SU solar resource measurement station: Sonbesie metadata

Date: 30 July 2013

Introduction

A solar resource measurement station, known as Sonbesie, has been installed at Stellenbosch University. The system is intended for solar resource assessment research which directly relates to CSP, PV and CPV-developments. The Sonbesie system comprises a set of high quality radiometry and meteorological instruments (Figure 1).

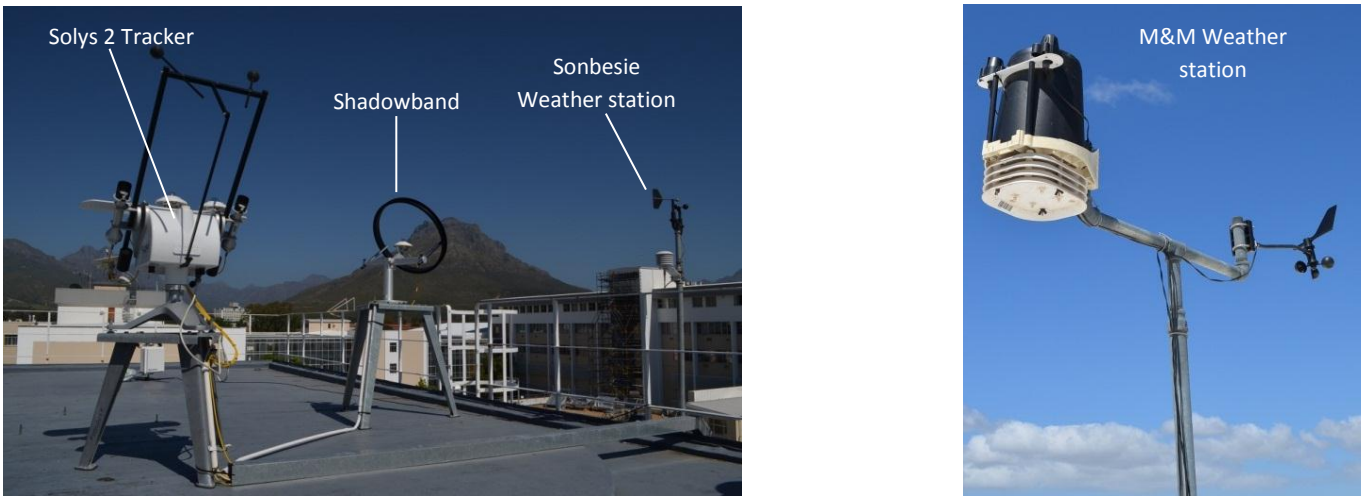


Fig. 1. Sonbesie instrumentation. From left to right: Solys2 tracker; CM 121 shadow ring; and Sonbesie weather station (approx. GPS: 33°9281'S, 18°8654'E). Far right: M&M weather station (approx. GPS: 33°9283'S, 18°8648'E).

Instrumentation

The installation includes an automatic solar tracker, Kipp and Zonen (K&Z) Model Solys 2 dual-axis sun tracker, complete with a shading ball assembly and mounting plates.

The Solys 2 houses:

- one K&Z CHP1 pyrheliometer (DNI measurements)
- one shaded K&Z CMP11 pyranometer (DHI measurements)
- one un-shaded K&Z CMP11 pyranometer (GHI measurements)
- one UVS-AB-T radiometer (UVA, UVB measurements)

A K&Z CM 121 shadow ring and CMP6 pyranometer configuration is installed to provide comparable DHI data.

Meteorological data is recorded by two separate systems: Sonbesie and M&M weather stations.

