

Analysis of heat waves in models and observations for the Delaware Estuary Watershed

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Introduction

We found in a previous analysis that global climate models overestimated heat waves in the Delaware Estuary Watershed. We speculated that this may be due to the coarse temporal resolution of the data set we used for model evaluation: the North American Regional Reanalysis (NARR), which produces output at a temporal resolution of 3 hours. Here we compare heat waves in the NARR with those from observational data.

Processing

Daily maximum temperature datasets were taken from the Global Historical Climatology Network (GHCN) and a gridded dataset described in Maurer et al. (2002) which interpolated Co-op reporting stations maximum temperature to a $1/8^\circ$ grid. A third daily maximum temperature dataset was created from the NARR 3 hourly temperature output. The three datasets were averaged to a 1° grid, creating 3 grid boxes within the Delaware watershed. Two grid boxes for the GHCN contained 2 stations and the other grid box contained 8 stations (Figure 1). NARR maximum temperatures were created by taking the maximum of eight 3-hourly temperatures for a given day for each 1° grid. The maximum number of consecutive hot days, over certain thresholds (80, 85, 90, 95, 100° F), were calculated by analysis of the mean daily maximum temperature for the entire watershed.

Results

Figure 2 shows that the method used for producing daily maximum temperature from 3 hourly NARR temperatures consistently underestimates the number of maximum consecutive hot days at all thresholds. This is likely due to the maximum temperature occurring between the 3 hourly reporting periods. Therefore, the actual maximum temperature for a given day will always be greater than or equal to the 3 hourly NARR temperatures. The GHCN and Maurer datasets agree fairly well, but the Maurer dataset results in a slightly lower number of maximum consecutive hot days at thresholds greater than 80° F. This may be attributed to the effects of local orography, which is captured in the individual sites of the GHCN network, but are interpolated out in the Maurer dataset.

Figures

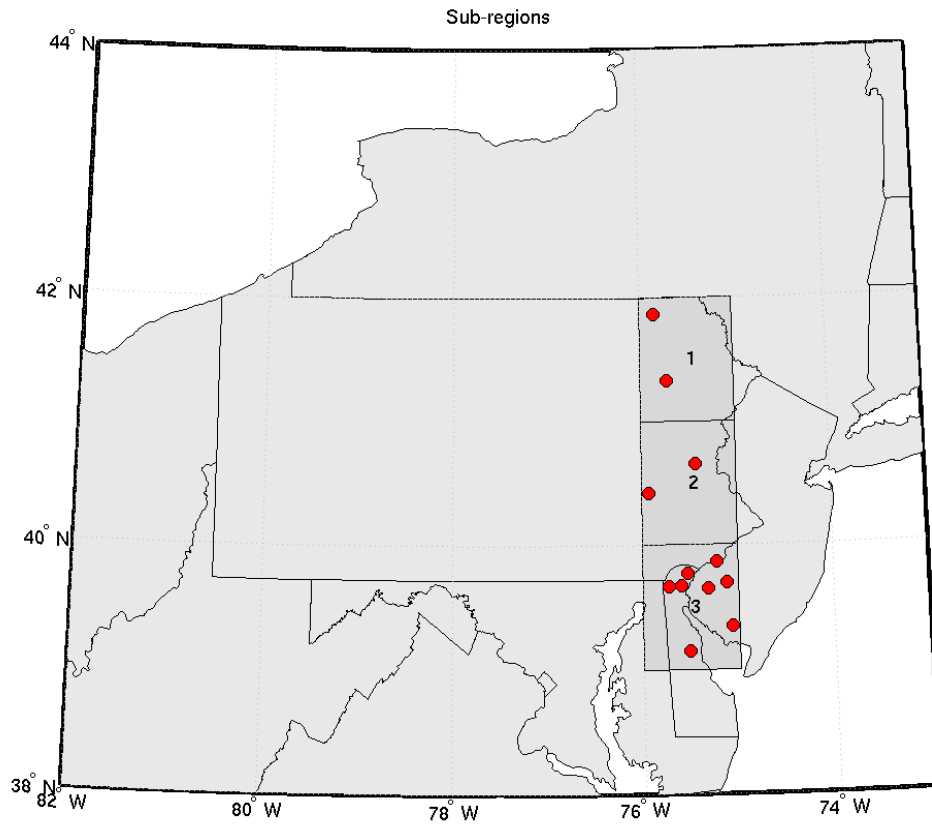


Figure 1. Locations of the GHCN reporting sites averaged to create values for each of the 1° grids.

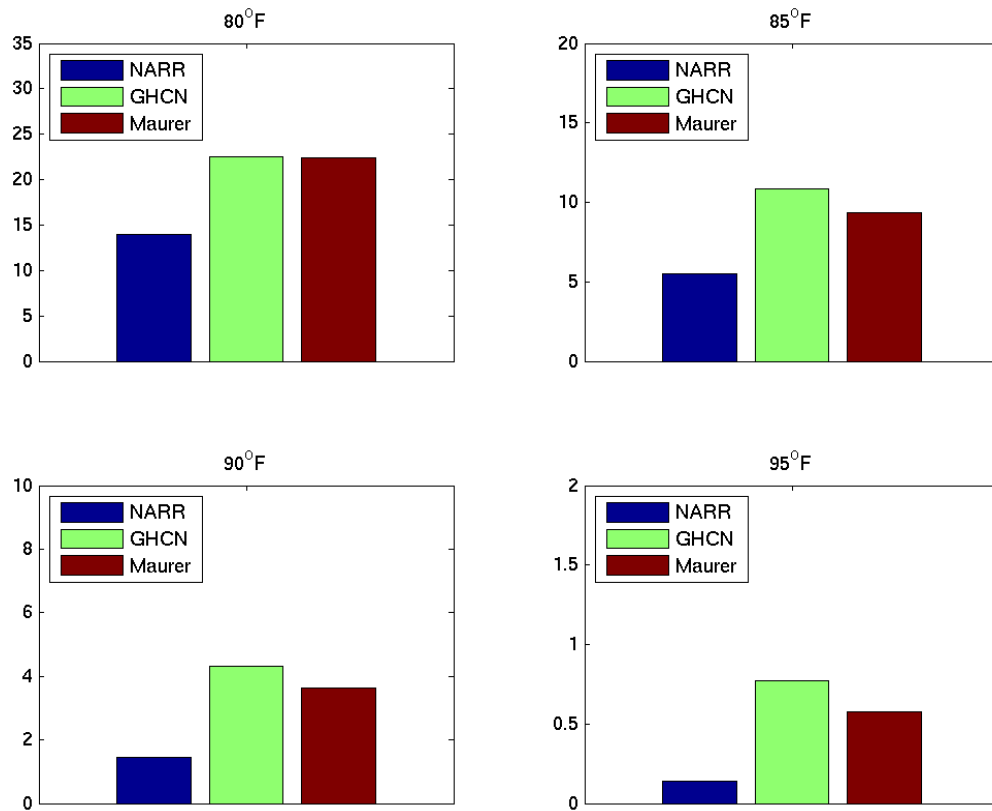


Figure 2. Average of the maximum number of consecutive days per year with the daily maximum temperature over 80, 85, 90, 95° F for NARR, GHCN, and Maurer datasets.

References

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