

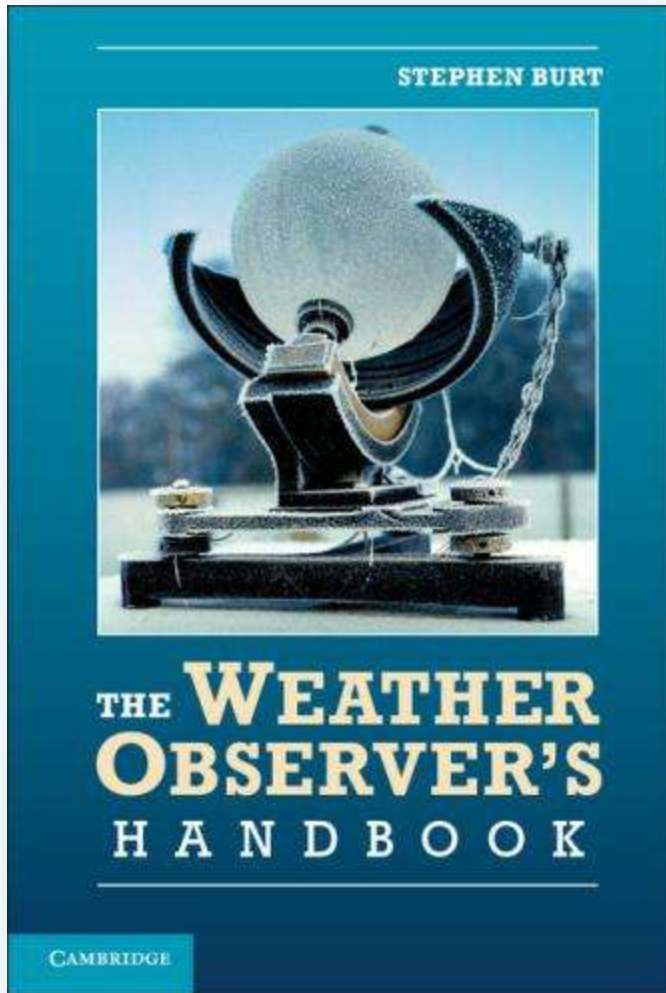
This review was presented at the Royal Meteorological Society's Second Amateur Meteorologists' Conference held at the University of Reading on 13-15 September 2013.

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## ***The Weather Observer's Handbook*** by Stephen Burt

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456 pp., 20 chapters, 4 Appendices, Index  
128 b/w illus. 2 maps 50 tables, 228 x 152 mm

*“I would highly recommend this comprehensive weather-observing guide to hobbyists, professionals, teachers, and college instructors. The author has done an outstanding job making the book accessible to anyone interested in observing the weather, even if they do not have a technical background. At the same time, there is plenty of useful information for those of us who have been professionally involved in observing the weather for quite some time.”*

***Bulletin of the American Meteorological Society***, May 2013

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*Instrument review*  
**Davis Instruments**  
**Vantage Vue AWS**

**Stephen Burt FRMetS**  
*Climatological Observers Link*

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Second RMetS Amateur Meteorologists' Conference  
University of Reading, UK  
September 2013

For Davis Instruments Vantage Pro2 review, see  
[www.measuringtheweather.com](http://www.measuringtheweather.com)

# Overview

## Objective

- Comparison against UK-standard climatological instruments
- Objective assessment of climatological worth

## Method

- Simultaneous same-site logging of adjacent systems
- Referenced against calibrated sensors

## Period

- 14 months, 9 June 2012 to 1 September 2013
- ~ 129 000 observations, availability typically 99.8%

# Overview

## Elements compared

- **Temperature**
- **Precipitation**
- Humidity and dew point
- Barometric pressure
- Wind speed and direction
  
- Ease of setup and installation
- Reliability and durability

# This comparative study is entirely independent of both manufacturer and equipment reseller

- AWS kindly loaned for this review by Dr John Dann, Prodata Associates



[www.weatherstations.co.uk](http://www.weatherstations.co.uk) 03336 664175

- Standard 'off the shelf' package with no special modifications or calibrations – 'sample of one'
- **The author has no connection with Davis Instruments or Prodata Associates (other than as an existing customer of the latter), and no incentives were offered or sought to influence this review in any way**

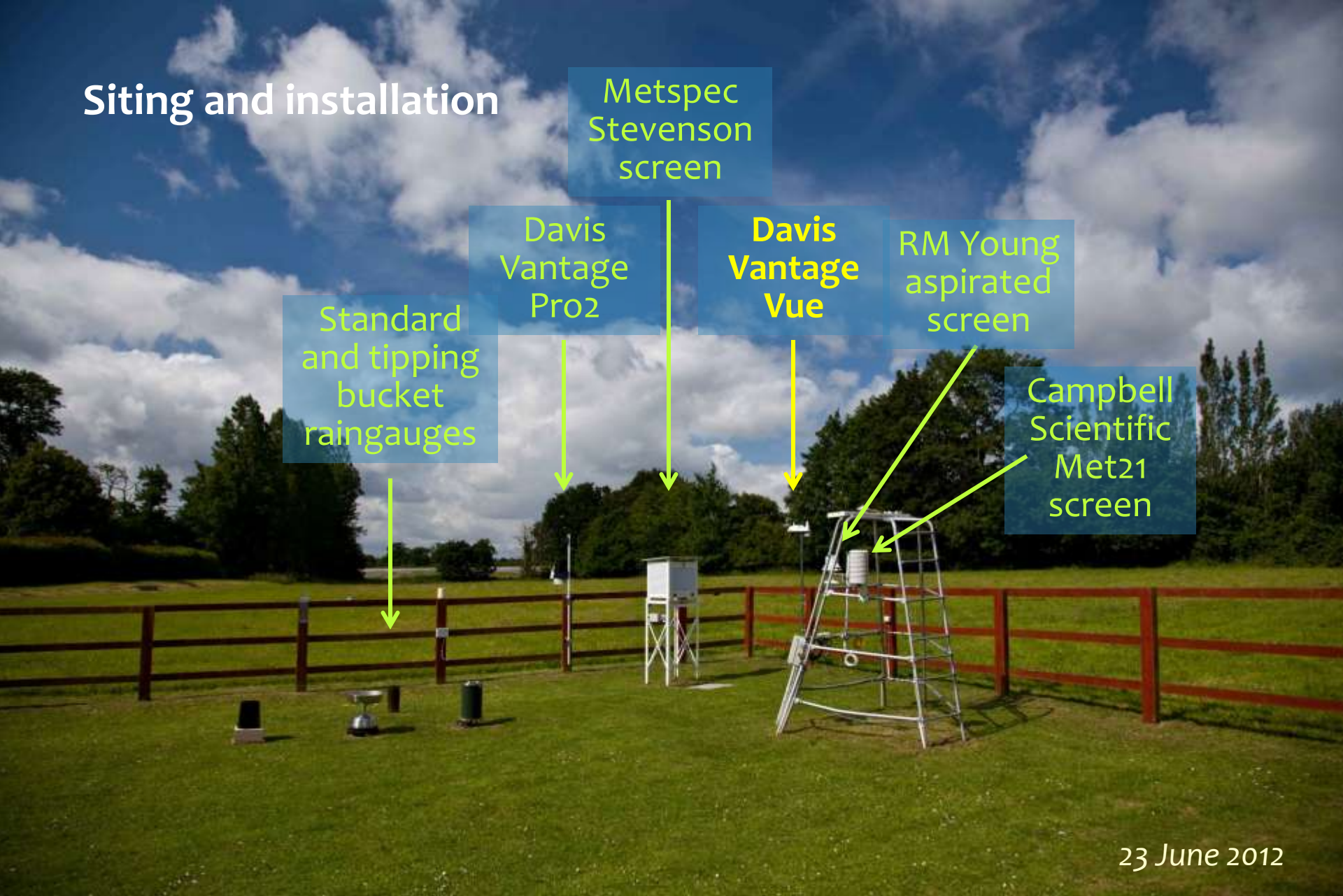
# Davis Instruments Vantage Vue AWS

- 'All-in-one' AWS
  - Temperature, humidity, wind speed and direction, barometric pressure, precipitation
  - Sensors cannot be independently positioned for optimum exposure
- Prodata price (Sept 2013) £289 inc VAT
  - £395 including logger and WeatherLink software (as tested)

Wireless  
interior display unit  
(includes barometer)



# Siting and installation



Metspec  
Stevenson  
screen

Davis  
Vantage  
Pro2

Davis  
Vantage  
Vue

RM Young  
aspirated  
screen

Standard  
and tipping  
bucket  
raingauges

Campbell  
Scientific  
Met21  
screen

23 June 2012

Comparison site – Stratfield Mortimer Observatory, Berkshire 51.4°N 1.0°W



# Siting and installation

Davis  
Vantage  
Pro2



1.25 m  
above  
short  
grass



Davis  
Vantage  
Vue



2.0 m  
above  
short  
grass

23 June 2012

# Air temperature comparison basis

- Compared with adjacent MetO standard Metspec Stevenson screen using calibrated Omega Engineering platinum resistance sensor
- Sampling and logging:
  - Screen PRT - 10 s samples, 60 s running mean logged 1 min, 5 min, hourly to Campbell Scientific CR1000 logger/multiplexer
    - › Aspirated and Met21 screens as Stevenson screen
  - Davis Vantage Vue 10 s spot, logged 5 min
- Evaluations
  - Mean temperature differences
    - › By month and by hour of day
    - › By solar radiation and wind speed combinations
  - Logged max and min temperatures 00-00h
  - Performance under specific conditions
  - Performance within 0.2 and 0.5 degC of Stevenson screen temperature
  - Comparison with adjacent Davis Instruments Vantage Pro2 AWS



