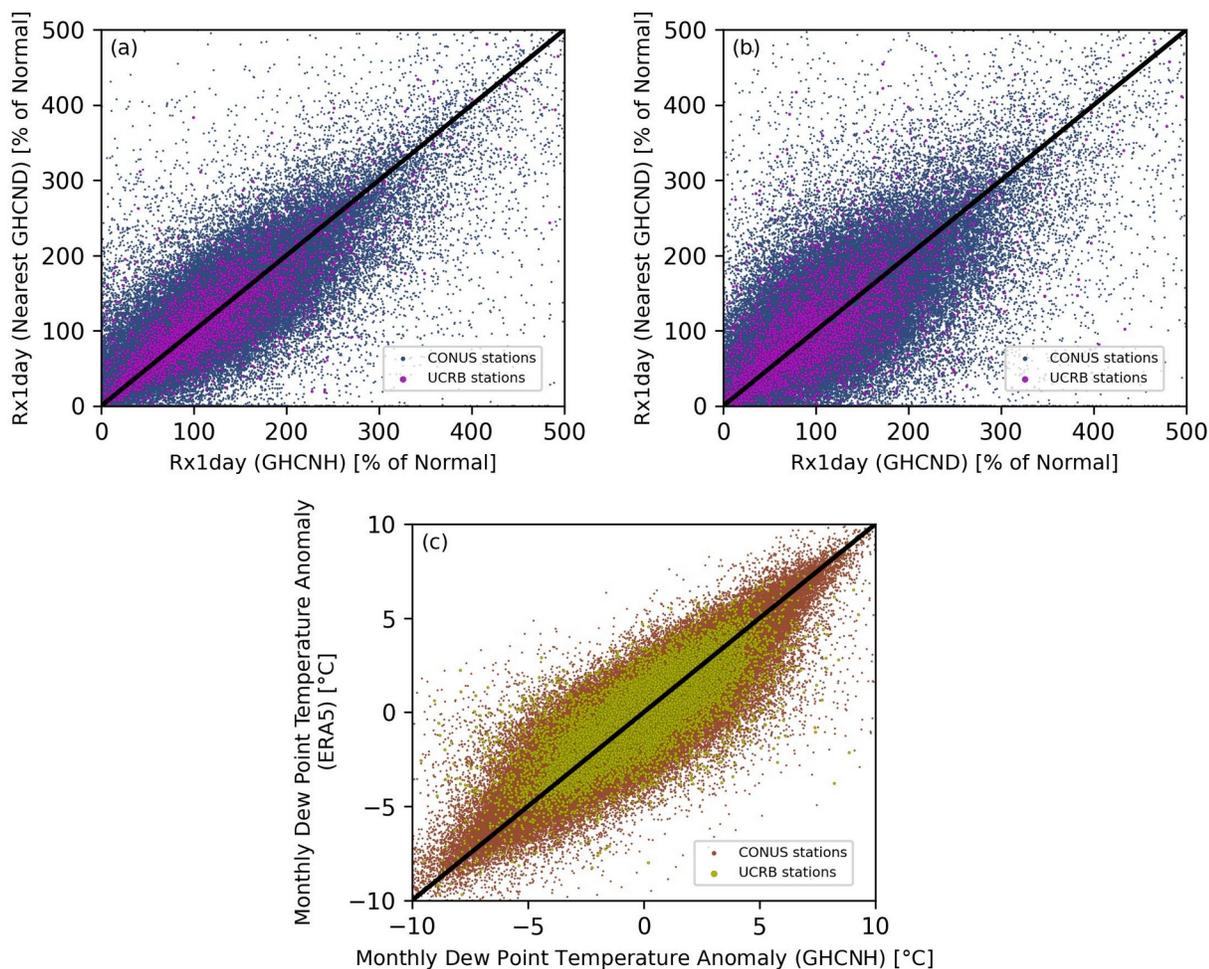


Figure S1: (a) Anomalies of Rx1day values are compared when Rx1day is computed from the hourly dataset (x-axis) or from the daily dataset (y-axis). This is shown for all stations and all months across CONUS and the UCRB. For each station in the hourly dataset, the data from the nearest station from the daily dataset is found and contrasted. (b) Plots the relationship between the daily data (GHCND) itself. For each GHCND station, the closest neighboring GHCND station is found and the anomalies of the two are compared. This is shown for all stations and all