

## TITLE

CAMP\_Tibet\_D105-AWS\_20021001\_20030331.sfc

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## DATE OF THIS DOCUMENT

02 Sep. 2004  
(Updated 05. Sep. 2006)

## 1. 0 DATASET OVERVIEW

### 1.1 Introduction

To clarify the energy and water cycle in the Tibetan Plateau, it is important to understand the characteristics of the basic meteorological elements and surface fluxes.

The purpose of Tibet AWS (Automatic Weather Station) observation is to improve the quantitative understanding of land-atmosphere interactions over the Tibetan Plateau and develop the land surface process models by monitoring these meteorological values.

## 1.2 Time period covered by the data

Start: 1 October 2002, 00:00

End: 31 March 2003, 23:00

## 1.3 Temporal characteristics of the data

All parameters are recorded every hour.

## 1.4 Physical location of the measurement

Latitude : 33.06429 N

Longitude : 91.94256 E

Elevation : 5038.6 m a.s.l.

Landscape : Bare land (with the thin weed-like plant)

Canopy height : Less than 5cm.

Soil Characteristics: Silt loam / Sandy loam

## 1.5 Data source

## 1.6 Website address references

<http://monsoon.t.u-tokyo.ac.jp/camp/tibets/>

## 2.0 INSTRUMENTATION DESCRIPTION

### 2.1 Platform

This AWS was constructed in summer 2000 to represent the cold location north of the Tanngla Mts. The site was located in the shallow slope of the mountain. The sensors are mounted on several heights.

### 2.2 Description of the instrumentation

Parameter	Model	Manufacturer
Station Pressure	PTB220C	VAISALA
Air Temperature	TS-801(Pt100)	Okazaki
Relative Humidity	HMP-45D	VAISALA
Wind Speed	WS-D32	Komatsu
Wind Direction	WS-D32	Komatsu
Precipitation	NOAH-II	ETI
Snow Depth	SR-50	CAMPBEL
Incoming Shortwave	CM21	Kipp & Zonen)
Outgoing Shortwave	CM21	Kipp & Zonen)
Incoming Longwave	Precision Infrared Radiometer	Eppley
Outgoing Longwave	Precision Infrared Radiometer	Eppley
Skin Temperature	IRt/C 1X-T50F	Exergen

### 2.3 Instrumentation specification

Station Pressure (0.5m) : Station Pressure at the 0.5m height (hPa)

Air Temperature (1.0m) : Air Temperature at the 1.0m height (deg.C)  
 Relative Humidity (1.0m) : Relative Humidity at the 1.0m height (%)  
 Wind Speed (10.0m) : Wind Speed at the 10.0m height (m/s)  
 Wind Direction (10.0m) : Wind Direction at the 10.0m height (deg.)  
 Precipitation (1.0m) : Precipitation at the 1.0m height (mm)  
 Snow Depth (3m) : Snow depth sensed at the 3m height (cm)  
 Incoming Shortwave (1.58m) : Shortwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Shortwave (1.28m) : Shortwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Incoming Longwave (1.58m) : Longwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Longwave (1.28m) : Longwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Skin Temperature (1.42m) : Surface Temperature sensed at the 1.42m height (deg.C)

### 3.0 DATA COLLECTION AND PROCESSING

#### 3.1 Description of data collection

Original data are sampled at every 5 seconds (0.2Hz) and average is computed and stored in a data logger (Campbell CR-10X).

Data are downloaded from the Tower twice every year, in spring and summer. Then, data are sent to Japan, where they are processed.

#### 3.2 Description of derived parameters and processing techniques used

Air Temperature, relative humidity, radiation, Wind speed, Wind direction and Skin Temperature are averaged over the previous hour. Air pressure and Snow depth are instantaneous values of each 1 hour. Precipitation is accumulated over the previous 1 hour.

One humidity sensor is set up for the comparison the performance of No.1 (9.3 m) and No.2 (1.0m) humidity sensor. This reference sensor is exchanged its level (From 1.0 m to 8.2 m) or down (From 9.3m to 1.0m) for every operation. We selected the couple of dataset (No.1 main sensor and No.1 reference sensor; No2. main sensor and No. 2 reference sensor) just before or after 5 days of the operation, and made the linear regressions.

$$RH1 = a1 \cdot RH\_ref + b1$$

$$RH2 = a2 \cdot RH\_ref + b2$$

From these two equations, the regression function between RH1 and RH2 can be derived as

$$RH2 = a \cdot RH1 + b$$

RH2 (1.0 m) was corrected as a reference of RH1 using above relation and put the data flag "I".

And the Two parameters indicated below were computed by using "CEOP Derived Parameter Equations : [http://www.joss.ucar.edu/ghp/ceopdm/refdata\\_report/eqns.html](http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html)" . also put the data flag "I",

U,V Components were computed by using (GEMPAK):

$$U = -\sin(\text{direction}) \cdot \text{wind\_speed};$$

$$V = -\cos(\text{direction}) \cdot \text{wind\_speed};$$

Net radiation were computed by using (GEMPAK):

$$NET\_radiation = \text{down(in)short} + \text{down(in)long} - \text{up(out)short} - \text{up(out)long};$$

Specific Humidity (Qv) was computed by using

$$Qv = 0.622 Rv / (1 + Rv)$$

$$Rv = Evap / Air\_Pressure$$

$$Evap = Rh * 0.01 * Evap\_sat$$

$$Evap\_sat = 6.1078^{(a*Air\_Temp/(b+Air\_Temp))}$$

( a = 7.5, b = 237.3 for Air\_Temp >= 0 degC; a = 9.5, b = 265.3 for Air\_Temp < 0)

#### 4.0 QUALITY CONTROL PROCEDURES

For all parameters, the data has been visually checked, looking for extremely and unusual low/high values and/or periods with constant values thorough the CAMP Quality Control Web Interface.

The quality control flags follow the CEOP data flag definition document.

#### 5.0 GAP FILLING PROCEDURES

No gap filling procedure was applied.

#### 6.0 DATA REMARKS

##### 6.1 PI's assessment of the data

##### 6.1.1 Instruments problems

Rain gauge: The liquid inside the gauge was sometimes frozen.

##### 6.1.2 Quality issues

Relative humidity data more than 100% was replaced 100% and data flag was put "I".

Snow depth was measured by ultra-sonic sensor. Snow depth was measured by ultra-sonic sensor. There are unknown noise data at D105 site, and those are treated as missing. Then, the data was corrected by filtering the relative distance between land surface or vegetation surface, but still the noise was found due to scattering of precipitation, movement of arm with strong wind, or short-term movement of vegetation. The noise was removed manually, but this process is imperfect. Therefore, data flag was put "D". Snow depths in the warm season (June-Sep.) are supposed to be 0 cm, except for hail due to sporadic Cumulonimbus activity.

##### 6.2 Missing data periods

Please see the chapter 9.0.

#### 7.0 REFERENCE REQUIREMENTS

Original data was collected and is provided within the framework of GAME/CAMP Tibet Scientific and Technological Research Project, funded by the Ministry of Education,

Culture, Sports, Science and Technology; the Japan Science and Technology Agency; the Frontier Research System for Global Change; the Japan Aerospace Exploration Agency; the Chinese Academy of Sciences; and the Chinese Academy of Meteorological Sciences.

## 8.0 REFERENCES

H. Ishikawa and GAME-Tibet Boundary Layer Group, 2001: What has been known and what has not in GAME/Tibet BL observation, Proceedings of the Fifth International Study Conference on GEWEX in Asia and GAME, 691.

Ma, Yaoming, O. Tsukamoto, H. Ishikawa, Z. Su, M. Menenti, J. Wang and J. Wen, 2002: Determination of regional land surface heat flux densities over heterogeneous landscape of HEIFE integrating satellite remote sensing with field observations, Jour. Meteorol. Soc. Japan, 80(3), 485-501.

K. Tanaka, I. Tamagawa, H. Ishikawa, Y. Ma and Z. Hu, 2003: Surface energy and closure of the eastern Tibetan Plateau during the GAME-Tibet IOP 1998, J. Hydrology, vol. 283, pp. 169-183

K. Tanaka and H. Ishikawa, 2001: Long term monitoring of surface energy fluxes of the Amdo PBL site in the eastern Tibetan Plateau, Proceedings of the Fifth International Study Conference on GEWEX in Asia and GAME, 384-388.

Ueno, K., H. Fujii, H. Yamada and L. Liu, (2001) Weak and Frequent Monsoon Precipitation over the Tibetan Plateau. J. Meteor. Soc. Japan, 79, 1B, 419-434.

