Improving the Functionality of Personal Weather Stations Through Data Analytics

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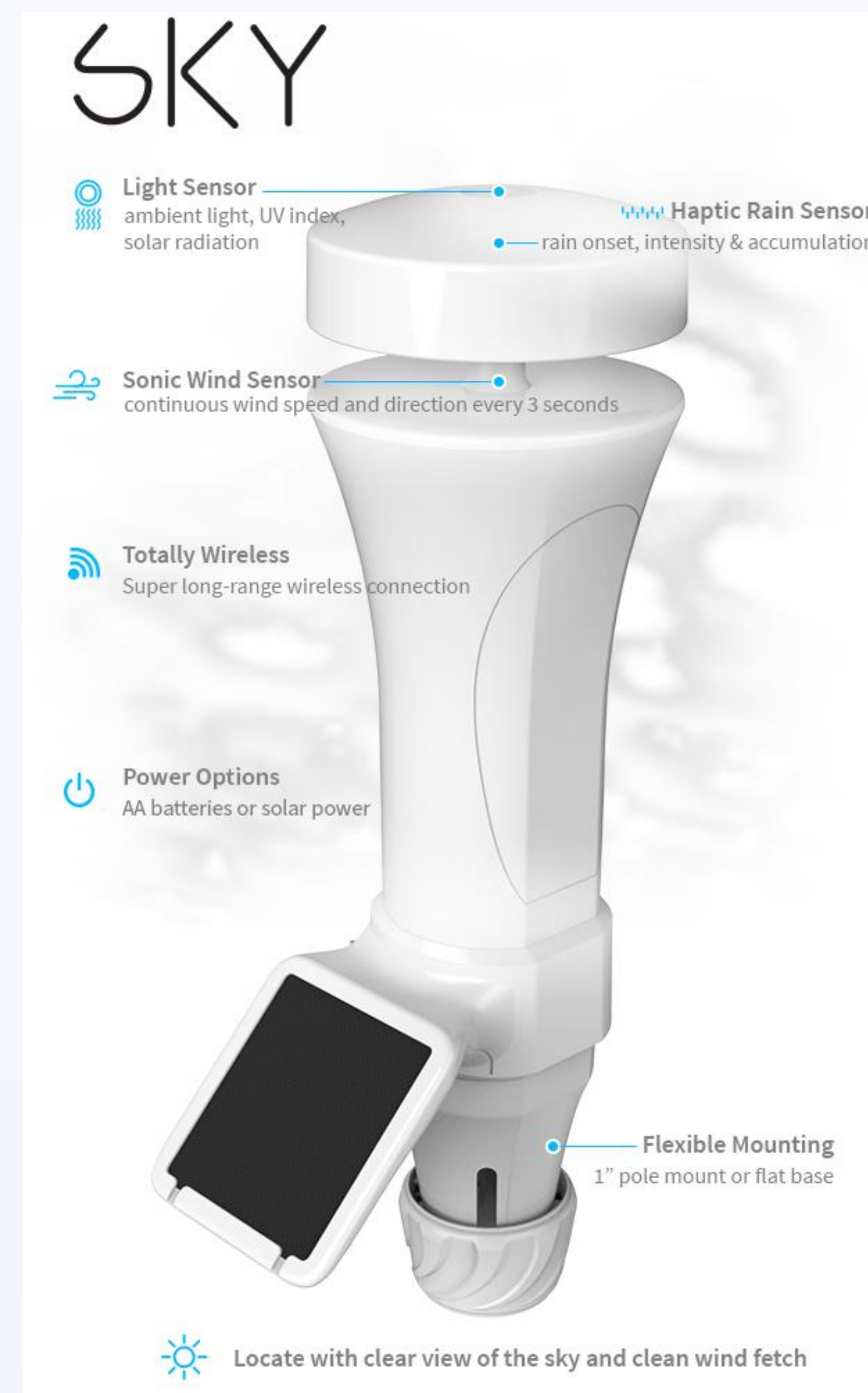
WeatherFlow

Abstract

WeatherFlow, a personal meteorological station company, collaborated with an undergraduate team at Embry-Riddle Aeronautical University to create a new way of visualizing real time meteorological data. Students used the meteorological data to create a real time display of the weather in relation to a principal station. Temperature and rain were tracked in a grid structure with ten-mile intervals from ten to fifty miles along the eight cardinal directions, North, Northwest, West, South West, South, South East, East, and North East. This visualization tool will give users a new understanding of their local conditions allowing them to better plan their daily activities.