# Temperature

## Vantage Vue - hourly mean differences from Stevenson screen

Month and hour (UTC)	1	2	3	4	5	6	7	8	9	10	11	12	Average
00	-0.20	-0.22	-0.25	-0.18	-0.16	-0.14	-0.08	-0.03	-0.03	-0.05	-0.05	-0.09	-0.12
01	-0.21	-0.20	-0.26	-0.18	-0.17	-0.14	-0.09	-0.04	-0.03	-0.05	-0.07	-0.10	-0.12
02	-0.21	-0.21	-0.27	-0.18	-0.15	-0.14	-0.08	-0.02	-0.02	-0.06	-0.07	-0.09	-0.11
03	-0.21	-0.22	-0.25	-0.16	-0.15	-0.14	-0.07	-0.03	0.00	-0.06	-0.08	-0.10	-0.11
04	-0.20	-0.23	-0.28	-0.16	-0.14	-0.15	-0.08	-0.04	-0.01	-0.05	-0.07	-0.10	-0.12
05	-0.20	-0.22	-0.25	-0.16	-0.17	-0.14	-0.09	-0.05	-0.01	-0.05	-0.04	-0.10	-0.12
06	-0.20	-0.22	-0.26	-0.20	-0.21	-0.05	-0.05	-0.07	-0.03	-0.05	-0.06	-0.12	-0.11
07	-0.22	-0.21	-0.23	-0.14	-0.11	0.02	0.10	-0.02	0.06	0.04	-0.08	-0.11	-0.06
08	-0.23	-0.21	-0.20	-0.06	0.02	0.09	0.17	0.10	0.14	-0.01	-0.07	-0.10	0.00
09	-0.21	-0.21	-0.20	-0.01	0.06	0.20	0.19	0.11	0.09	-0.06	-0.12	-0.11	0.01
10	-0.20	-0.20	-0.16	0.01	0.09	0.20	0.25	0.17	0.09	-0.02	-0.17	-0.15	0.03
11	-0.18	-0.19	-0.11	0.07	0.14	0.24	0.31	0.20	0.13	-0.01	-0.16	-0.21	0.06
12	-0.14	-0.18	-0.10	0.09	0.17	0.26	0.36	0.24	0.17	0.03	-0.09	-0.19	0.10
13	-0.10	-0.16	-0.06	0.11	0.18	0.25	0.35	0.27	0.22	0.06	-0.04	-0.14	0.12
14	-0.09	-0.12	-0.04	0.12	0.18	0.26	0.36	0.27	0.22	0.09	0.02	-0.06	0.14
15	-0.08	-0.06	-0.04	0.15	0.23	0.26	0.39	0.28	0.28	0.13	0.05	0.05	0.16
16	-0.12	-0.02	-0.03	0.17	0.26	0.28	0.45	0.31	0.32	0.11	-0.04	-0.07	0.18
17	-0.17	-0.11	-0.09	0.15	0.31	0.26	0.49	0.35	0.27	0.01	-0.12	-0.08	0.16
18	-0.20	-0.20	-0.16	0.07	0.32	0.22	0.50	0.27	0.09	-0.03	-0.03	-0.09	0.12
19	-0.19	-0.21	-0.23	-0.06	-0.19	0.19	-0.40	-0.04	-0.01	-0.04	-0.02	-0.10	0.04
20	-0.18	-0.18	-0.22	-0.11	-0.13	-0.06	-0.02	-0.07	-0.02	-0.04	-0.01	-0.08	-0.09
21	-0.20	-0.19	-0.22	-0.13	-0.17	-0.13	-0.09	-0.06	-0.02	-0.05	-0.04	-0.08	-0.11
22	-0.20	-0.21	-0.23	-0.15	-0.14	-0.15	-0.09	-0.05	0.01	-0.04	-0.05	-0.10	-0.11
23	-0.18	-0.21	-0.25	-0.15	-0.17	-0.14	-0.09	-0.05	-0.01	-0.05	-0.07	-0.08	-0.11
<b>Average</b>	<b>-0.18</b>	<b>-0.18</b>	<b>-0.18</b>	<b>-0.05</b>	<b>0.01</b>	<b>0.05</b>	<b>0.14</b>	<b>0.09</b>	<b>0.08</b>	<b>-0.01</b>	<b>-0.06</b>	<b>-0.10</b>	<b>-0.01</b>

Diurnal shortwave and longwave curves

5 min data, assigned to nearest hour UTC  
Data period 11 June 2012 to 1 Sept 2013

# Temperature

## Vantage Vue - hourly mean differences from aspirated screen

Month and hour (UTC)	1	2	3	4	5	6	7	8	9	10	11	12	Average
00	-0.29	-0.27	-0.32	-0.22	-0.24	-0.14	-0.09	-0.06	0.17	-0.04	-0.05	-0.01	-0.12
01	-0.29	-0.22	-0.31	-0.25	-0.25	-0.14	-0.12	-0.05	0.12	-0.05	-0.09	-0.06	-0.13
02	-0.28	-0.25	-0.33	-0.23	-0.22	-0.14	-0.12	-0.04	0.10	-0.05	-0.08	-0.05	-0.13
03	-0.28	-0.23	-0.31	-0.27	-0.26	-0.15	-0.13	-0.06	0.10	-0.05	-0.09	-0.05	-0.14
04	-0.27	-0.27	-0.36	-0.25	-0.22	-0.18	-0.14	-0.11	0.05	-0.05	-0.10	-0.05	-0.16
05	-0.26	-0.26	-0.32	-0.24	-0.33	-0.19	-0.22	-0.14	0.02	-0.04	-0.06	-0.04	-0.17
06	-0.24	-0.25	-0.36	-0.35	-0.36	-0.07	-0.21	-0.21	-0.06	-0.05	-0.09	-0.08	-0.19
07	-0.27	-0.25	-0.27	-0.09	0.01	0.14	0.24	-0.03	0.14	-0.04	-0.12	-0.03	-0.02
08	-0.29	-0.23	-0.13	0.02	0.19	0.29	0.46	0.22	0.51	0.06	-0.09	-0.03	0.13
09	-0.27	-0.17	-0.09	0.05	0.22	0.37	0.47	0.31	0.61	0.11	-0.04	-0.07	0.17
10	-0.23	-0.16	-0.09	0.08	0.23	0.38	0.50	0.37	0.64	0.13	-0.02	-0.07	0.20
11	-0.18	-0.12	-0.04	0.13	0.25	0.42	0.54	0.39	0.74	0.18	0.04	-0.05	0.24
12	-0.13	-0.10	-0.04	0.14	0.29	0.42	0.58	0.46	0.52	0.20	0.12	0.03	0.26
13	-0.08	-0.05	0.03	0.14	0.30	0.40	0.58	0.49	0.41	0.25	0.17	0.06	0.27
14	-0.06	-0.01	0.06	0.16	0.30	0.41	0.60	0.50	0.42	0.29	0.25	0.22	0.31
15	-0.04	0.05	0.05	0.19	0.37	0.44	0.62	0.51	0.49	0.34	0.29	0.38	0.35
16	-0.11	0.08	0.06	0.24	0.39	0.44	0.68	0.53	0.56	0.34	0.19	0.21	0.35
17	-0.22	-0.04	-0.03	0.25	0.43	0.44	0.74	0.58	0.48	0.19	0.01	0.04	0.30
18	-0.27	-0.17	-0.11	0.16	0.48	0.42	0.78	0.51	0.36	0.06	0.03	0.00	0.26
19	-0.25	-0.24	-0.20	-0.03	0.41	0.41	0.77	0.27	0.50	-0.02	0.00	0.00	0.20
20	-0.24	-0.21	-0.30	-0.05	-0.02	0.17	0.25	0.06	0.36	-0.03	0.02	0.01	0.03
21	-0.27	-0.24	-0.29	-0.13	-0.19	-0.01	0.04	-0.03	0.25	-0.02	-0.06	0.05	-0.06
22	-0.26	-0.27	-0.25	-0.16	-0.18	-0.08	-0.01	-0.06	0.32	-0.01	-0.06	0.01	-0.08
23	-0.26	-0.27	-0.29	-0.18	-0.24	-0.10	-0.05	-0.06	0.25	-0.03	-0.08	0.02	-0.10
<b>Average</b>	<b>-0.22</b>	<b>-0.17</b>	<b>-0.18</b>	<b>-0.03</b>	<b>0.06</b>	<b>0.16</b>	<b>0.28</b>	<b>0.18</b>	<b>0.33</b>	<b>0.07</b>	<b>0.00</b>	<b>0.02</b>	<b>0.07</b>

5 min data, assigned to nearest hour UTC  
Data period 11 June 2012 to 1 Sept 2013