Sonbesie weather station houses:

- CS215 probe with 41303-5A radiation shield (T_{amb} & relative humidity (RH) measurements)
- RM Young wind sentry, Model 03001 (wind speed (WS), direction (WD) measurements)
- RM Young barometric pressure sensor, Model 61205V (barometric press (BP) measurements)

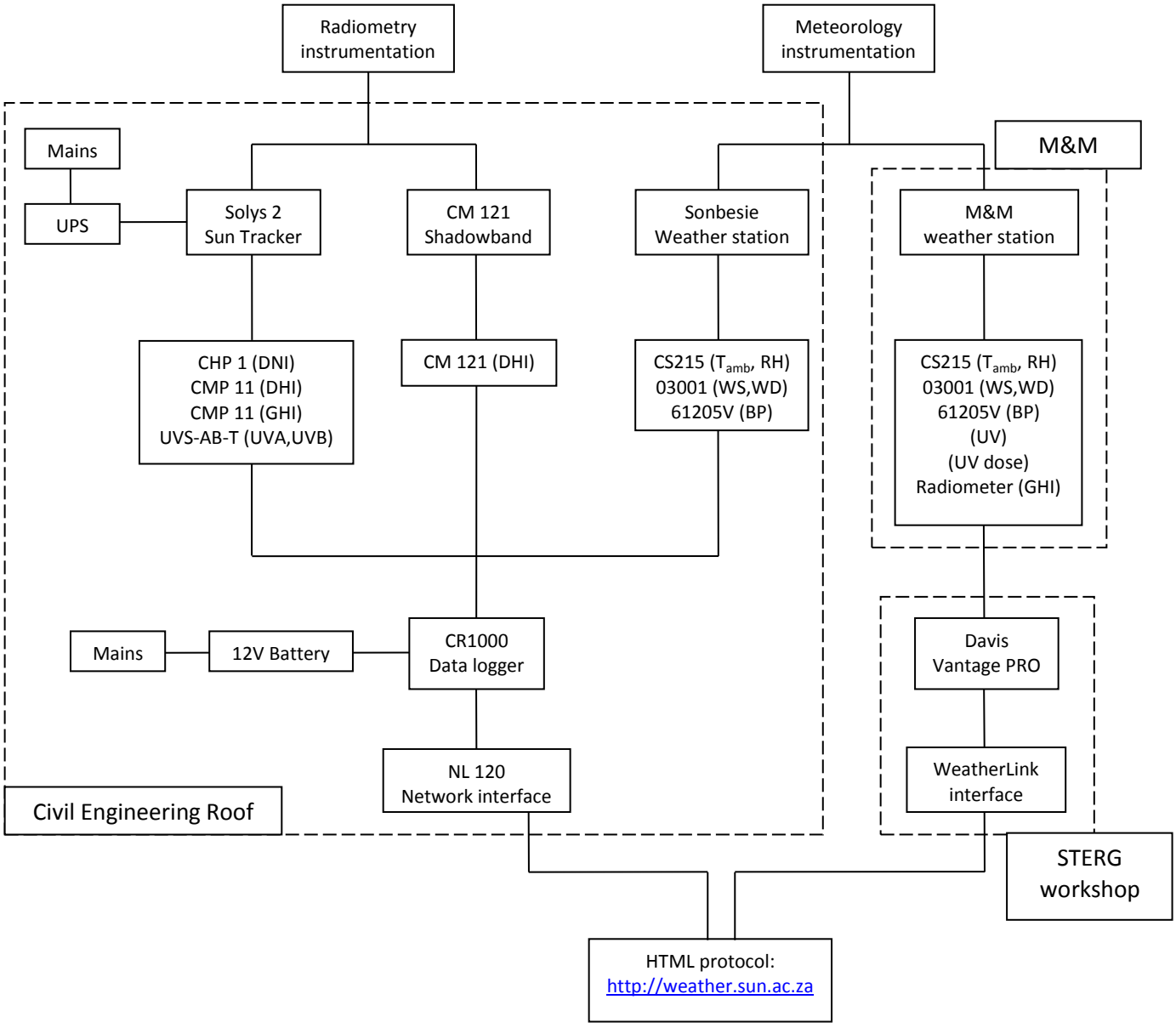
M&M weather station comprises a Vantage PRO Integrated Sensor Suite (ISS) which houses:

- Anemometer (WS, WD, wind chill measurements)
- Temperature/humidity sensor & radiation shield (T_{amb}, RH measurements)
- Rain collector (rain rate measurements)
- UV 6490 sensor (UV measurements)
- Solar radiation 6450 sensor (GHI measurements)
- Barometric pressure sensor (BP measurements)
- Dew point (DP) measurements
- Heat index (HI) measurements

Appendix A shows detailed specifications and calibration information for each instrument.

