The Weather Company METAR Gap-Filling Process

In order to create a seamless time series of near-surface meteorological variables at various observing stations worldwide, The Weather Company, an IBM Business has developed a gap-filling technique to create temporally continuous data, even when METAR stations fail to record data. Two different techniques are used to fill gaps, depending on the size of the gap.

Global gridded data is collected every six hours and interpolated to match the coordinates of each existing METAR station in order to produce daily station files that are used to fill in missing data when needed. When a METAR station file is available, the data is ingested. Each variable reported by the METAR station is scanned to identify missing data, whether it is an entire missing METAR report due to temporary station downtime or a single variable that is missing or invalid from a report due to an instrument malfunction. Quality assurance checks make sure all METAR data that is accepted is error free and of the highest quality. Outliers are removed and processed as missing data.

The gap-fill technique used is dependent on the number of continuous hours missing in the data. A linear interpolation is used for gaps of less than or equal to six hours. A METAR gap-filling technique is applied that utilizes the global gridded data when six or more continuous hours are missing. This is done to create a seamless transition from one end of the gap to the other, while accurately capturing atmospheric changes that occurred at that METAR location over the entire missing period.
Figure 1 shows the METAR data before gap-filling and quality assurance checks, as well as the quality controlled gap-filled data below, where missing hours are not only recovered, but outliers and errors are also removed.

Figure 1: