

Readme_ASOS_gust

Written by: John Kaplan (NOAA/AOML)

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Overview: ASOS wind data that had been obtained previously by Lixin Lu from NCEI archives for all U.S. landfalling hurricanes from 2011-2022 were further processed using the following methodology.

1. The 2-min ASOS wind speed (WSPD-2min) and direction every minute and the maximum 3-sec gust* (GUST-3sec) measured during that same 2-minute ASOS averaging period as well as the time and location of each ASOS observation were extracted.

*Note that to obtain the maximum 3-sec gust the observation from the previous 2-min averaging period was also checked as each 2-minute ASOS observations only provided the maximum gust within the past 1-minute.

2. All ASOS observations were placed into storm relative coordinates based upon the most recent NHC best track position data.
3. The Gust Factor (GF) was computed for each observation using:

$$GF = GUST-3sec/WSPD-2min$$

4. The Kaplan/DeMaria decay model (inwind_jht_island_new.f) was then run for the period roughly 24-h prior to landfall until the TC was no longer a TC based upon the NHC best track data to place the ASOS observations into storm relative coordinates and to determine the time and location of the TC landfall. Also, as part of each decay model run an estimate of the maximum wind and wind radii of the landfalling TC obtained using an updated version of the Kaplan/DeMaria decay model (DeMaria et al. 2006) that accounts for a TC's proximity to water were also computed. Note that both the TC landfall time and location for the above model runs were determined based upon the aland.f routine developed by Robert Merrill.
5. The ASOS observations described above that were within the time window from 24- h before landfall to 72-h after landfall were then further processed so that GF could be stratified by factors such as ASOS-2min, storm relative location, time after TC landfall, and surface roughness. To obtain an estimate of surface roughness, the roughness length (Z_0) values that had been previously estimated visually at the various coastal ASOS station locations by Powell et. 2004 were employed. Various statistics were then computed based upon the above stratifications using the program guststats_new.f.
6. As part of each guststats_new.f run, the following ASOS relevant parameters were output to an ASCII file.

- a) Obs no.
- b) ASOS station ID
- c) Time elapsed of observation after start of decay model run (h).
- d) Time after Landfall of observation estimated by decay model (h).
- e) Date of observation (yrmoda)
- f) Time of observation (hrminsec)
- g) Storm Latitude at time of observation (deg. N)
- h) Storm Longitude at time of observation (deg. W)
- i) Heading of storm at observation time (e.g., due north heading = 90 deg)
- j) Observation latitude (deg. N)
- k) Observation longitude (deg. W)
- l) Observation radius from storm center (km)
- m) Heading of storm at observation time (e.g., due north heading = 90 deg)
- n) Observation location relative to storm center (due north heading = 90 deg)
- o) Storm relative location of observation (deg.) where 90 = an along track motion
- p) Distance inland (km) Note: Negative values indicate inland location)
- q) 3-sec gust magnitude (kt)
- r) 3-sec gust direction (deg). (Note: 90= a wind from the due east)
- s) 2-minute wind magnitude (kt)
- t) 2-minuted wind direction (deg) (Note: a wind from the due east is 90 deg)
- u) GF (see Note 3 above)
- v) ASOS anemometer height above ground level (m). Note: -99 = missing value.
- w) Roughness length (Z_0) (m) visual estimate by Powell et al (2004). Note -99.=missing value.