A Comparison of Shippensburg University's Weather Datasets

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This report is a summary based on the first author's Master's degree practical exam.

The purpose of this analysis is to assess the differences in measurements between the National Weather Service (NWS) Cooperative Observer's Network station (COOP) and the automated Davis weather station (AUTO) that are co-located at Shippensburg University. The COOP station utilizes a NWS-issued maximum minimum temperature sensor (MMTS) and 10-inch non-recording rain gauge. Data are observed and recorded once daily at midnight (11:59 pm). The AUTO station is a Davis Instruments Wireless Vantage Pro2 station. The station takes measurements every 15 minutes. While the AUTO station records a variety of data types, only those that are also measured by the COOP station are analyzed here.

Data for the two stations were examined for every day between September 1, 2006 and March 31, 2009. Variables examined included: maximum temperature (°F), minimum temperature (°F), and liquid precipitation (inches). Trace amounts of precipitation (less than 0.1 inches) were assumed to equal zero in this analysis. The precipitation data were divided into two time periods: non-winter (April through November) and winter (December through March). For winter, precipitation data were used only during 2008-2009 due to the installation of a heater to melt solid precipitation on the AUTO station.

Table 1 shows the regression results between the two stations for the five variables analyzed. Figure 1 shows the scatter plots for the five variables. Generally speaking, COOP temperatures are on the order of 1-3°F colder than AUTO temperatures. COOP precipitation is on the order of 1.2 times greater than AUTO precipitation. Figure 2 shows a time series of these differences.

Care must be taken in selecting and using the Shippensburg data. It is likely that the COOP data are more accurate due to the MMTS sensitivity and the larger size of the precipitation gage. However, the AUTO station provides better temporal resolution. Robust and meaningful analyses are possible using either data set. However, **EXTREME CARE SHOULD BE TAKEN WHEN COMPARING THE DATASETS** as this analysis has shown.

Table 1. Regression results for the comparison between stations.

Variable	R^2	Equation
Maximum Temperature	0.999	COOP = 1.023(AUTO) – 1.893
Minimum Temperature	0.997	COOP = 1.019(AUTO) – 2.439
Non-winter (liquid) Precipitation	0.990	COOP = 1.216(AUTO) + 0.000
Winter Liquid Precipitation	0.996	COOP = 1.330(AUTO) + 0.003
Winter Solid Precipitation	0.985	COOP = 1.444(AUTO) + 0.010

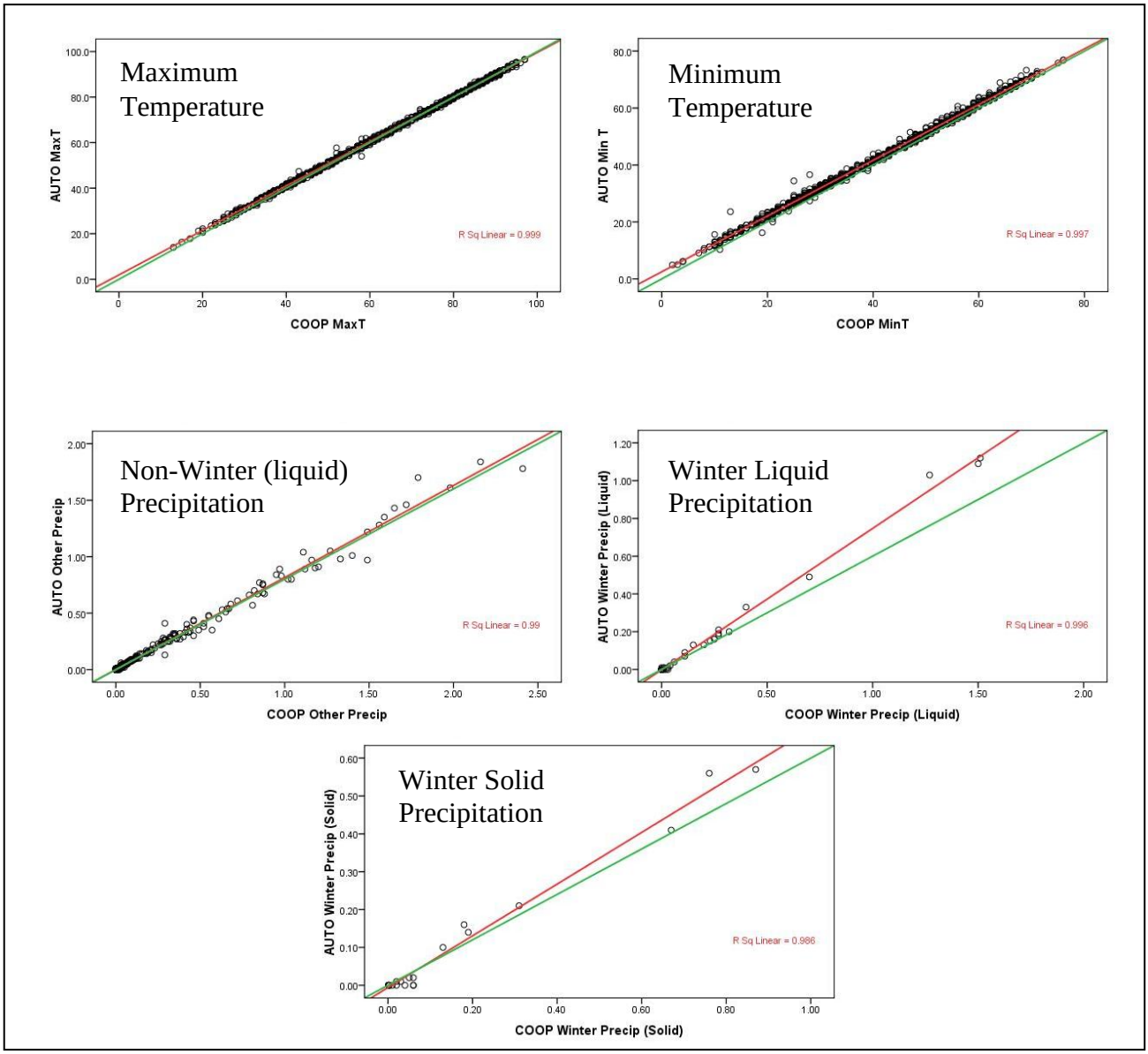

Figure 1. Scatter plots between stations. Red lines are the regression lines from Table 1. Green lines are the 1:1 lines.

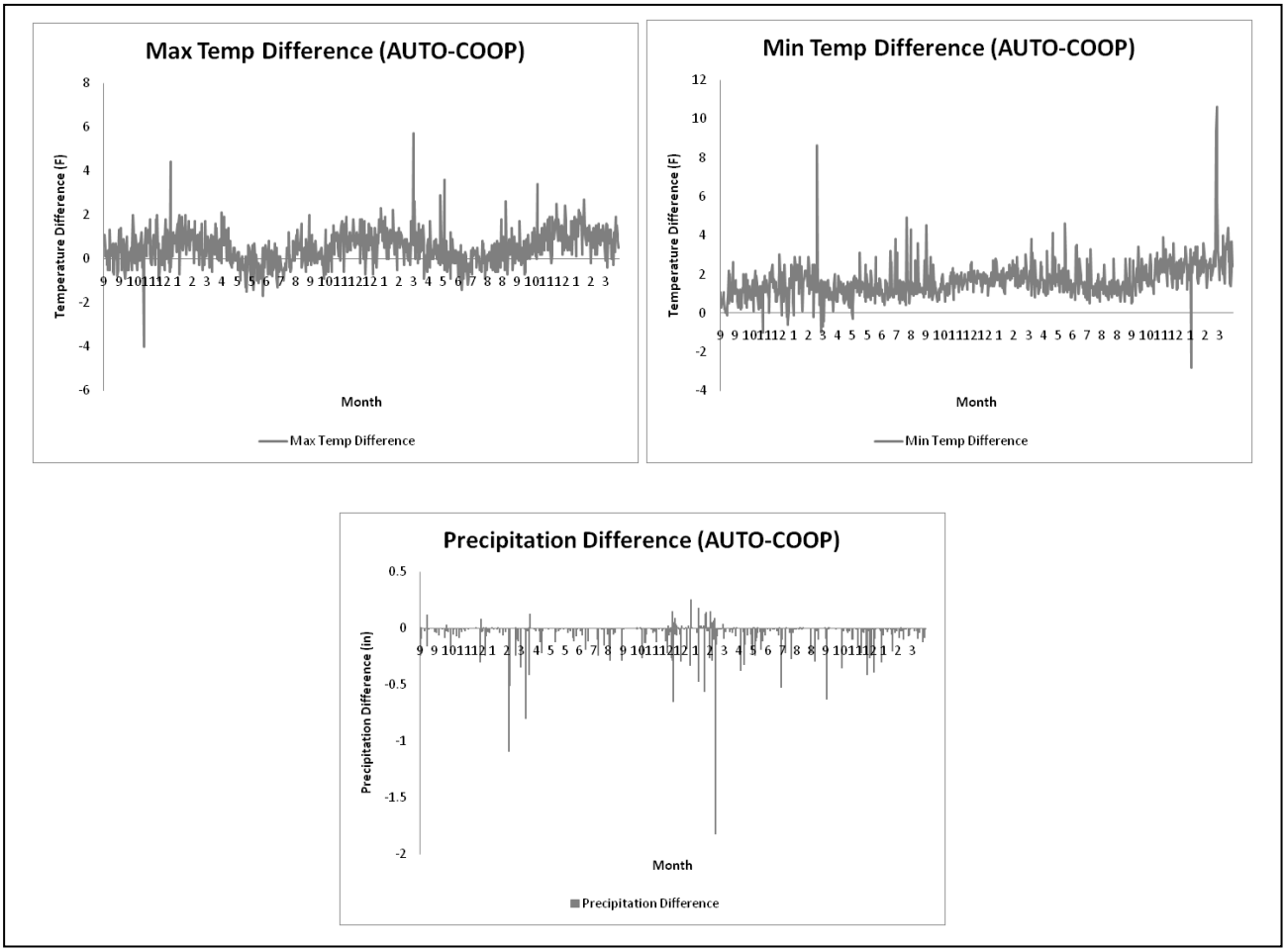

Figure 2. Time series of difference between stations.