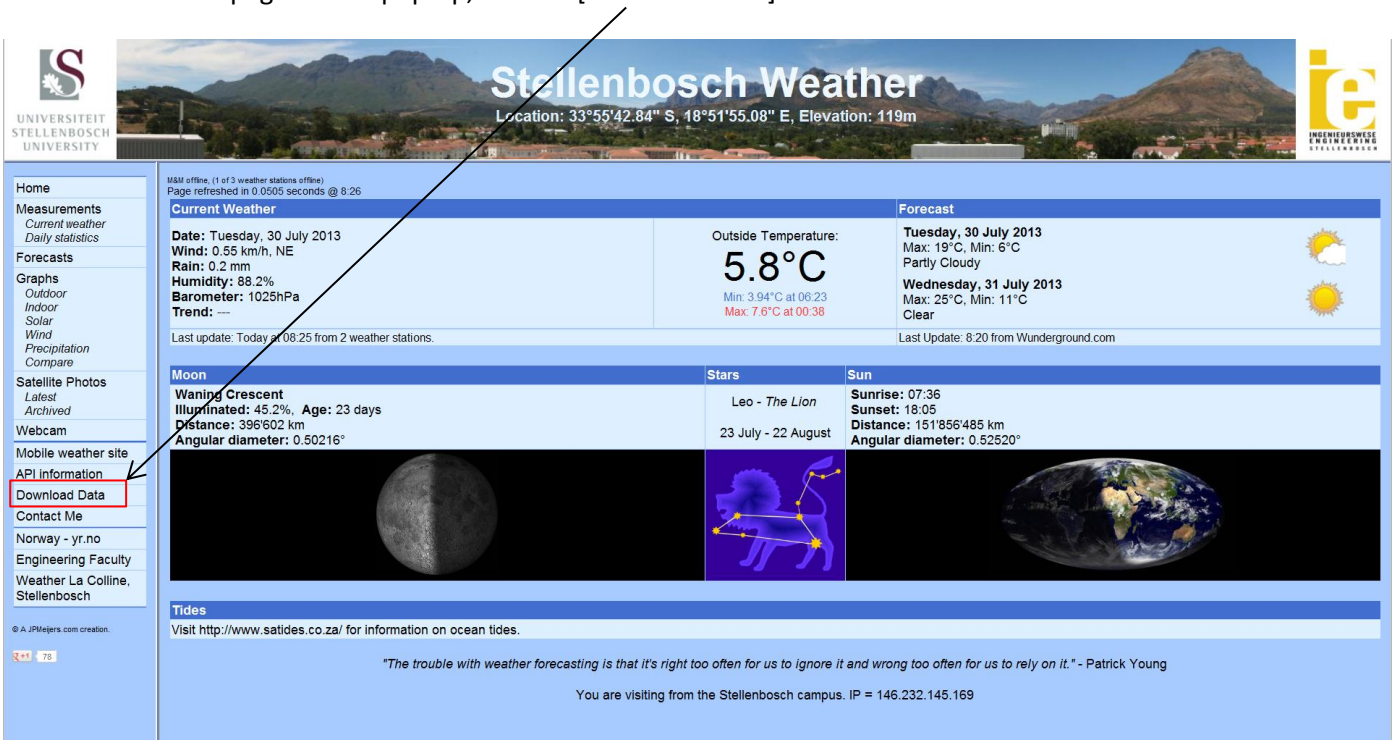
Sonbesie architecture

The below diagram describes the Sonbesie system architecture.