# Temperature

## Vantage Vue - hourly mean differences from Davis VP2 AWS

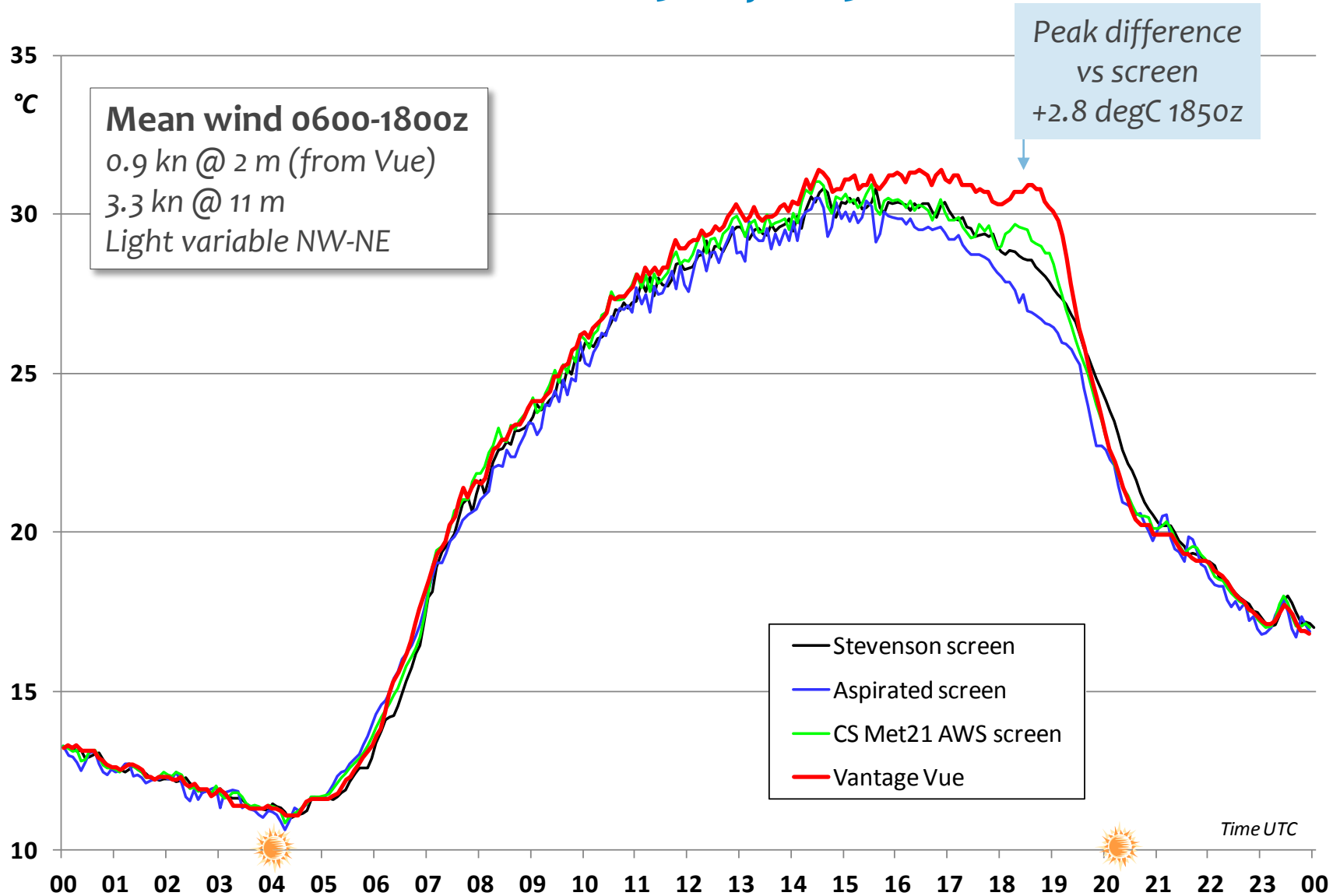
VS VP2

Month and hour (UTC)	1	2	3	4	5	6	7	8	9	10	11	12	Average
00	-0.24	-0.31	-0.43	-0.48	-0.43	-0.30	-0.33	-0.31	-0.35	-0.37	-0.21	-0.20	-0.33
01	-0.24	-0.29	-0.43	-0.48	-0.43	-0.30	-0.35	-0.32	-0.37	-0.36	-0.20	-0.23	-0.33
02	-0.25	-0.30	-0.44	-0.49	-0.43	-0.30	-0.32	-0.31	-0.38	-0.37	-0.21	-0.23	-0.33
03	-0.28	-0.33	-0.44	-0.45	-0.43	-0.31	-0.31	-0.32	-0.37	-0.37	-0.22	-0.22	-0.33
04	-0.25	-0.34	-0.46	-0.45	-0.42	-0.28	-0.30	-0.31	-0.35	-0.35	-0.21	-0.21	-0.32
05	-0.23	-0.33	-0.44	-0.43	-0.35	-0.20	-0.25	-0.29	-0.35	-0.34	-0.19	-0.20	-0.29
06	-0.24	-0.32	-0.42	-0.40	-0.25	-0.06	-0.11	-0.20	-0.32	-0.34	-0.22	-0.19	-0.23
07	-0.26	-0.31	-0.34	-0.24	-0.10	0.06	0.12	-0.01	-0.07	-0.31	-0.19	-0.20	-0.11
08	-0.26	-0.22	-0.24	-0.11	0.00	0.13	0.17	0.14	0.10	-0.18	-0.13	-0.19	-0.03
09	-0.19	-0.16	-0.17	-0.08	0.04	+0.2	0.15	0.11	0.04	-0.12	-0.01	-0.13	0.01
10	-0.13	-0.14	-0.14	-0.02	0.08	0.22	0.22	0.13	0.05	-0.11	-0.01	-0.10	0.04
11	-0.08	-0.10	-0.08	0.04	0.14	0.25	0.28	0.18	0.12	-0.08	0.00	-0.10	0.08
12	-0.06	-0.07	-0.06	0.04	0.15	0.25	0.30	0.24	0.15	-0.06	0.00	-0.11	0.10
13	-0.06	-0.09	-0.05	0.03	0.15	0.24	0.28	0.21	0.14	-0.07	-0.02	-0.12	0.09
14	-0.07	-0.08	-0.06	0.03	0.12	0.22	0.26	0.17	0.09	-0.07	0.00	-0.08	0.08
15	-0.10	-0.09	-0.10	0.02	0.10	0.20	0.24	0.13	0.08	-0.08	-0.05	-0.13	0.05
16	-0.21	-0.12	-0.14	0.00	0.11	0.18	0.24	0.11	0.05	-0.20	-0.25	-0.22	0.00
17	-0.26	-0.28	-0.23	-0.06	0.09	0.12	0.20	0.08	-0.04	-0.34	-0.31	-0.21	-0.06
18	-0.26	-0.27	-0.33	-0.17	0.06	0.07	0.16	-0.04	-0.29	-0.36	-0.21	-0.20	-0.12
19	-0.24	-0.34	-0.41	-0.32	-0.14	0.00	0.01	-0.30	-0.39	-0.34	-0.18	-0.20	-0.21
20	-0.24	-0.34	-0.40	-0.41	-0.45	-0.28	-0.35	-0.38	-0.38	-0.33	-0.18	-0.19	-0.33
21	-0.26	-0.33	-0.41	-0.41	-0.41	-0.33	-0.37	-0.35	-0.35	-0.32	-0.21	-0.20	-0.33
22	-0.26	-0.34	-0.44	-0.43	-0.41	-0.31	-0.35	-0.35	-0.32	-0.34	-0.23	-0.21	-0.33
23	-0.24	-0.31	-0.45	-0.47	-0.41	-0.31	-0.34	-0.33	-0.34	-0.36	-0.23	-0.21	-0.33
<b>Average</b>	<b>-0.21</b>	<b>-0.25</b>	<b>-0.30</b>	<b>-0.24</b>	<b>-0.15</b>	<b>-0.04</b>	<b>-0.03</b>	<b>-0.10</b>	<b>-0.16</b>	<b>-0.26</b>	<b>-0.15</b>	<b>-0.18</b>	<b>-0.15</b>

5 min data, assigned to nearest hour UTC  
Data period 11 June 2012 to 1 Sept 2013

