1. ABOUT THE DATSET

Title: Screen air temperature measurements 2019-2020

Creators: Giles Harrison[1] and Stephen Burt[1]

(1) Department of Meteorology, University of Reading, UK

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Description: This dataset contains a processed subset of meteorological data from the Reading University Atmospheric Observatory[1], concerned with a comparison of air temperature measured in different thermometer enclosures (screens). This comparison between two different thermometer enclosures investigates uncertainties associated with conventional meteorological measurements of air temperature.

Cite as: Harrison R.G. and Burt S.D., Screen air temperature measurements, University of Reading, Dataset. http://dx.doi.org/10.17864/1947.303

Related publication: Harrison R.G. and Burt S.D., Quantifying uncertainties in climate data: measurement limitations of naturally ventilated thermometer screens (in preparation)

2. TERMS OF USE

3. PROJECT AND FUNDING INFORMATION

This dataset was not created in the course of a funded project.

4. CONTENTS

The two data files contained in this archive contain time series of meteorological quantities. Together with the air temperatures investigated, wind speeds at a range of heights, solar radiation, long wave radiation relative humidity and rainfall are also included[2]. The quantities are all from the 5min average values routinely provided by the Observatory systems in daily files, processed further and combined to produce a single data file of: naturally ventilated screen dry bulb and wet bulb temperature (T_{dry} and T_{wet}), Relative Humidity (RH), temperature in the aspirated screen (T_{asp}), global solar irradiance (S_g), direct beam irradiance (S_b), diffuse solar irradiance (S_d), wind speeds at 1.12m, 2m and 5m height (U_{112}, U_2, U_5), rainfall, net radiation (R_n), upwards and downwards longwave radiation (LW_{up} and LW_{dn}). Further, processing of the original one second sampled was undertaken to generate 20s averages, of T_{dry}, T_{asp} and U_2.

The data files are:

(1) AllTAspData2.txt –5minute average values (from 1s samples)
(2) TscrnFidas20s.txt –20s average values (from 1s samples) of a subset of the quantities in (1).

Both files are plain ascii text files, with each line of data values in columns from left to right representing values obtained at the same time. Tabs are used to separate the values. Comment lines begin with "#" and missing values are marked as "NA" (Not Available).

The columns of file (1) containing the 5minute average values are arranged as:

Column number	Quantity	Description	unit
1	LineNo	Count of the line number	
2	year	Calendar year	
3	yearday	Day number of the year (1st January =1)	
4	dectime	Hour of day expressed as decimal values	UTC
5	T_{dry}	Dry bulb temperature in naturally ventilated screen	°C
6	T_{wet}	Wet bulb temperature in naturally ventilated screen	°C
7	RH	Relative humidity (probe) in naturally ventilated screen	%
8	T_{asp}	Temperature in aspirated screen	°C
9	S_g	Global solar irradiance	Wm^{-2}
10	S_d	Diffuse solar irradiance	Wm^{-2}
11	U_{112}	Cup anemometer wind speed at 1.12m	ms^{-1}
12	U_2	Cup anemometer wind speed at 2m	ms^{-1}
13	U_5	Cup anemometer wind speed at 5m	ms^{-1}
14	Rain	Daily rainfall total to time measured	mm
15	R_n	Net radiation	Wm^{-2}
16	LW$_{up}$	Upwards long wave radiation	Wm^{-2}
17	LW$_{dn}$	Downwards long wave radiation	Wm^{-2}
18	T_{diff}	screen temperature difference T_{dry}-T_{asp}	°C

The columns of file (2), containing the 20s average values are arranged as:

Column number	Quantity	Description	unit
1	Decimal yearday	Day number of the year (1st January =1), expressed as a decimal value	
2	T_{dry}	Dry bulb temperature in naturally ventilated screen	°C
3	T_{asp}	Temperature in aspirated screen	°C
4	U_2	Cup anemometer wind speed at 2m	ms^{-1}

Further discussion of the instrumentation and the quantities above is available in Harrison (2014).