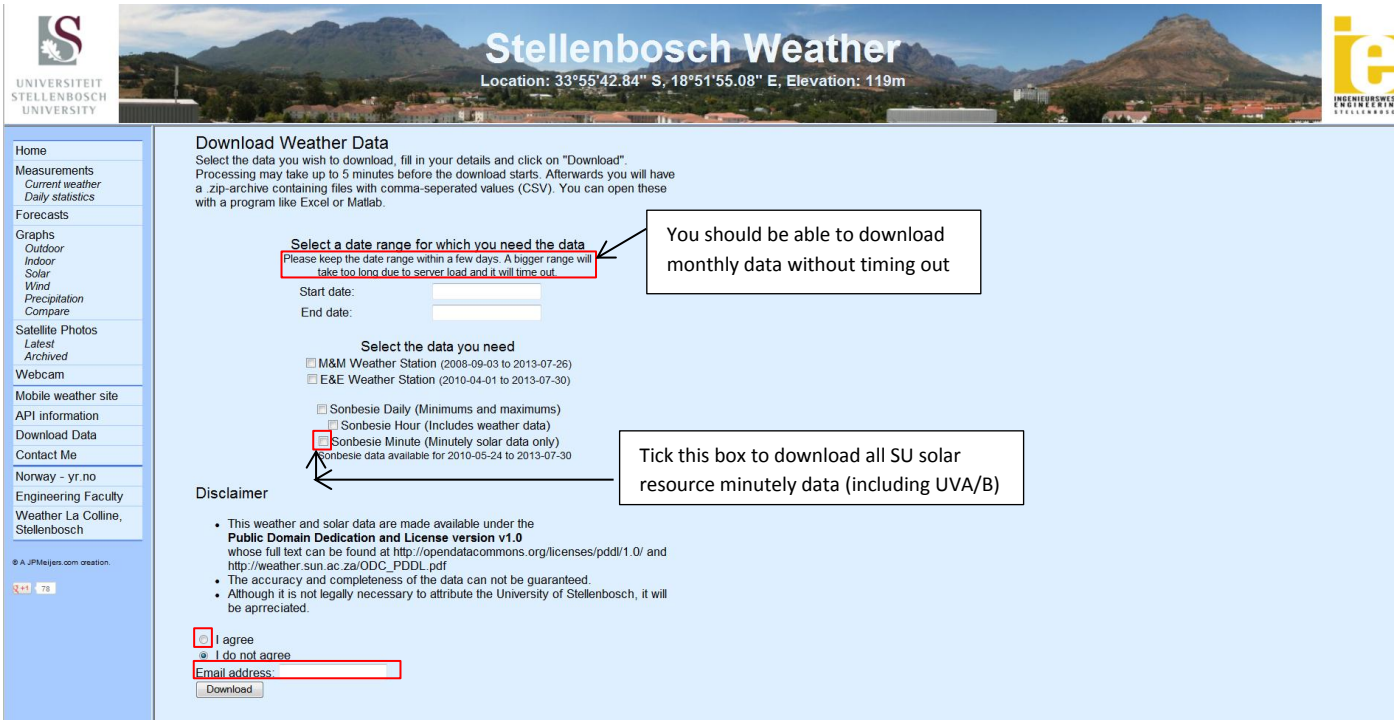


Download instructions for solar resource data at Stellenbosch University

1. Go to link http://weather.sun.ac.za/
2. The below page should pop-up, click on [Download data]



3. Fill in the [Start date] and [End date] required. Please keep date range within one month, anything longer may not work. Under [Select the data you need] select at least one item (daily/hourly/minutely).
   At bottom of page tick [I agree] and enter a valid email address, then click [Download].