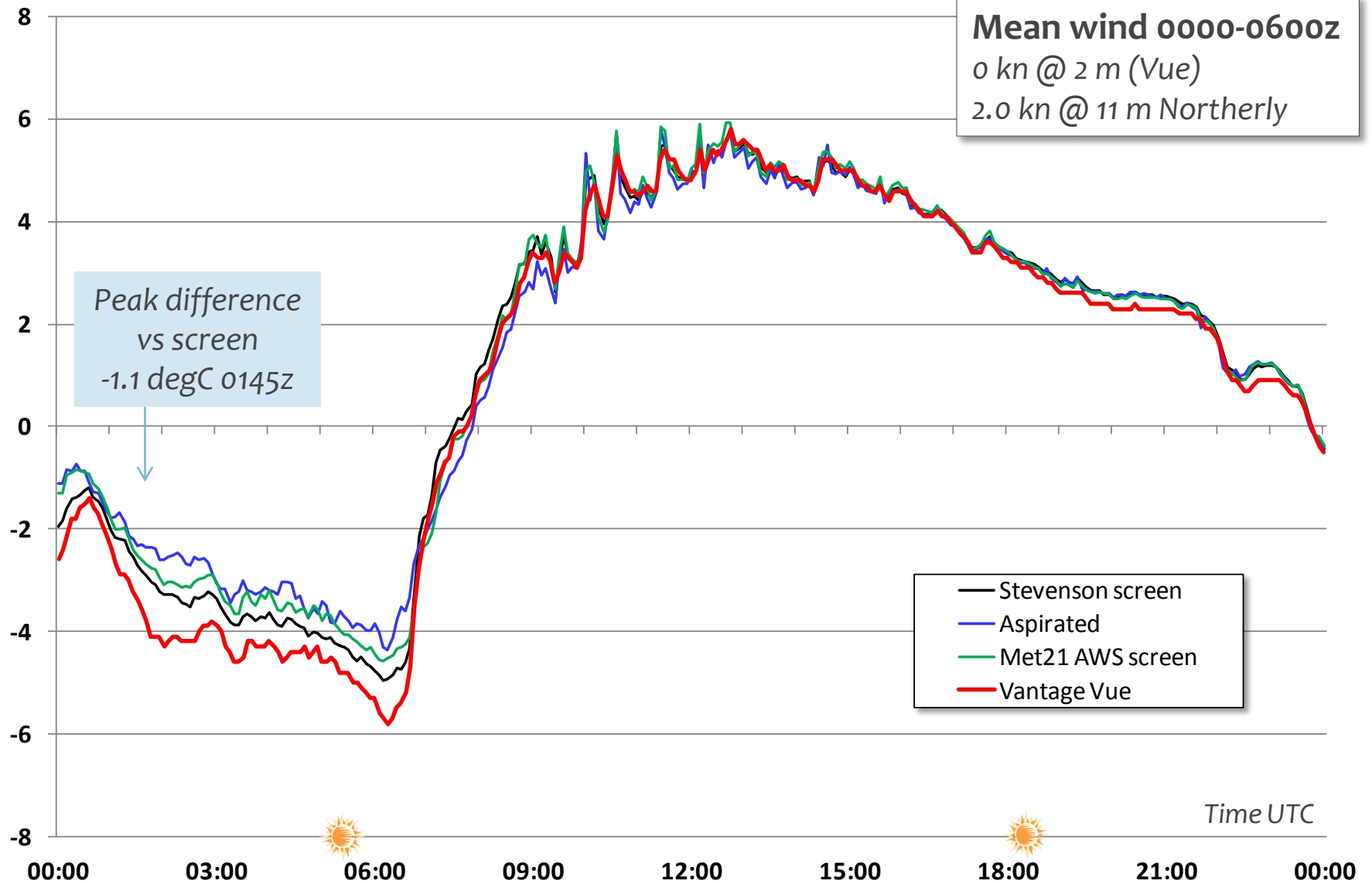
# Temperature

Summer – unbroken sunshine: 13 July 2013



# Temperature

Winter – clear, calm night: 31 March 2013



# Temperature

Dependence upon solar radiation and 2 m wind speed

Vantage Vue differences (degC) from Stevenson screen

V/Vue wind speed, kn	Global insolation, W/m2															Grand Total												
	0	50	100	150	200	250	300	350	400	450	500	550	600	650	700		750	800	850	900	950	1000	1050	1100	1150	1200	1250	
0.0	-0.12	-0.03	0.07	0.15	0.18	0.21	0.22	0.35	0.33	0.32	0.30	0.45	0.49	0.43	0.41	0.55	0.54	0.72	0.34		0.87						-0.08	
0.9	-0.10	-0.05	0.01	0.07	0.12	0.14	0.18	0.24	0.28	0.26	0.25	0.30	0.34	0.32	0.31	0.37	0.47	0.49	0.48	0.48	0.50	0.40	0.78		0.23		0.02	
1.7	-0.11	-0.04	0.02	0.08	0.12	0.16	0.19	0.18	0.21	0.22	0.25	0.26	0.28	0.26	0.28	0.31	0.34	0.34	0.36	0.38	0.36	0.43	0.54			-0.19	0.04	
2.6	-0.11	-0.05	0.01	0.07	0.13	0.13	0.15	0.22	0.23	0.21	0.24	0.24	0.24	0.22	0.22	0.26	0.25	0.29	0.30	0.30	0.17	0.24	0.22			+0.5	0.04	
3.5	-0.11	-0.04	0.02	0.05	0.10	0.12	0.15	0.17	0.20	0.22	0.24	0.22	0.24	0.24	0.20	0.26	0.24	0.26	0.27	0.25	0.09	0.21	0.30				0.04	
4.3	-0.11	-0.05	0.03	0.05	0.08	0.10	0.13	0.13	0.16	0.19	0.21	0.18	0.19	0.20	0.17	0.22	0.18	0.24	0.25	0.13	0.14	0.27	0.26				0.03	
5.2	-0.11	-0.05	0.04	0.05	0.07	0.10	0.10	0.08	0.15	0.14	0.19	0.18	0.20	0.17	0.19	0.21	0.16	0.17	0.14	0.18	0.07				+0.25		0.02	
6.1	-0.09	-0.03	0.04	0.10	0.11	0.09	0.06	0.11	0.17	0.10	0.10	0.18	0.08	0.18	0.18	0.15	0.15	0.18	0.08	0.15	-0.02	0.17	0.59				0.02	
7.0	-0.10	-0.06	0.04	0.07	0.09	0.11	0.11	0.19	0.17	0.24	0.14	0.22	0.18	0.21	0.13	0.10	0.08	0.10	0.12	0.21	0.34	0.38					0.02	
7.8	-0.09	-0.07	0.06	0.14	0.08	0.18	0.05	0.20	0.15	0.15	0.25	0.16	0.18	0.23	0.10	0.16	0.03	0.17	0.17	0.06	0.25	0.51					0.01	
8.7	-0.09	-0.04	0.00	0.11	0.12	0.09	0.19	0.14	0.08	0.12	0.12	0.14	0.09	0.13	-0.01	0.10	-0.30	0.21	0.09	0.06			-0.54				-0.03	
9.6	-0.09	-0.05	-0.01	0.01	0.09	0.25	0.09	0.17	0.18	0.10	0.18	0.22	0.06	-0.14	0.09	0.15	-0.35	-0.04	0.21		0.45	0.19	0.29				-0.02	
10.4	-0.09	-0.06	-0.11		0.13	0.02	0.10	0.06	-0.01	0.03	-0.04	-0.22	0.19	-0.01	0.09	-0.31	0.42		0.21								-0.06	
11.3	-0.10		-0.01		0.38		-0.04	0.09		0.25	0.09		-0.17	-0.15	-0.16	-0.27					-0.04						-0.07	
12.2	-0.13														-0.21													-0.15
13.0	-0.05																											-0.05
13.9	-0.15																											-0.15
<b>Grand Total</b>	<b>-0.11</b>	<b>-0.04</b>	<b>0.03</b>	<b>0.08</b>	<b>0.12</b>	<b>0.14</b>	<b>0.16</b>	<b>0.20</b>	<b>0.22</b>	<b>0.22</b>	<b>0.24</b>	<b>0.25</b>	<b>0.27</b>	<b>0.25</b>	<b>0.25</b>	<b>0.29</b>	<b>0.31</b>	<b>0.33</b>	<b>0.32</b>	<b>0.30</b>	<b>0.24</b>	<b>0.31</b>	<b>0.37</b>		<b>0.23</b>	<b>-0.19</b>	<b>-0.01</b>	

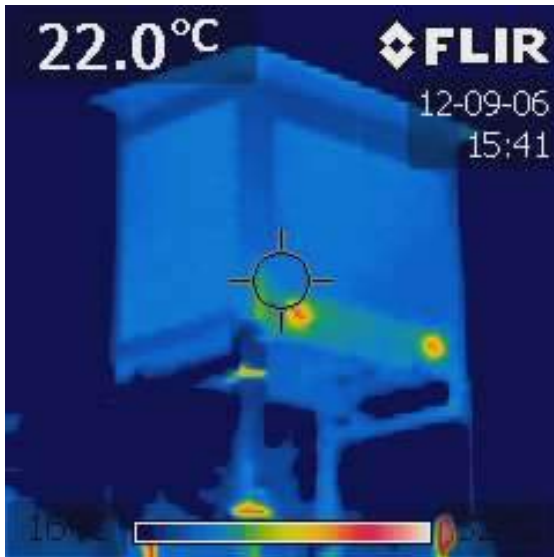
5 min data, data period 11 June 2012 to 1 Sept 2013



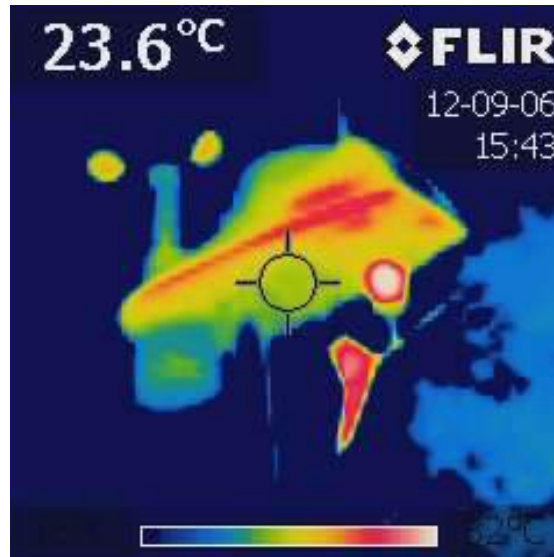
# Temperature

## Evidence from thermal imaging

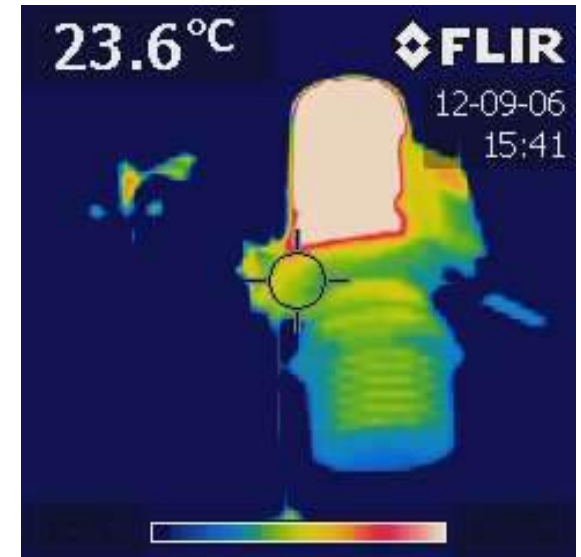
Images taken by a Flir i5 thermal imaging camera, the colour-scale is consistent.