months across CONUS and the UCRB. (c) plots the average monthly dew point temperature anomalies from the GHCNH dataset against the nearest grid cell of average monthly dew point temperature anomalies from ERA5.

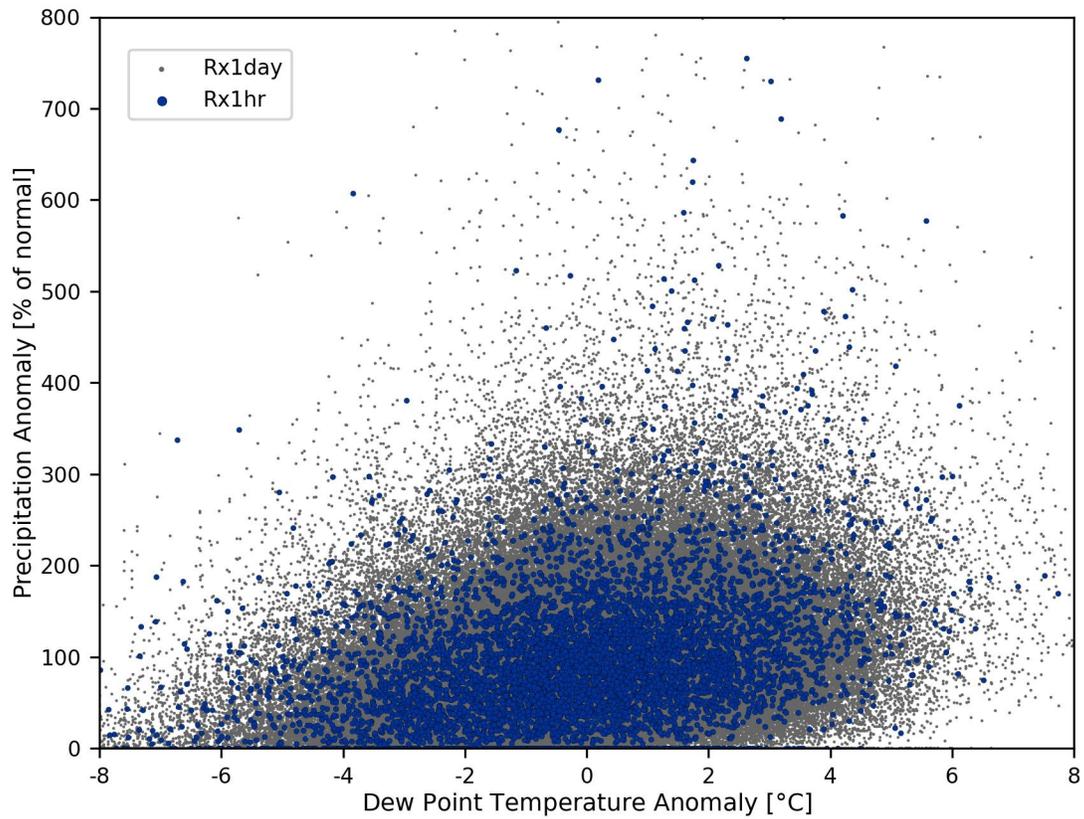


Figure S2: The small points show the normalized anomalies of dew point temperature versus the normalized anomalies of Rx1day using the UCRB stations from the daily dataset GHCND. The larger blue points show the normalized anomalies of dew point temperature versus the normalized anomalies of Rx1hr using the UCRB stations from the hourly dataset GHCNH.