5. METHODS

Two electrical resistance thermometers in different exposure situations – thermometer screens - were sampled every second by a Campbell Scientific CR9000X data logger, and the resistances converted to temperature and stored.

One platinum resistance thermometer was contained within a conventional, naturally ventilated large MetSpec thermometer screen and another within a forced ventilated (electrically aspirated) thermometer screen (Young model 43502). Measurements were obtained between 7 November 2019 (day 188 of 2019) and 16 August 2020 (day 229 of 2020), alongside a wide range of other meteorological measurements also made at the site. The temperatures recorded in the naturally ventilated screen are designated T_{dry}, and those within the aspirated screen, T_{asp}.

The naturally ventilated and aspirated screens were mounted close to each other, as shown in figure 1 below, with the thermometers they contained at the same height. The platinum resistance thermometers were 1/3 Din PT100 sensors made by Campbell Scientific. Both thermometer screens were close to radiation instruments measuring solar and terrestrial radiation, and a vertical array of cup anemometers.
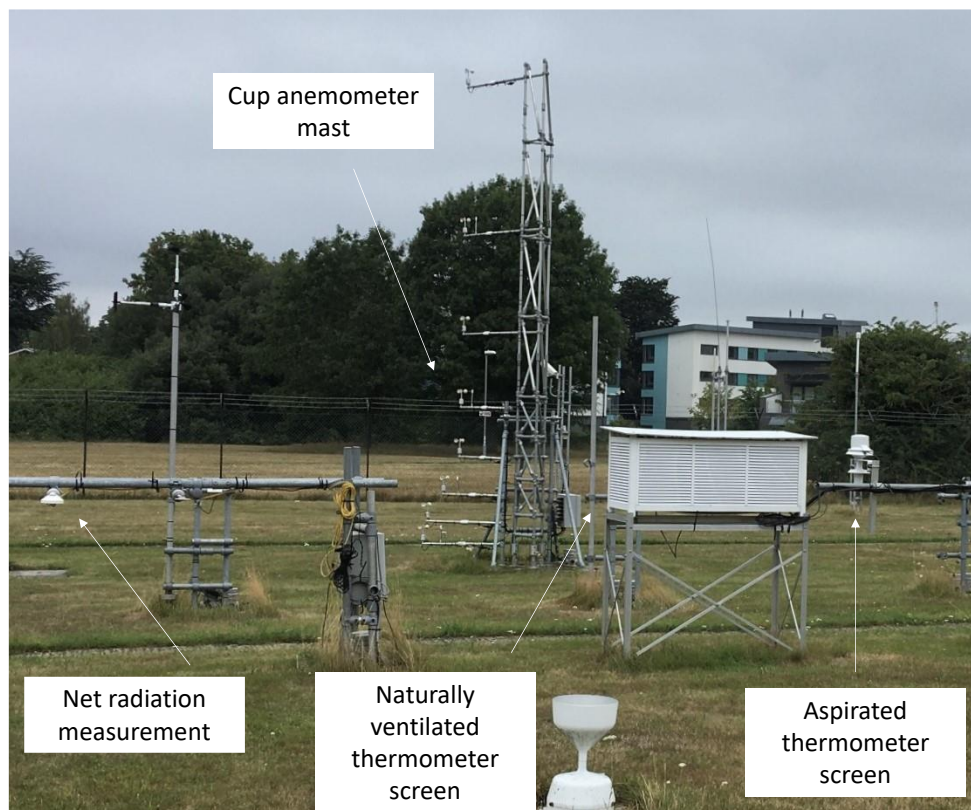

Figure 1. Arrangement of the naturally ventilated and aspirated thermometer screens at the Reading University Atmospheric Observatory.

Reference

Harrison, R.G., 2014 *Meteorological measurements and Instrumentation* (Wiley, Chichester).

[1] https://research.reading.ac.uk/meteorology/atmospheric-observatory/
[2] https://research.reading.ac.uk/meteorology/atmospheric-observatory/observatory-metadata/instruments-and-metadata/