**Metspec  
Stevenson  
screen**



**Davis  
Vantage Vue**



**Davis  
Vantage Pro2**

*Images by kind courtesy of Simon Bell, Aston University*

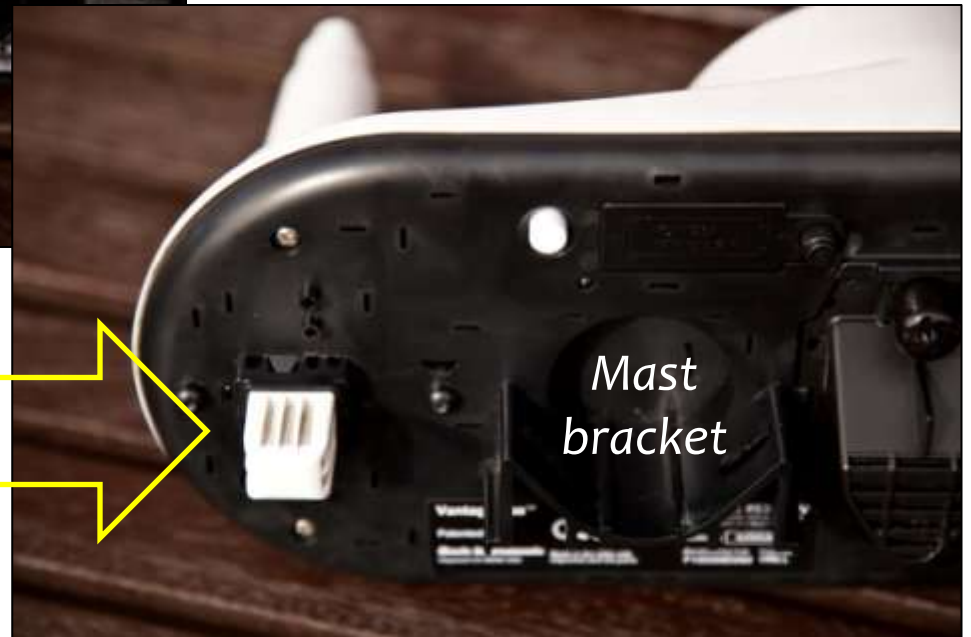
# Temperature

*Long-wave warming of underside of unit*



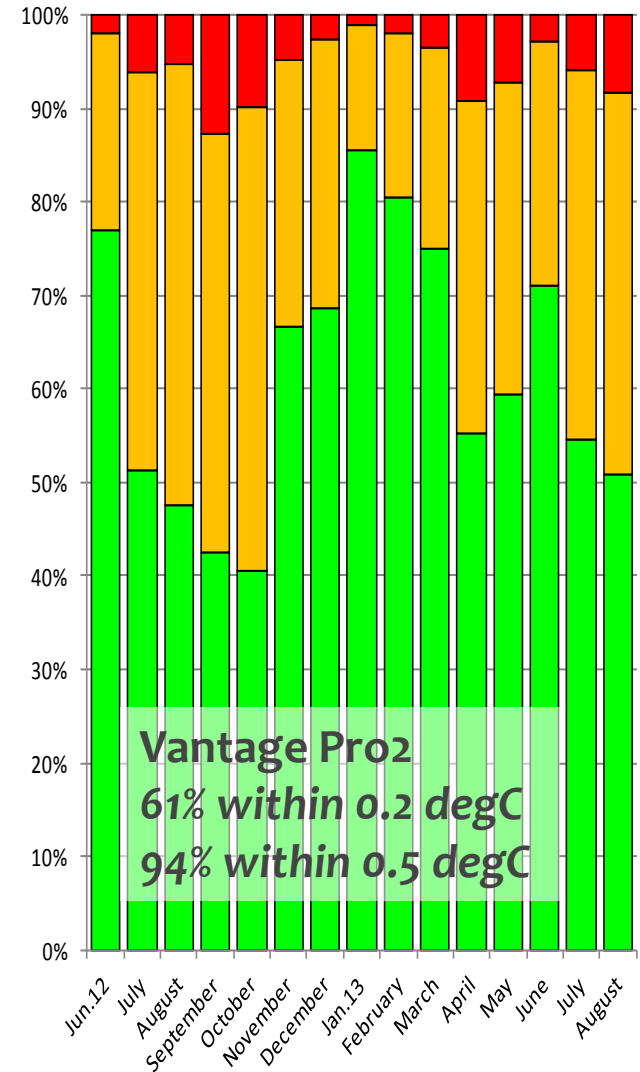
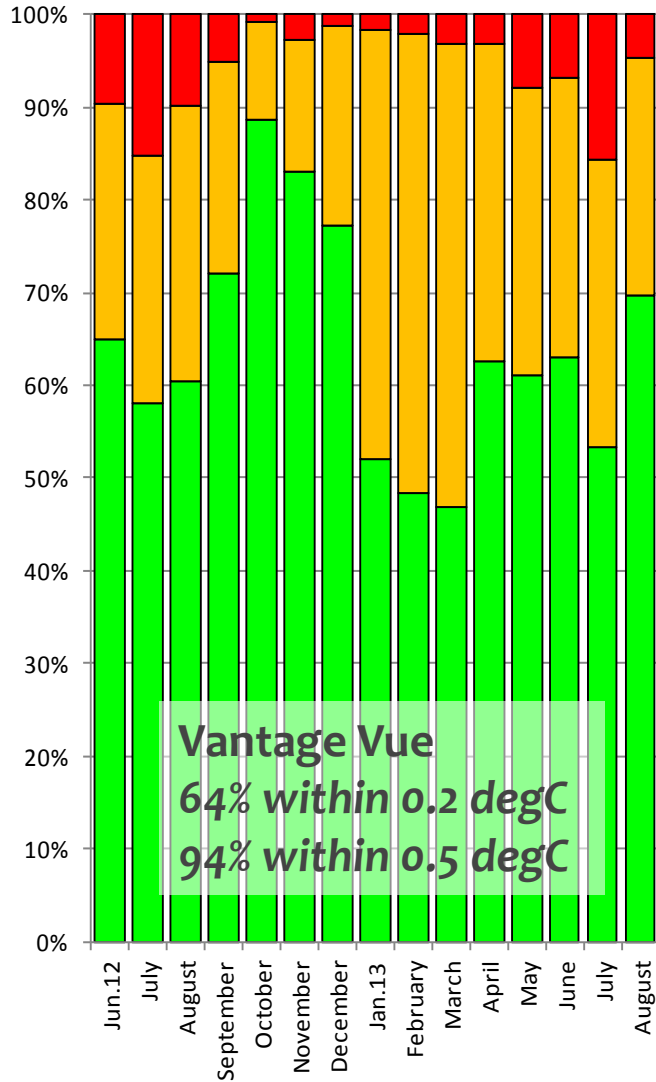
Passive screen  
70 x 90 mm, 5 'saucers'

Temperature and humidity sensor



# Temperature

Vantage Vue performance within 0.20/0.50 degC of Stevenson screen



# Temperature

## Monthly means of maximum and minimum

00-00h	MEAN MONTHLY MAXIMUM °C				MEAN MONTHLY MINIMUM °C				DIFF FROM SCREEN		
Month	VVue	Screen	Aspirated	Met21	VVue	Screen	Aspirated	Met21	Vvue M/Max	Vvue M/Min	
June 10-30th	19.0	18.7	18.6	18.7	9.6	9.7	9.6	9.7	+0.29	-0.14	
July	20.7	20.2	20.2	20.3	11.1	11.1	10.9	11.2	+0.47	-0.02	
August	22.3	22.0	21.8	22.1	11.7	11.7	11.6	11.8	+0.36	+0.03	
September	19.0	18.8	18.7	18.9	7.1	7.1	7.1	7.2	+0.21	+0.03	
October	13.4	13.4	13.2	13.5	5.9	6.0	5.9	6.1	+0.01	-0.11	
November	10.1	10.2	10.0	10.3	2.0	2.1	2.0	2.2	-0.11	-0.08	
December	8.0	8.2	8.0	8.3	1.4	1.4	1.2	1.5	-0.19	-0.05	
January	6.1	6.2	6.2	6.2	0.9	1.1	1.0	1.1	-0.16	-0.19	
February	6.0	6.1	6.0	6.1	-0.2	0.0	0.0	0.1	-0.15	-0.24	
March	6.6	6.7	6.7	6.7	-0.7	-0.4	-0.2	-0.3	-0.07	-0.33	
April	12.6	12.5	12.6	12.6	2.7	2.8	2.7	2.9	+0.04	-0.15	
May	18.7	18.5	18.4	18.6	5.5	5.6	5.6	5.7	+0.20	-0.12	
June	19.4	19.1	19.1	19.3	8.6	8.8	8.7	8.8	+0.23	-0.18	
July	26.1	25.7	25.6	25.8	11.6	11.7	11.5	11.8	+0.35	-0.12	
August	23.4	23.4	23.3	23.4	11.2	11.3	11.0	11.3	+0.06	-0.04	
<b>Average</b>	<b>14.11</b>	<b>14.07</b>	<b>13.99</b>	<b>14.16</b>	<b>4.66</b>	<b>4.80</b>	<b>4.71</b>	<b>4.86</b>	<b>+0.03</b>	<b>-0.13</b>	
<i>12 mo ended August 2013</i>											
<i>Mean RMS error</i>									0.21	0.18	
<i>Within 0.2 degC - days</i>									218	331	
									%	60	90
<i>Within 0.5 degC - days</i>									233	348	
									%	64	95

# Temperature - conclusions

- Vantage Vue screen is overly sensitive to both short-wave (solar) and long-wave (terrestrial) radiation
  - The passive shield warms more than the Stevenson screen, particularly in sunshine and light winds, and stays warm into the evening
  - Under strong solar radiation and light winds differences average  $\sim +1$  degC, can exceed  $+2$  degC
  - Under clear skies at night differences average about  $-0.5$  degC but can exceed  $-2$  degC
- 64% of the 5 min spot observations were within  $0.2$  degC of the Stevenson screen – indistinguishable from Vantage Pro2 results
- Mean absolute error was near zero, RMS error  $0.18$  degC
  - The largest and smallest differences wrt **Stevenson screen** were  $+2.8$  and  $-1.5$  degC

# Precipitation: comparison basis

- Vantage Vue ‘tipping spoon’ compared with
  - Adjacent standard copper ‘five-inch’ climatological gauge, read daily at 0900 UTC
  - 1 and 5 min logged data from Didcot 0.2 mm tipping-bucket raingauge
  - Vantage Vue gauge rim at **2.0 m AGL**, five-inch at **30 cm**, Didcot at **42 cm**