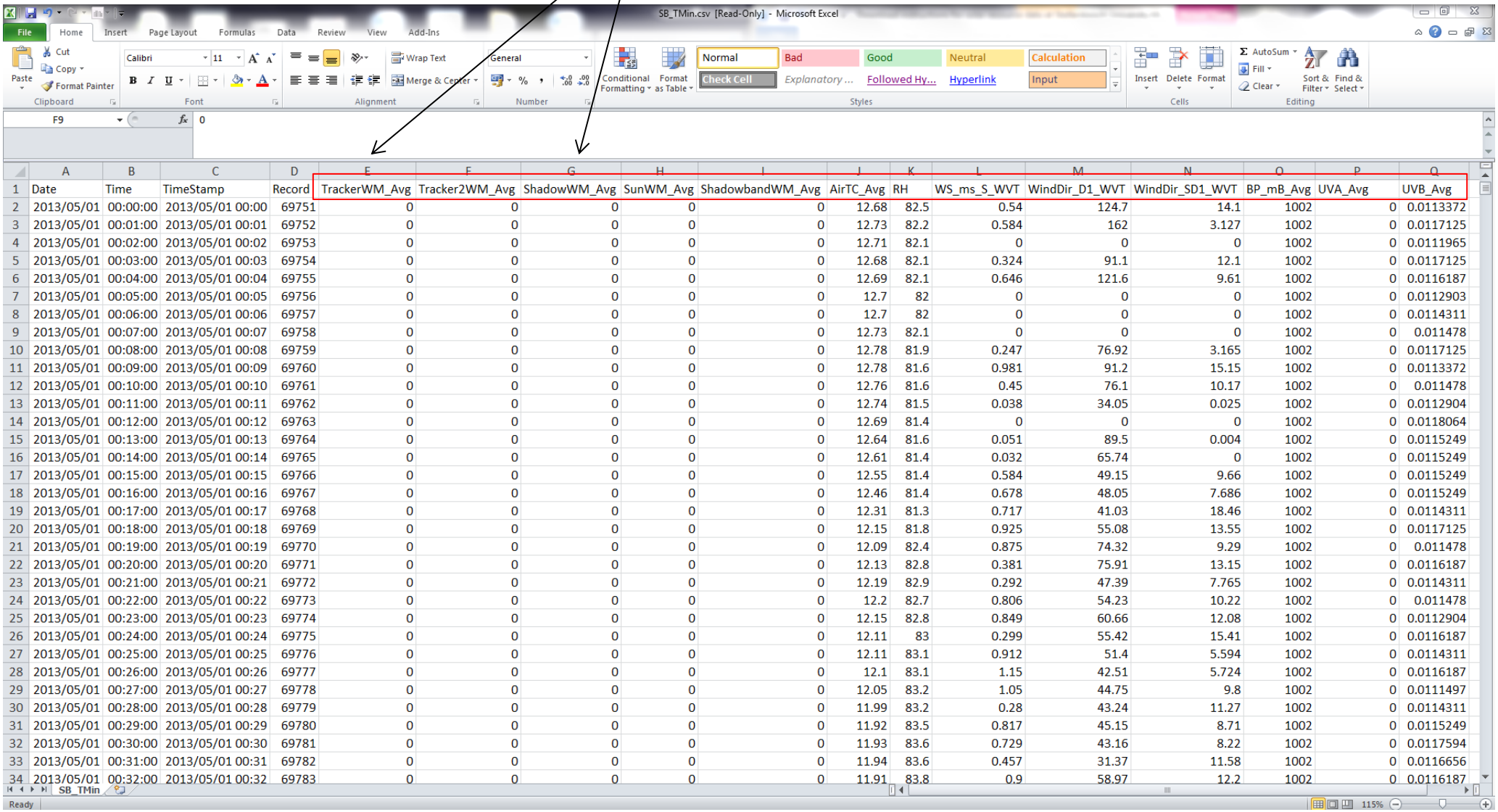


4. Wait for data download, if it takes too long, it most likely timed-out, input smaller data range and try again.

What does the data mean?

