

The Importance of Validating Data

The *BAMS* May 2024 issue published a Nowcast piece entitled, “It’s the Heat... and the Humidity (p. 312).” This Nowcast piece referenced a recently published article by David Romps in the April 2024 issue of *Environmental Research Letters* (<https://doi.org/10.1088/1748-9326/ad3144>). One particular line of the Nowcast piece caught our attention:

The study observed the highest heat index at Houston’s Ellington Airport, which reached 167°F (75°C) on 23 July.

At first blush, this sentence did not pass the “eyeball” test because 167°F seemed unrealistically high. Thus, we did some basic meteorological forensic investigation to determine the veracity of this exceptional heat index value.

First, we searched for the world’s highest recorded heat index, which yielded 178°F (81°C) at Dhahran, Saudi Arabia (<https://www.noaa.gov/jetstream/synoptic/heat-index>). This is only 11°F higher than the above purported value at Houston’s Ellington Airport (KEFD).

Second, we obtained the observations for KEFD from MesoWest (https://mesowest.utah.edu/cgi-bin/droman/meso_base_dyn.cgi?product=&past=1&stn=KEFD&unit=0&time=LOCAL&day1=23&month1=07&year1=2023&hour1=23) valid for 23 July 2023 and noticed an observation at 14:54 CDT (1954 UTC) that had a temperature and dewpoint both equal to 93.2°F and, thus, an RH of 100%.

In addition to MesoWest, we also checked the Iowa Environmental Mesonet (IEM) archive (<https://mesonet.agron.iastate.edu/request/download.phtml>) for the raw METAR

observations; and the three centered on the questionable observation are listed below:

EFD,2023-07-23 18:54,KEFD 231854Z
00000KT 10SM SCT048 BKN090 35/23
A2997

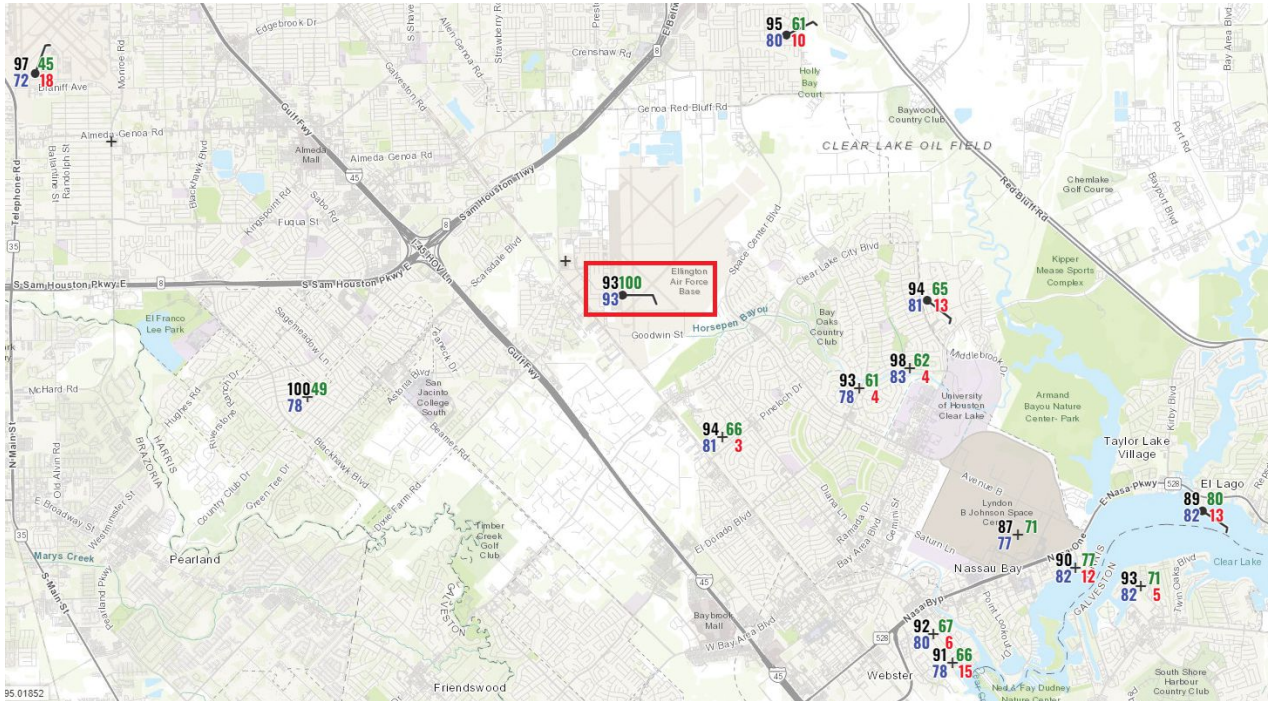
EFD,2023-07-23 19:54,KEFD 231954Z
09010KT 10SM SCT050 34/34 A2995