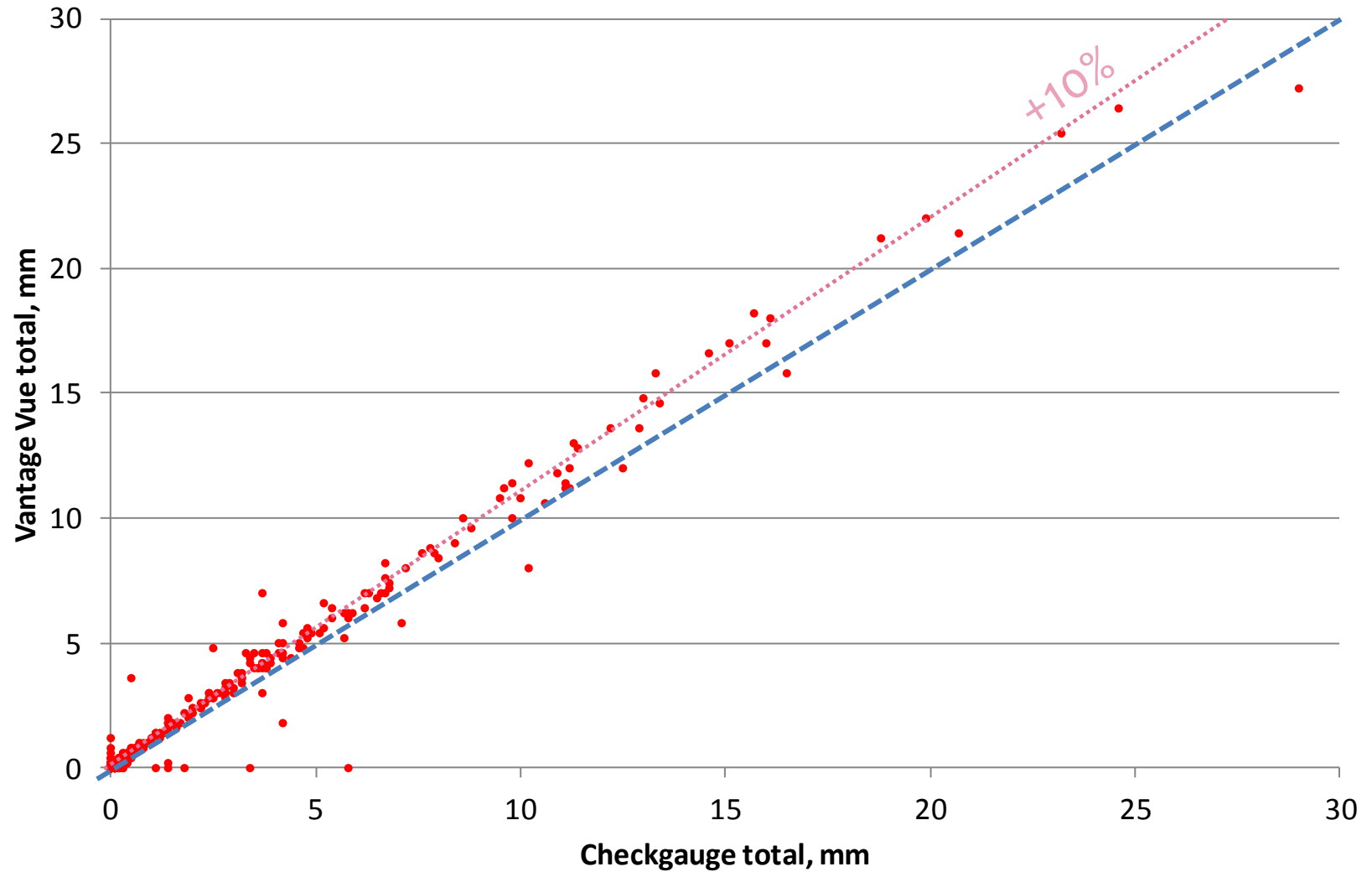


*Funnel diameter 120 mm*



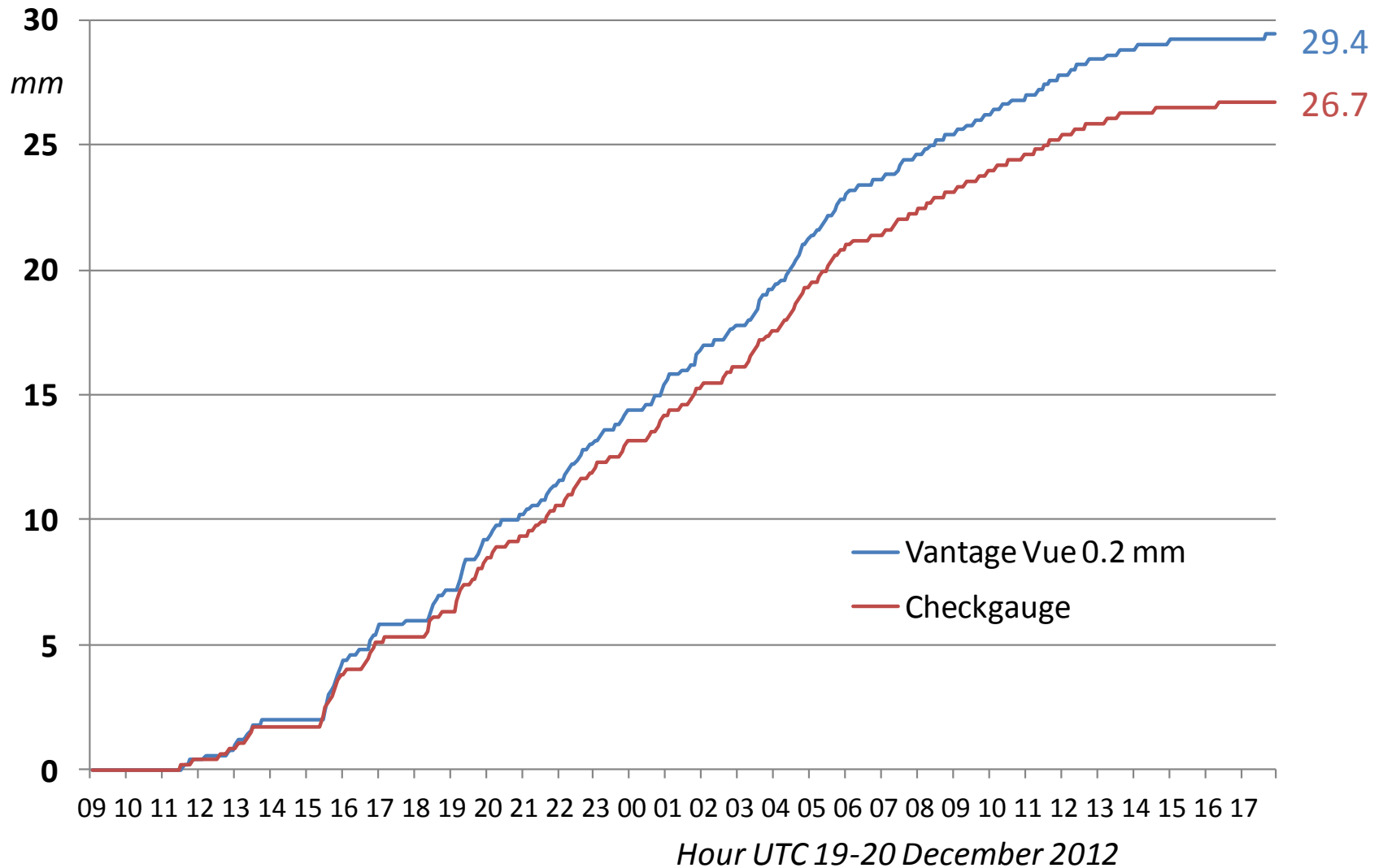
# Precipitation

Scatterplot of daily 0900-0900 UTC totals



# Precipitation

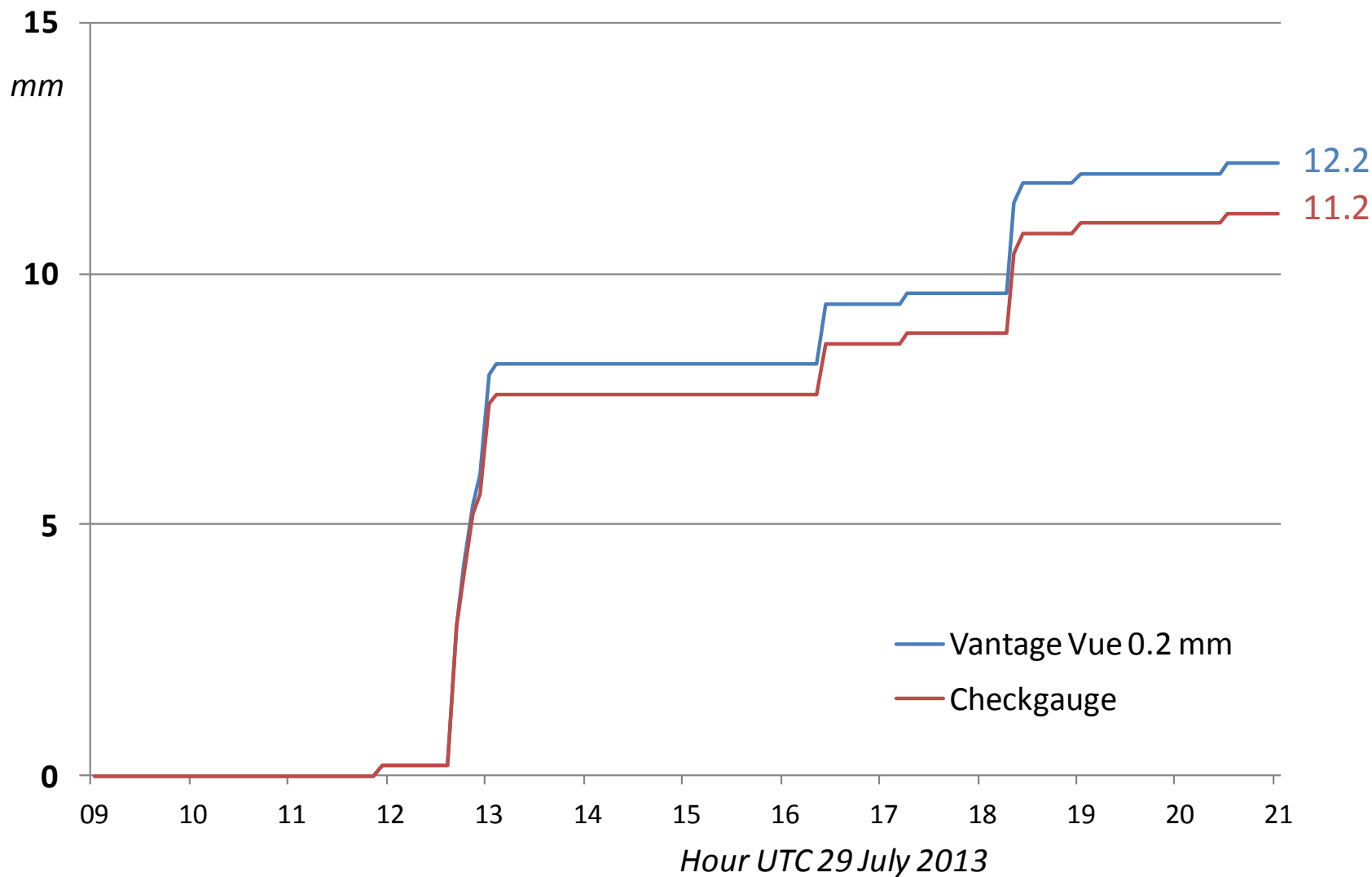
Timing: prolonged rainfall. Winds mostly SE force 2-3





# Precipitation

*Timing: intense rainfall. Showers and thunderstorms*



# Precipitation: monthly totals

## MONTHLY TOTALS

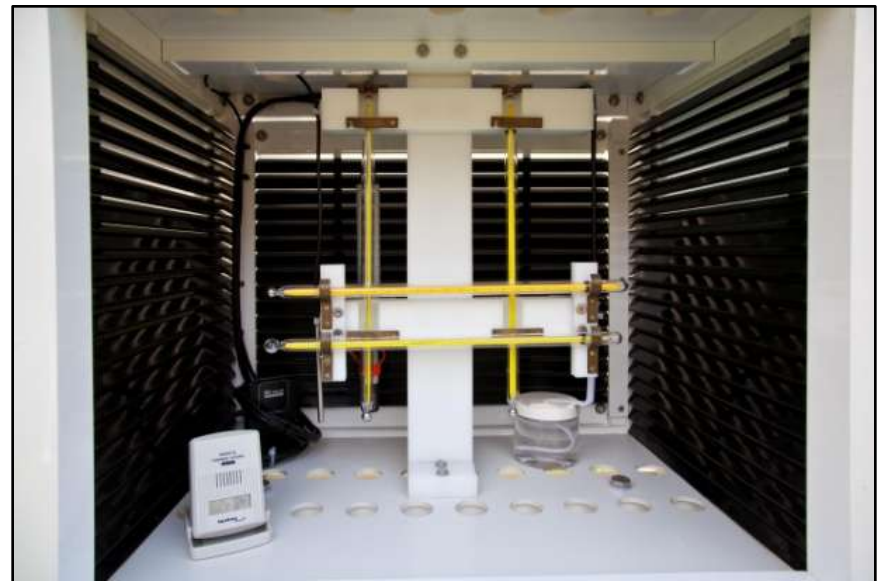
## PERCENTAGE OF CHECKGAUGE

Year	Month	Vantage		Didcot 0.2 mm TB	Didcot 0.2 mm		
		Vue	Checkgauge		Vantage Vue	TB	
<b>2012</b>	June <i>10-30th</i>	97.4	97.4	93.2	100	96	
	July	83.2	74.8	76.2	111	102	
	August	49.8	43.5	44.8	114	103	
	September	54.4	47.1	47.0	115	100	
	October	136.2	120.8	117.0	113	97	
	November	89.8	85.9	83.6	105	97	
	December	128.8	117.1	114.2	110	98	
<b>2013</b>	January	66.0	65.5	64.6	101	99	
	February	42.4	37.3	36.4	114	98	
	March	100.0	91.2	89.4	110	98	
	April	48.6	45.7	45.4	106	99	
	May	58.0	54.4	55.2	107	101	
	June	22.2	19.2	19.4	116	101	
	July	33.2	28.7	28.4	116	99	
	August	20.0	16.2	17.4	123	107	
	<b>TOTAL</b>	<b>1030.0</b>	<b>944.8</b>	<b>932.2</b>	<b>109</b>	<b>99</b>	
	<b>12 months to August 2013</b>						
	<b>Total fall, mm</b>	<b>799.6</b>	<b>729.1</b>	<b>718.0</b>	<b>110</b>	<b>98</b>	
	<b>Rain days (≥ 0.2 mm)</b>	<b>192</b>	<b>179</b>	<b>192</b>	<b>107</b>	<b>107</b>	

