The National Aeronautics and Space Administration's (NASA) Marshall Space Flight Center (MSFC) Natural Environments Branch (EV44) provides atmospheric databases and analysis in support of space vehicle design and day-of-launch operations for NASA and commercial launch vehicle programs launching from the NASA Kennedy Space Center (KSC), co-located on the United States Air Force's Eastern Range (ER) at the Cape Canaveral Air Force Station. The ER complex is one of the most heavily instrumented sites in the United States with over 31 towers measuring various atmospheric parameters on a continuous basis. An inherent challenge with large datasets consists of ensuring erroneous data are removed from databases, and thus excluded from launch vehicle design analyses. EV44 has put forth great effort in developing quality control (QC) procedures for individual meteorological instruments, however no standard QC procedures for all databases currently exists resulting in QC databases that have inconsistencies in variables, development methodologies, and periods of record. The goal of this activity is to use the previous efforts to develop a standardized set of QC procedures from which to build meteorological databases from KSC and the ER, while maintaining open communication with end users from the launch community to develop ways to improve, adapt and grow the QC database. Details of the QC procedures will be described. As the rate of launches increases with additional launch vehicle programs, it is becoming more important that weather databases are continually updated and checked for data quality before use in launch vehicle design and certification analyses.

Abstract

The three wind towers at LC39-B

Wind Towers QC [2]

- Check that derived Tt has supporting measured T and RH values.
- Calculate Tt, if T and RH are both provided, but Tt isn’t available.

\[ T_t = 243.04 + \frac{\ln (RH) - 17.625 + T}{100} \]

- Realistic value check for Tp, RH, WSmean, WDmean, WSpeak, WDpeak.
- Check for instances where dew point was greater than temperature.
- Check for instances where WSmean > WSpeak.
- Check that derived Td has supporting measured T and RH values.

\[ \Delta T = T_{adjacent} - T > Tower \ defined \ threshold \]

\[ |\Delta V_{mean} - \Delta V_{peak}| > 3.0 \ m/s \]

\[ |\Delta W_{mean} - \Delta W_{peak}| > 3.0 \ m/s \]

45° < |W P_{mean} - W P_{peak}| < 315°

- Checks against data from surrounding vertical sensors:

\[ |\Delta V|, |\Delta T| < 4.0 \ C \]

\[ |\Delta RH| < 10 \% \]

\[ |\Delta \text{Mean Wind Speed}| < 5.0 \ m/s \]

References