Objective

Create an improved method for user visualization of weather from other in network stations around them.

Figure 1: WeatherFlow's Air Station. This station is capable of collecting the local pressure, temperature, relative humidity, lightning strike counts, and lightning strike distance.


Figure 2: WeatherFlow's Sky Station. This station is capable of collecting the local illuminance, UV index, solar radiation, rainfall per minute, wind speed, and wind direction.

Method

Temperature and rain were tracked in a grid structure with ten-mile intervals from ten to fifty miles along the eight cardinal directions, North, Northwest, West, South West, South, South East, East, and North East. The percent difference of a given weather attribute is plotted in a color according to **Figure 3** in it's appropriate grid space.

| Percent Difference	Color
< -10%	Purple
-10% to -5%	Dark Blue
-5% to -1%	Cyan
-1% to 1%	Green
1% to 5%	Yellow
5% to 10%	Orange
>10%	Red

Figure 3: The color representation of a sector's station's percent difference in regards to the principal station.
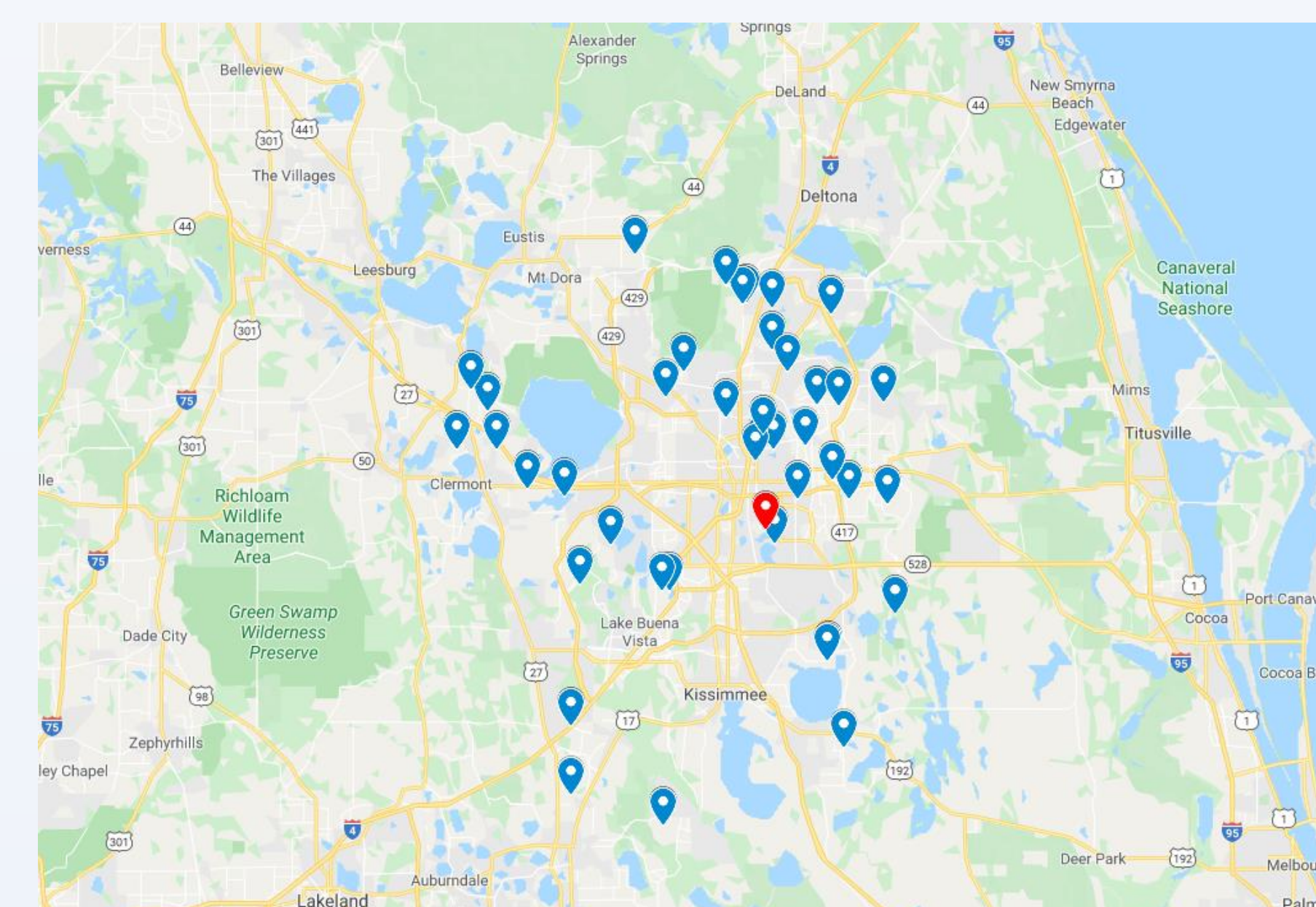

Figure 4: A map of the principal and surrounding stations used in creating **Figures 5** and **6**. The principal is marked in red.

