

Relative Humidity at Armagh Observatory from 1838 to 2008

Wet and Dry bulb thermometer readings have been made at Armagh Observatory from 1838 to 2008 in the morning and from 1844 to 1964 in the evening. These data can be found under the subdirectories /temperature/wet and /temperature/dry, Calculations to derive relative humidity from these readings were carried out by Ana Garcia Suarez and John Butler over the period 2000-2011 with the final RH computation in February 2011 using equations given by Butler and Garcia-Suarez (2011) including an equation by Buck(1981) for occasions when the wet bulb is frozen. Corrections for time of observation were made by CJB in February, 2011 to form two standardized series at 09:00 and 21:00.

Days in 1874-1881 with missing data have been patched with RH computed from the wet and dry readings at 09:00 from the Automatic Weather Station at Armagh ("Hourly readings from the self recording instruments at the Seven Observatories in connection with the Meteorological Office, 1874-1881")

The 1838-2004 wet and dry data in the morning and also 1844-1965 in the evening have been corrected for thermometer errors by AMGS. An additional correction for time of observation (1838-1938 for the morning series; 1844-1938 for the evening series) has been applied to the derived humidity series by following the procedure outlined in Butler and Garcia-Suarez, (2011), using the mean diurnal RH curves calculated from the wet and dry temperature data from the Self Recording Thermograph of the Automatic Weather Station from 1874-1883. The humidity in the morning has been transformed to the equivalent of the relative humidity at 09:00 GMT. Data from 1938 to the present does not need a correction for time of observation as data were recorded at 9 AM. The estimated error is 2%. A list of the time of observations is given in Table 1 in Butler et al., (2005). Note, there was an additional change for morning readings during Summer Time in 1917/18, after Dreyer left and before Ellison arrived. Evening humidity readings have been corrected for the time of observation to the equivalent at 21:00 GMT.

References:

Butler, C.J. and Garcia-Suarez, A.M. (2012a). Relative Humidity at Armagh Observatory, 1838-2008. *International Journal of Climatology* 32, 657-668. Published online 21 Feb. 2011; DOI: 10.1002/joc.2302

Garcia-Suarez, A.M. Butler, C.J., Coughlin, A.D.S. Cardwell, D. Boyle, E., Ryan, G. and Dougan, L. (2006). *Meteorological Data recorded at Armagh Observatory: Volume VII - Daily, Monthly and Annual wet and dry Temperatures and relative humidity 1838-2004*, Armagh Observatory Climate Series.

Butler, C.J. and Garcia-Suarez, A.M. (2012b). A long relative humidity series for Armagh Observatory: Its relevance to the occurrence of 19th century potato famines in Ireland and atmospheric warming in the 20th century. *Proc. Tyndall Conference, "150 years of Greenhouse Gases"*, 1-4, December 2011, Dublin. R. Bates and F. McGovern (eds) 2012, Environmental Protection Agency and Royal Irish Academy.

Butler, C. J., Garcia-Suarez, A.M., Coughlin A.D.S. and Morrell C., 2005a. Air Temperatures at Armagh Observatory, N. Ireland from 1796-2002. Int. J. of Climatol. 25, 1055-1079.

Files:

/humidity/daily/no-time-corr/rham-1838-2008-2 , rhpm-1844-1964 Daily Relative Humidity at the time of observation.

/humidity/daily/time-cor/rham-tc-1838-2008-4-head, rhpm-tc-1844-1964-4-head Daily RH corrected to 09:00 and 21:00 GMT.

/humidity/monthly/rham-tc-mon-1838-2008-head, rhpm-tc-mon-1844-1964-head

Mean monthly RH at 09:00 and 21:00 GMT

/humidity/seas-ann/rham-tc-seas-1838-2008, rhpm-tc-seas-1844-1964 Mean RH during winter spring, summer and autumn and annually at 09:00 and 21:00 GMT.

/humidity/hourly-RH/RH_1874, RH_1875 .. etc RH calculated for each hour of the day from the wet and dry temperature readings from the Automatic Weather Station at Armagh for the ten years 1874-1883. Rows: day number; Columns: GMT

/humidity/hourly-RH/mean-hourly-RH-1874-1883 The mean RH for each hour, for each day of the year, averaged over the ten years 1874-1883.

/humidity/hourly-RH/mean-15d The mean RH for each hour of the day, for each day of the year, averaged over the ten years 1874-1883 and for fifteen days centred on the date in question (seven days before, the day itself and the seven days following), This file was used to make the correction for time of reading of the long AM/PM series from 1838/1844.

Archive Reference files:

ARM/MET/001106, ARM?MET/001107, ARM/MET/001108, ARM/MET/001109, ARM/MET/001110, ARM/MET/001111