Data is downloaded in CSV format and can be opened with excel or similar software.

An explanation of each title, including, measurement, instrument, units and calibration information is given on the following page.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Date	Time	TimeStamp	Record	TrackerWM_Avg	Tracker2WM_Avg	ShadowWM_Avg	SunWM_Avg	ShadowbandWM_Avg	AirTC_Avg	RH	WS_ms_S_WVT	WindDir_D1_WVT	WindDir_SD1_WVT	BP_mB_Avg	UVA_Avg	UVB_Avg
2	2013/05/01	00:00:00	2013/05/01 00:00	69751	0	0	0	0	0	12.68	82.5	0.54	124.7	14.1	1002	0	0.0113372
3	2013/05/01	00:01:00	2013/05/01 00:01	69752	0	0	0	0	0	12.73	82.2	0.584	162	3.127	1002	0	0.0117125
4	2013/05/01	00:02:00	2013/05/01 00:02	69753	0	0	0	0	0	12.71	82.1	0	0	0	1002	0	0.0111965
5	2013/05/01	00:03:00	2013/05/01 00:03	69754	0	0	0	0	0	12.68	82.1	0.324	91.1	12.1	1002	0	0.0117125
6	2013/05/01	00:04:00	2013/05/01 00:04	69755	0	0	0	0	0	12.69	82.1	0.646	121.6	9.61	1002	0	0.0116187
7	2013/05/01	00:05:00	2013/05/01 00:05	69756	0	0	0	0	0	12.7	82	0	0	0	1002	0	0.0112903
8	2013/05/01	00:06:00	2013/05/01 00:06	69757	0	0	0	0	0	12.7	82	0	0	0	1002	0	0.0114311
9	2013/05/01	00:07:00	2013/05/01 00:07	69758	0	0	0	0	0	12.73	82.1	0	0	0	1002	0	0.011478
10	2013/05/01	00:08:00	2013/05/01 00:08	69759	0	0	0	0	0	12.78	81.9	0.247	76.92	3.165	1002	0	0.0117125
11	2013/05/01	00:09:00	2013/05/01 00:09	69760	0	0	0	0	0	12.78	81.6	0.981	91.2	15.15	1002	0	0.0113372
12	2013/05/01	00:10:00	2013/05/01 00:10	69761	0	0	0	0	0	12.76	81.6	0.45	76.1	10.17	1002	0	0.011478
13	2013/05/01	00:11:00	2013/05/01 00:11	69762	0	0	0	0	0	12.74	81.5	0.038	34.05	0.025	1002	0	0.0112904
14	2013/05/01	00:12:00	2013/05/01 00:12	69763	0	0	0	0	0	12.69	81.4	0	0	0	1002	0	0.0118064
15	2013/05/01	00:13:00	2013/05/01 00:13	69764	0	0	0	0	0	12.64	81.6	0.051	89.5	0.004	1002	0	0.0115249
16	2013/05/01	00:14:00	2013/05/01 00:14	69765	0	0	0	0	0	12.61	81.4	0.032	65.74	0	1002	0	0.0115249
17	2013/05/01	00:15:00	2013/05/01 00:15	69766	0	0	0	0	0	12.55	81.4	0.584	49.15	9.66	1002	0	0.0115249
18	2013/05/01	00:16:00	2013/05/01 00:16	69767	0	0	0	0	0	12.46	81.4	0.678	48.05	7.686	1002	0	0.0115249
19	2013/05/01	00:17:00	2013/05/01 00:17	69768	0	0	0	0	0	12.31	81.3	0.717	41.03	18.46	1002	0	0.0114311
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21	2013/05/01	00:19:00	2013/05/01 00:19	69770	0	0	0	0	0	12.09	82.4	0.875	74.32	9.29	1002	0	0.011478
22	2013/05/01	00:20:00	2013/05/01 00:20	69771	0	0	0	0	0	12.13	82.8	0.381	75.91	13.15	1002	0	0.0116187
23	2013/05/01	00:21:00	2013/05/01 00:21	69772	0	0	0	0	0	12.19	82.9	0.292	47.39	7.765	1002	0	0.0114311
24	2013/05/01	00:22:00	2013/05/01 00:22	69773	0	0	0	0	0	12.2	82.7	0.806	54.23	10.22	1002	0	0.011478
25	2013/05/01	00:23:00	2013/05/01 00:23	69774	0	0	0	0	0	12.15	82.8	0.849	60.66	12.08	1002	0	0.0112904
26	2013/05/01	00:24:00	2013/05/01 00:24	69775	0	0	0	0	0	12.11	83	0.299	55.42	15.41	1002	0	0.0116187
27	2013/05/01	00:25:00	2013/05/01 00:25	69776	0	0	0	0	0	12.11	83.1	0.912	51.4	5.594	1002	0	0.0114311
28	2013/05/01	00:26:00	2013/05/01 00:26	69777	0	0	0	0	0	12.1	83.1	1.15	42.51	5.724	1002	0	0.0116187
29	2013/05/01	00:27:00	2013/05/01 00:27	69778	0	0	0	0	0	12.05	83.2	1.05	44.75	9.8	1002	0	0.0111497
30	2013/05/01	00:28:00	2013/05/01 00:28	69779	0	0	0	0	0	11.99	83.2	0.28	43.24	11.27	1002	0	0.0114311
31	2013/05/01	00:29:00	2013/05/01 00:29	69780	0	0	0	0	0	11.92	83.5	0.817	45.15	8.71	1002	0	0.0115249
32	2013/05/01	00:30:00	2013/05/01 00:30	69781	0	0	0	0	0	11.93	83.6	0.729	43.16	8.22	1002	0	0.0117594
33	2013/05/01	00:31:00	2013/05/01 00:31	69782	0	0	0	0	0	11.94	83.6	0.457	31.37	11.58	1002	0	0.0116656
34	2013/05/01	00:32:00	2013/05/01 00:32	69783	0	0	0	0	0	11.91	83.8	0.9	58.97	12.2	1002	0	0.0116187