Results

By using the station marked in red in **Figure 4** a plot of the relative temperature and rainfall can be seen in **Figures 5** and **6** respectively. This process can easily be extended to any of the other weather attributes the WeatherFlow stations provide but for simplicity it was initially limited to temperature and rainfall as consumers find those attributes the most informative. In the live application these plots update with new information every minute to keep users up to date with the most recent weather patterns.
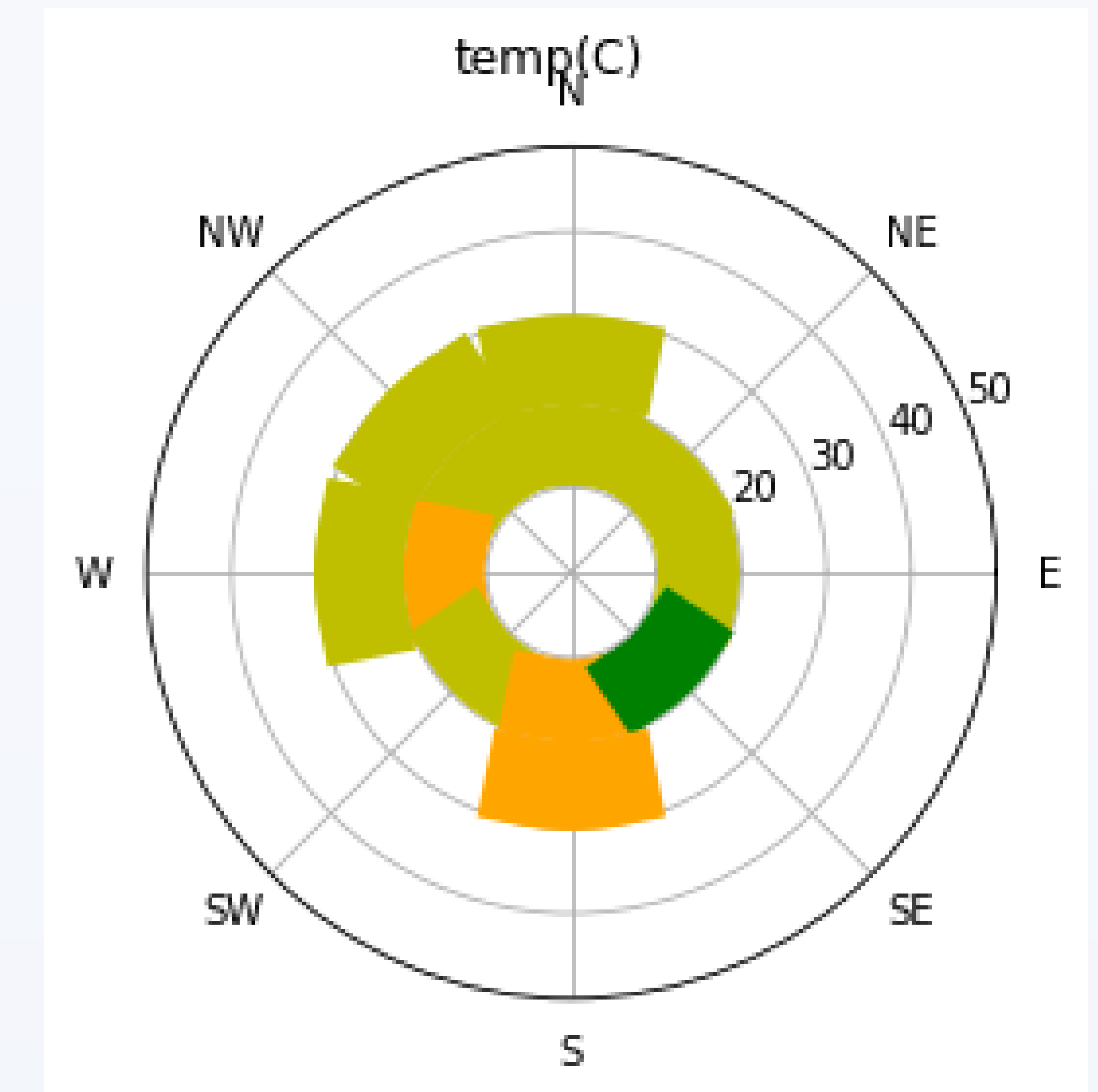
Figure 5: A map of the relative temperature in regards to the principal station. The color key is shown in **Figure 3**.
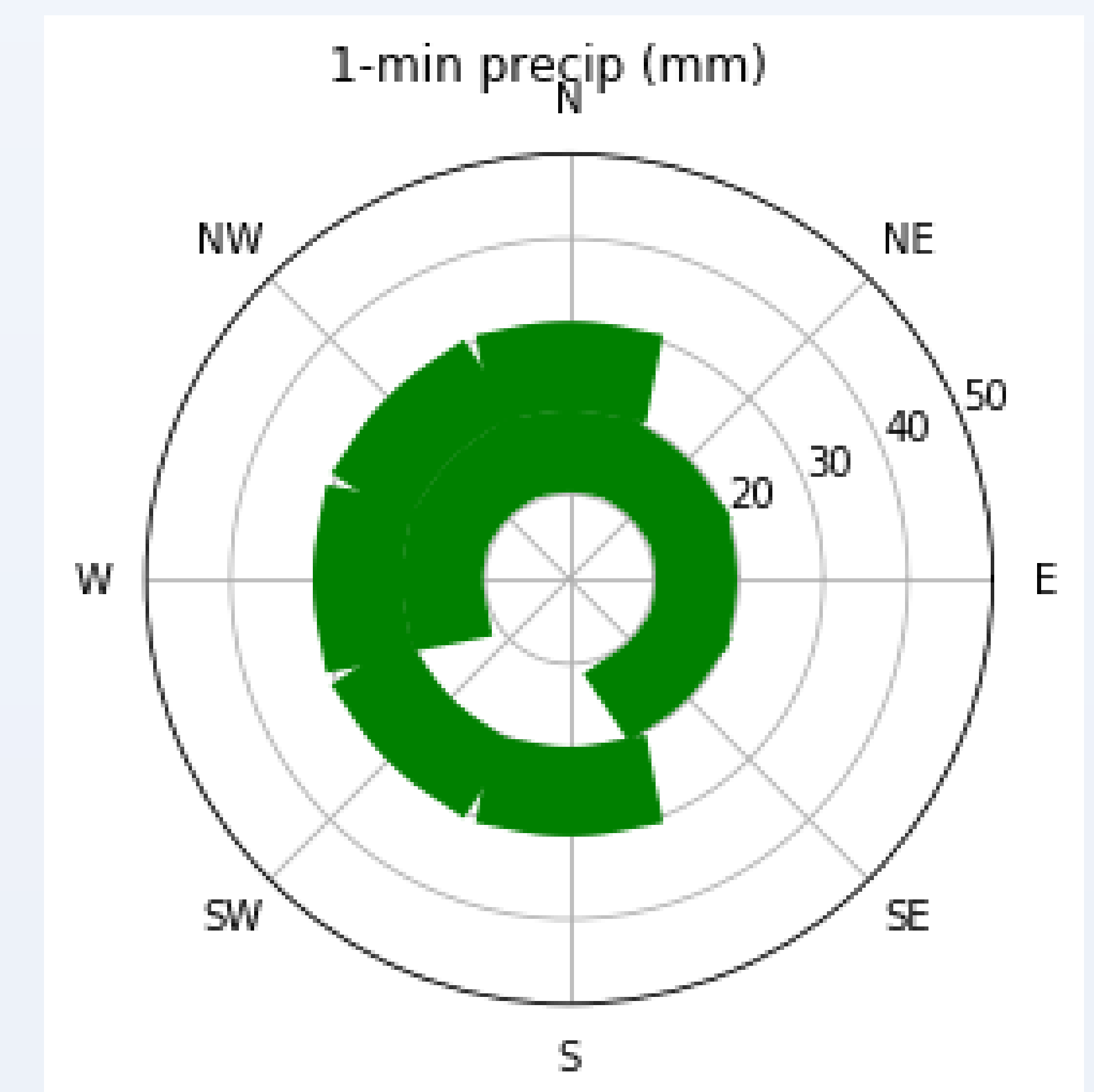
Figure 6: A map of the relative rainfall in regards to the principal station. The sectors that are absent in **Figure 6** yet present in **Figure 5** are sectors where there is a Sky unit but not an Air unit. The color key is shown in **Figure 3**.