- Slightly high throughout
  - +5-15%
  - Should be lower owing to height!
- Higher rainday count

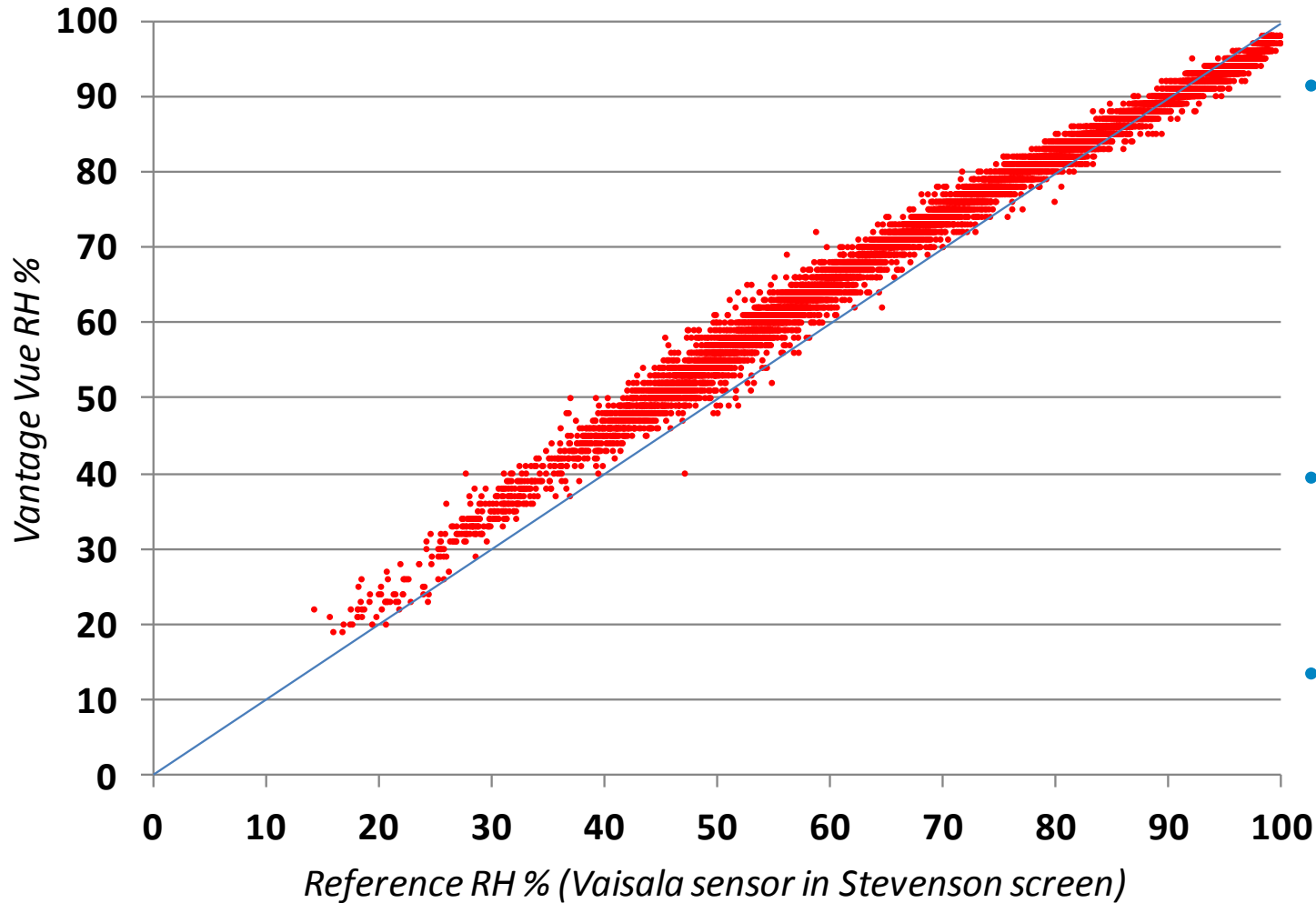
# Humidity: comparison basis

- Compared with calibrated Vaisala HMP45C capacitive sensor housed within Stevenson screen
- Sampling and logging:
  - 10 s samples, 60 s running mean logged 1 min, 5 min, hourly to Campbell Scientific CR1000 logger/multiplexer
  - Davis Vantage Vue 10 s spot, logged 5 min



# Humidity: scatterplot

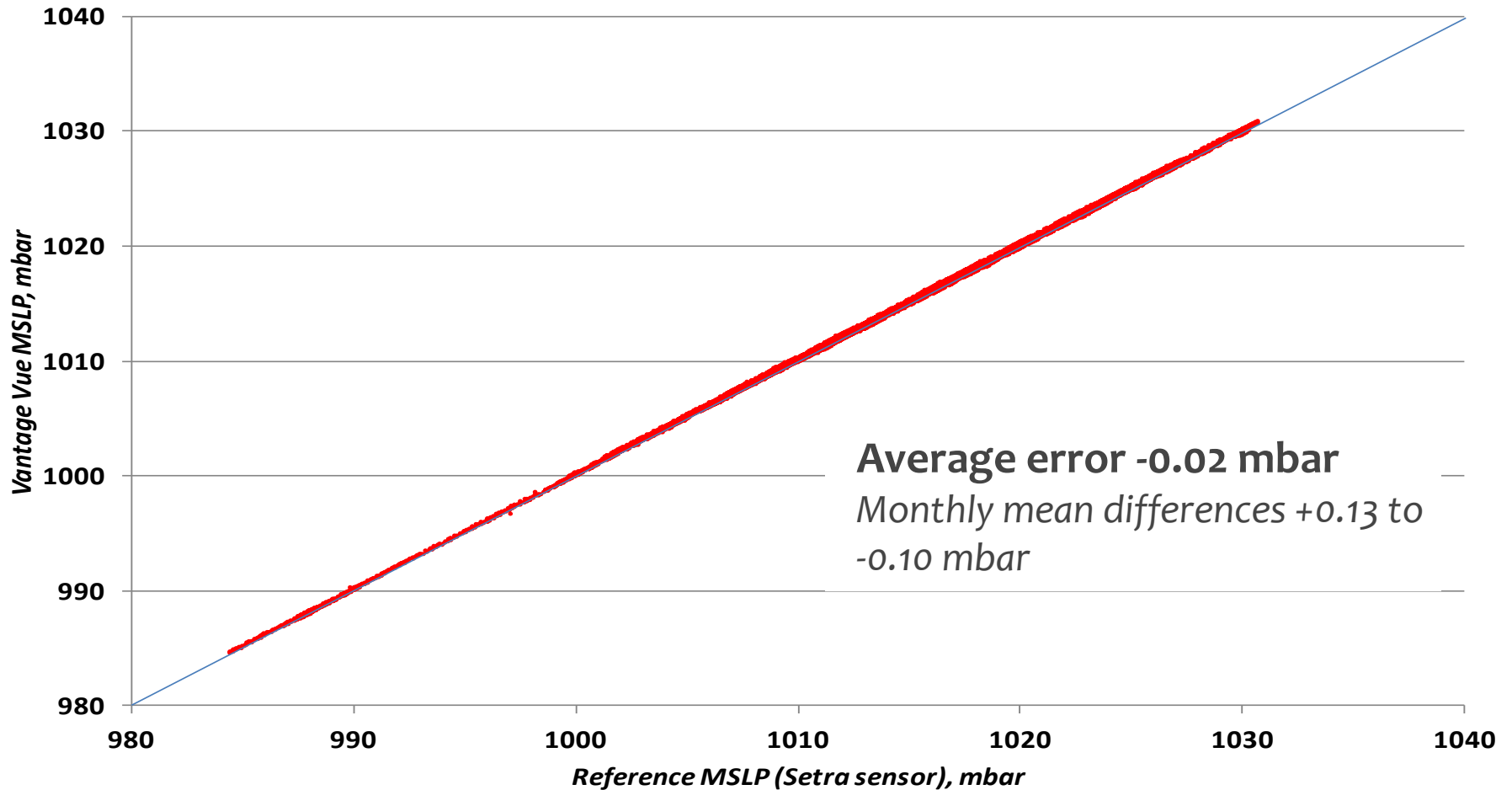
May-June 2013, 17 568 5 min observation pairs



- Slightly high most of range
  - Mean absolute error +1.9%
  - Mean RMS error +3.0%
- Worst in midrange, ~ 6% error
- Dew point errors ~ 1 degC high