EFD,2023-07-23 20:54,KEFD 232054Z
09010KT 10SM SCT050 34/23 A2993

The 1954 UTC observation (highlighted in red, and supportive of the 14:54 CDT MesoWest observation noted above) is the one with the erroneous dewpoint (34°C = 93.2°F). These values result in a heat index of 150°F using the NWS method [which is different from that utilized in an October 2022 *Journal of Applied Meteorology and Climatology* article by Yi-Chuan Lu and David Romps (<https://doi.org/10.1175/JAMC-D-22-0021.1>)]. This is not the same as the 167°F indicated in the *BAMS* Nowcast piece, but that is because the Nowcast piece referenced the 75°C value from the Romps article (which equals 167°F).

Third, we examined the regional weather observations around 1954 UTC (2:54 pm CDT) to perform a spatial comparison of KEFD to surrounding sites. This analysis used the NWS Weather & Hazards Data Viewer (<https://www.wrh.noaa.gov/map/>) and shows KEFD clearly was an outlier (see graphic). Specifically, the KEFD dewpoint of 93°F is 10°–15°F higher than any of the other nearby observations.

As a final check, we reviewed the official METAR observations for KEFD from the National Centers for Environmental Information (NCEI) database. These official obser-



Surface observations around 2:54 pm CDT on 23 July 2023 for the area on the southeastern side of Houston, Texas. Temperature is black (°F), dewpoint is blue (°F), relative humidity is green (%), and wind gusts, if present, are red (mph). The KEFD observation is outlined with a red rectangle.

observations would have been available within days to at most one month after the time of the observation (S. Stephens 2024, personal communication). The NCEI quality-controlled observations did not have the erroneous dewpoint that was in the MesoWest and IEM databases. Using the NCEI official temperature of 95°F (35°C) and dewpoint of 73°F (22.8°C)—when both were maximum for KEFD on 23 July 2023—yields a heat index of 104.5°F (40°C) using the NWS method [or about 109°F (43°C) using the method of Lu and Romps in their 2022 *Journal of Applied Meteorology and Climatology* article]. This latter value is 58°F (32°C) lower than that

reported in the Nowcast piece, which again was taken from Romps.

We conclude by bringing up some points for *BAMS* readers to consider.

- Outlier data should be checked for validity before being utilized in research and ultimately published. This is most critical for cases where official data are not yet available.
- Official data, such as from NCEI, should be utilized when performing studies such as that by Romps. This is especially important for attribution-type studies related to global-warming impacts.

- Proper vetting should be done when including snippets from published articles in other publications, newsletters, etc. Even though *BAMS* did not publish the Romps article, the citing of claims such as this anomalously high heat index by Romps should be scrutinized.
- Articles like the one from Romps potentially cause great harm for furthering the understanding of global warming [e.g., Atmosfear: Communicating the Effects of Climate Change on Extreme Weather by Vladimir Janković and David Schultz in the January 2017 issue of *Weather, Climate, and Society* (<https://doi.org/10.1175/WCAS-D-16-0030.1>)]. Scientific publishing of glaring errors such as this only furthers skepticism of global warming and promotes other viewpoints (e.g., that global warming is overblown).

In closing, our multisource analysis shows the 167°F (75°C) heat index clearly is in error and very misleading. We will write an official Comment on Romps in *Environmental Research Letters*, but also wanted to bring this issue to *BAMS* readers to (i) help further the understanding, vetting, and communication of potential outlier events and (ii) draw attention to possible impacts that publishing of bad data can have on public trust.

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Editor's Note: *We thank Matt Bunkers and Jon Zeitler for identifying this error in the May issue and informing BAMS about it. This Parcel, based on an institutional press release, will be removed from the BAMS online archive as it is clearly in error. We also appreciate Dr. Bunkers and Mr. Zeitler for submitting a formal comment to Environmental Research Letters requesting that the official peer-reviewed record be corrected.*