Title	Measurement	Instrument	Units	Calibration date
TrackerWM_Avg	Direct Normal Irradiance (DNI)	K&Z CHP1 pyrheliometer	W/m^2	18 July 2012
Tracker2WM_Avg	Direct Normal Irradiance (DNI)	K&Z CHP1 pyrheliometer	W/m^2	Unknown
*ShadowWM_Avg	Diffuse Horizontal Irradiance (DHI)	K&Z CMP11 pyranometer (shaded)	W/m^2	28 Jul 2011
*SunWM_Avg	Global Horizontal Irradiance (GHI)	K&Z CMP11 pyranometer (un-shaded)	W/m^2	28 Jul 2011
ShadowbandWM_Avg	Diffuse Horizontal Irradiance (DHI)	K&Z CMP6 pyranometer (Shadowband)	W/m^2	16 Dec 2009
AirTC_Avg	Air temperature	CS215 probe with 41303-5A radiation shield	^oC	Unknown
RH	Relative humidity	CS215 probe with 41303-5A radiation shield	%	Unknown
WS_ms_S_WVT	Wind speed	R.M. Young wind sentry (Model 03001)	m/s	Unknown
WindDir_SD1_WVT	Wind direction	R.M. Young wind sentry (Model 03001)	^{o}	Unknown
BP_mB_Avg	Barometric pressure	R.M. Young sensor (Model 61205V)	mB	Unknown
UVA_Avg	UVA	K&Z UVS-AB-T radiometer	W/m^2	24 Oct 2012
UVB_Avg	UVB	K&Z UVS-AB-T radiometer	W/m^2	24 Oct 2012

* ShadowWM_Avg & SunWM_Avg prior to 6 February 2012 represented data recorded from K&Z CMP6 pyranometers.