

HadISDH.land Update Document

Kate Willett (MOHC), 4th May 2023

General Notes:

The HadISDH.land.v4.5.1.2022f contains all 12 months of 2022. It is a minor new version (Y element + 1) because a new formula is used to calculate the wet bulb temperature from dewpoint temperature and air temperature. Errors were found when the air temperature was very high but dewpoint temperature very low, resulting in spuriously high wet bulb temperatures. The Stull (2011) formula is now used as this has a far wider range of applicability. See the [blogpost](#) for details. This mostly affects the wet bulb temperature fields although differences are very small, and far less than 1 degree for the most part. Differences are larger over warm, dry air conditions. The calculated wet bulb temperature is used to decide whether to calculate vapour pressure with respect to ice or water and so this new formula can lead to very small changes in vapour pressure and variables that use vapour pressure in their calculation (specific humidity and relative humidity). Stull (2011) tends to give higher wet bulb temperatures overall which will result in fewer uses of the calculations with respect to ice and therefore fractionally higher vapour pressures and related values. As it is consistently used across the time period it should not impact long-term trends in anomalies.

Additionally, a minor bug fix which prevented a few stations from completion of the HadISDH processing suite if they were removed by a completeness test relevant to the new HadISDH.extremes product (coming soon). This product is processed simultaneously with HadISDH.land. Correcting this resulted in 36 extra stations passing through to the final dataset but 9 stations being lost. The lost stations are removed during homogenisation. The new stations will have influenced the network of correlating neighbours which in turn increases the power of the homogenisation to detect and adjust/remove inhomogeneous periods. Stations with periods removed may no longer pass the temporal completeness checks and so are removed.

All other processing steps for HadISDH.land remain identical. The new version of HadISD (3.3.0.2022f) has pulled through some historical changes to stations which are passed on to HadISDH.land resulting in 9555 compared to 9278 initial stations. The end station count is further reduced after homogenisation. The homogeneity adjustments differ slightly due to sensitivity to the addition and loss of stations, historical changes to stations previously included and the additional 12 months of data. More information can be found at <https://hadisdh.blogspot.com/2023/05/2022-update-from-hadisdhlandv4502022f.html>.

Version Number X.Y.Z.0000p/f:

4.5.1.2022f

Major Changes X:

- None

Minor Changes Y:

- Change of wet bulb temperature formula to [Stull \(2011\); <https://journals.ametsoc.org/view/journals/apme/50/11/jamc-d-11-0143.1.xml>](#) - see [blogpost](#) (<https://hadisdh.blogspot.com/2023/01/new-wetbulb-temperature-algorithm-for.html>).

Bug fixes / historical data updates Z:

- 9555 compared to 9278 initial selection stations last year.

- Use of HadISD.3.2.0.2021f as the basis which includes retrospective improvements (to correct data, add or remove data sections) to the historical data in NCEI's ISD archive are ongoing. These are not documented.
- Bug fix to permit 36 new stations to pass through to the final dataset that were being removed when failing the new HadISDH.extremes completeness checks (product coming soon). (Incremented from 4.5.0 to 4.5.1)
- The above bug fix resulted in 9 existing stations being removed during the homogenisation process. (Incremented from 4.5.0 to 4.5.1)

Start Date DD.MM.YYYY: 1973-01-01

End Date DD.MM.YYYY: 2022-12-31

Hadisdh Data Format (Baseline documentation): <https://zenodo.org/record/7963175>

Reference: No change

- Willett, K. M., Dunn, R. J. H., Thorne, P. W., Bell, S., de Podesta, M., Parker, D. E., Jones, P. D., and Williams Jr., C. N.: HadISDH land surface multi-variable humidity and temperature record for climate monitoring, *Clim. Past*, 10, 1983-2006, doi:10.5194/cp-10-1983-2014, 2014.
- Willett, K. M., Williams Jr., C. N., Dunn, R. J. H., Thorne, P. W., Bell, S., de Podesta, M., Jones, P. D., and Parker D. E., 2013: HadISDH: An updated land surface specific humidity product for climate monitoring. *Climate of the Past*, 9, 657-677, doi:10.5194/cp-9-657-2013.
- Smith, A., N. Lott, and R. Vose, 2011: The Integrated Surface Database: Recent Developments and Partnerships. *Bulletin of the American Meteorological Society*, 92, 704-713, doi:10.1175/2011BAMS3015.1.

Other notes: The update blog post is here: <https://hadisdh.blogspot.com/2023/05/2022-update-from-hadisdhlandv4502022f.html>