# Barometric pressure: scatterplot

VV MSLP



# Wind speed comparisons

- Vue 2.0 m AGL, 2.5 s samples

Starting speeds – anemo  
~ 1.4 kn, wind vane 1-2 kn



2.0 m  
above ground

11.1 m  
above ground

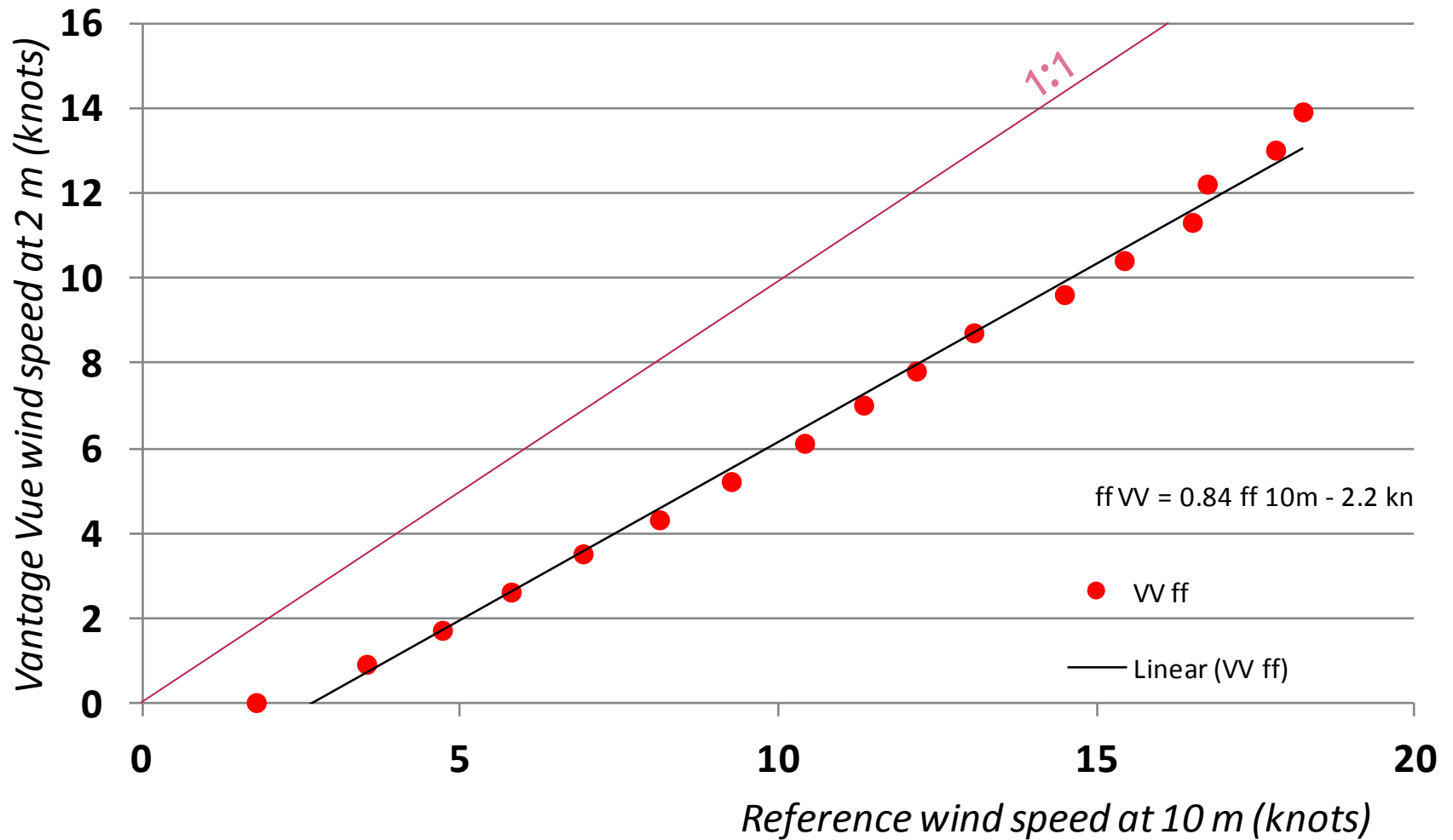
Effective height  
~ 6 m AGL



- Vector Instruments anemo/wind vane 11.1 m AGL, 1 s samples
  - Starting speeds – anemo ~ 0.5 kn, wind vane 1.0 kn
  - Gust 3 sec running mean

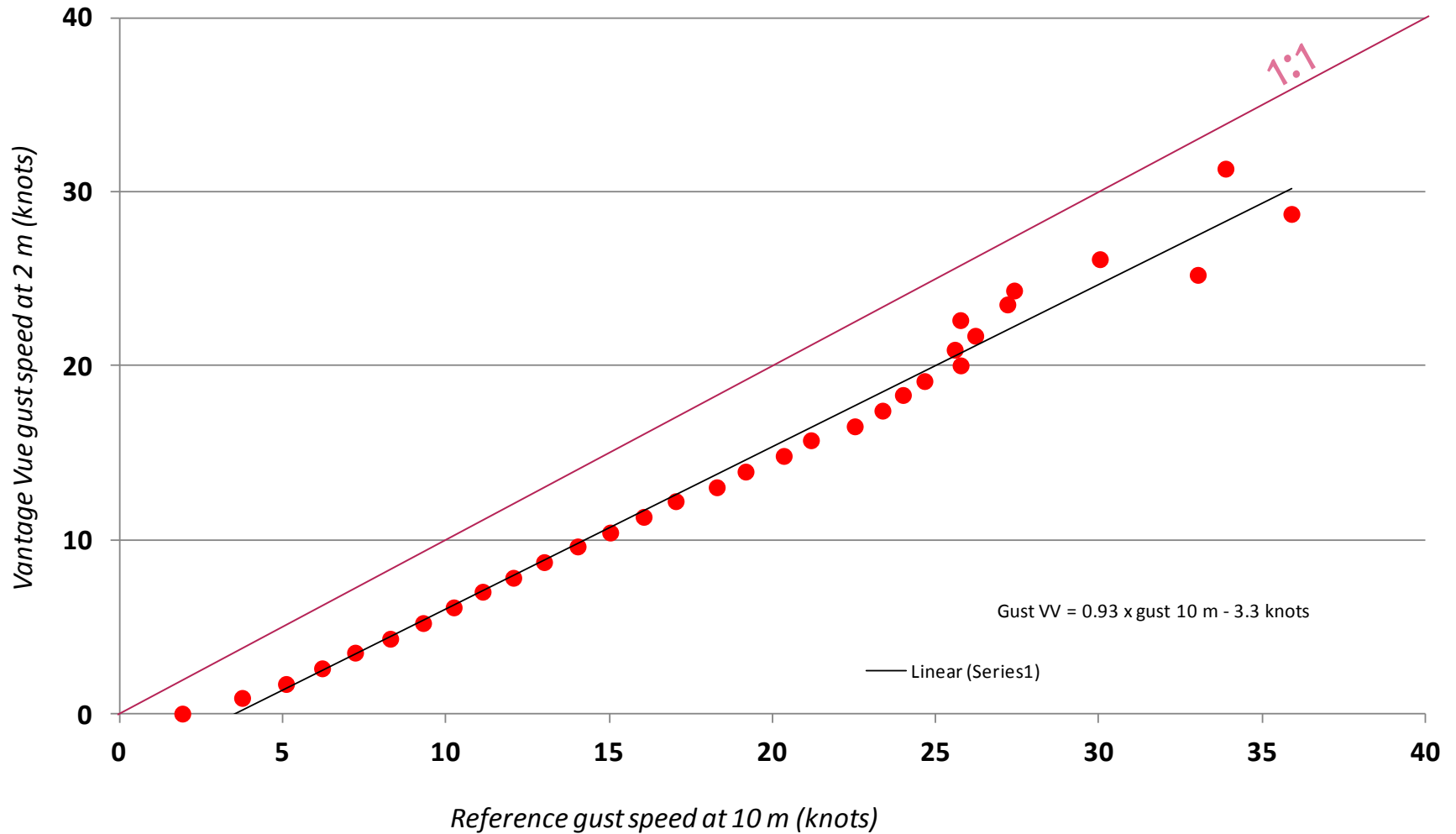
# Wind speed - means

2 m Vantage Vue vs 10 m Vector anemometer, knots



# Wind speed - gusts

2 m Vantage Vue vs 10 m Vector anemometer, knots





# Summary assessment

## Davis Instruments Vantage Vue AWS

**Accurate  
climatological  
records**

Element	Very poor	Poor	Reasonable	Good	Excellent
Setup and ease of use					X
Air temperature			X		
Precipitation		X	X		
Humidity			X		
Barometric pressure					X
Wind speed				X	
Wind direction			X		
Reliability and maintenance					X
<i>Capability</i>					X

# Conclusions

## Based on 14 month evaluation -

- Air temperature records are likely to show significant departures from neighbouring standard sites on sunny days (+1-2 degC) and on clear nights (-1 degC) owing to insufficient radiation shielding on the passive screen and black base to unit
- Rainfall readings were high – a standard ‘checkgauge’ should always be used to provide accurate rainfall measurements
- Humidity is slightly high, but within acceptable tolerances
- Barometric pressure is excellent (once set to MSL)
- Wind speed and direction are reliable, but limited to system height
- **In the author’s opinion the Davis Vantage Vue AWS represents good value for money for those who require a simple or ‘starter’ system, or where ease and simplicity of installation are paramount**

# Other instrument reviews

Other instrument reviews on [www.measuringtheweather.com](http://www.measuringtheweather.com)

- available as downloadable PDFs:

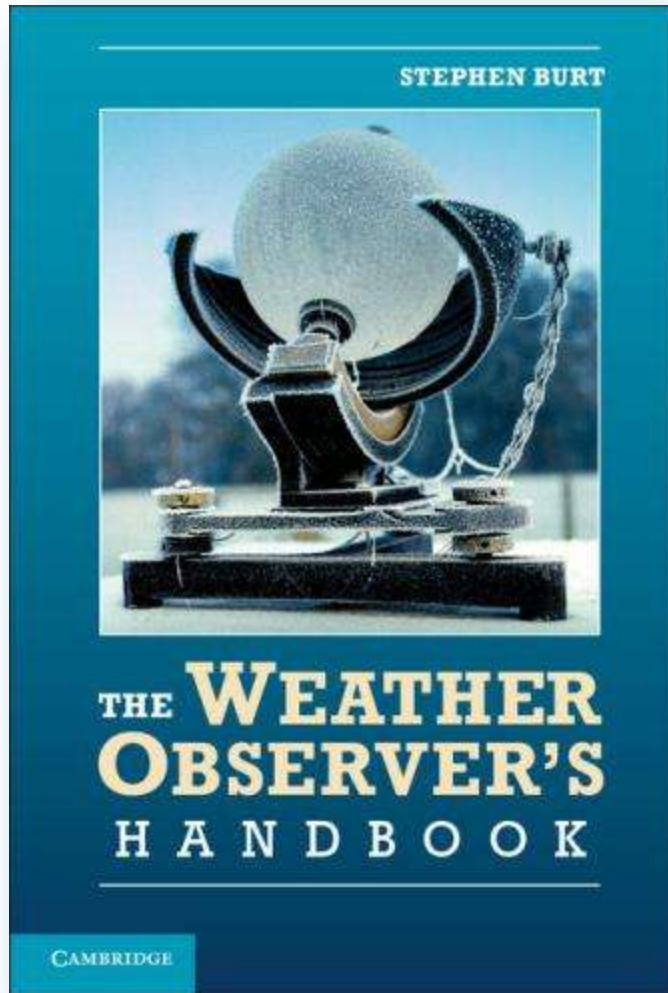
- **Davis Instruments Vantage Vue AWS** (September 2013)
- **CoCoRaHS raingauge review** (July 2013)
- **An overview of sunshine sensors** (July 2012)
- **Logging the output from the Instromet sunshine sensor** (March 2012)
- **An assessment of the Campbell Scientific 'Met21' passive AWS radiation screen** (2010)
- **Davis Vantage Pro2 AWS review** (2009)

## Reviews in hand

- Davis '7852' raingauge mounted at ground level
  - Hydreon drop-counter rain sensor
  - Sunshine recorder intercomparison
-



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## ***The Weather Observer's Handbook*** by Stephen Burt

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456 pp., 20 chapters, 4 Appendices, Index  
128 b/w illus. 2 maps 50 tables, 228 x 152 mm

*“I would highly recommend this comprehensive weather-observing guide to hobbyists, professionals, teachers, and college instructors. The author has done an outstanding job making the book accessible to anyone interested in observing the weather, even if they do not have a technical background. At the same time, there is plenty of useful information for those of us who have been professionally involved in observing the weather for quite some time.”*

***Bulletin of the American Meteorological Society***, May 2013



# Diurnal variation in shortwave (solar) and longwave (terrestrial) radiation

[Return](#)