## 9.0 Missing data periods

Air Temperature  
2003/03/16 17:00

Dew Point Temperature  
2002/10/01 00:00 - 2003/03/31 23:00 (ALL)

Relative Humidity  
No missing data.

Specific Humidity  
2002/11/23 06:00  
2002/11/23 08:00 - 2002/11/23 09:00 (2)  
2002/11/24 07:00 - 2002/11/24 08:00 (2)  
2002/11/27 08:00 - 2002/11/27 09:00 (2)  
2002/11/28 08:00 - 2002/11/28 09:00 (2)  
2003/03/16 17:00

Wind Speed  
No missing data.

Wind Direction

No missing data.

U Wind Component

2002/11/24 07:00 - 2002/11/24 08:00 (2)  
2002/11/27 08:00 - 2002/11/27 09:00 (2)  
2002/11/28 08:00 - 2002/11/28 09:00 (2)

V Wind Component

2002/11/24 07:00 - 2002/11/24 08:00 (2)  
2002/11/27 08:00 - 2002/11/27 09:00 (2)  
2002/11/28 08:00 - 2002/11/28 09:00 (2)

Precipitation

2002/10/01 00:00 - 2003/03/31 23:00 (ALL)

Snow Depth

2002/10/22 16:00 - 2002/10/23 01:00 (10)  
2002/10/23 13:00 - 2002/10/23 15:00 (3)  
2002/10/27 04:00 - 2002/10/27 07:00 (4)  
2002/10/28 17:00 - 2002/10/28 19:00 (3)  
2002/10/28 21:00 - 2002/10/29 01:00 (5)  
2002/10/29 15:00 - 2002/10/29 20:00 (6)  
2002/10/29 22:00 - 2002/10/29 23:00 (2)  
2002/11/03 04:00 - 2002/11/03 05:00 (2)  
2002/11/03 15:00 - 2002/11/03 23:00 (9)  
2002/11/04 04:00 - 2002/11/04 05:00 (2)  
2002/11/05 12:00 - 2002/11/06 01:00 (14)  
2002/11/08 12:00  
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2002/11/23 18:00 - 2002/11/24 01:00 (8)  
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2003/03/21 13:00 - 2003/03/22 01:00 (13)  
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2003/03/27 23:00  
2003/03/28 04:00 - 2003/03/28 07:00 (4)  
2003/03/28 09:00 - 2003/03/28 10:00 (2)  
2003/03/28 19:00 - 2003/03/28 22:00 (4)  
2003/03/29 03:00 - 2003/03/29 04:00 (2)  
2003/03/29 08:00 - 2003/03/29 12:00 (5)  
2003/03/30 20:00  
2003/03/31 06:00 - 2003/03/31 07:00 (2)  
2003/03/31 10:00

Incoming Shortwave  
No missing data.

Outgoing Shortwave  
No missing data.

Incoming Longwave  
No missing data.

Outgoing Longwave  
2002/11/23 05:00 - 2002/11/23 10:00 (6)  
2002/11/24 07:00 - 2002/11/24 09:00 (3)

2002/11/26 07:00 - 2002/11/26 09:00 (3)  
2002/11/27 06:00 - 2002/11/27 10:00 (5)  
2002/11/28 08:00 - 2002/11/28 10:00 (3)  
2002/11/29 09:00  
2002/11/30 08:00 - 2002/11/30 09:00 (2)  
2002/12/28 03:00  
2002/12/28 06:00  
2002/12/29 04:00 - 2002/12/29 05:00 (2)  
2002/12/30 05:00  
2003/01/02 06:00  
2003/01/19 09:00  
2003/02/21 06:00  
2003/03/01 08:00

#### Net Radiation

2002/11/23 05:00 - 2002/11/23 10:00 (6)  
2002/11/24 07:00 - 2002/11/24 09:00 (3)  
2002/11/26 07:00 - 2002/11/26 09:00 (3)  
2002/11/27 06:00 - 2002/11/27 10:00 (5)  
2002/11/28 08:00 - 2002/11/28 10:00 (3)  
2002/11/29 09:00  
2002/11/30 08:00 - 2002/11/30 09:00 (2)  
2002/12/28 03:00  
2002/12/28 06:00  
2002/12/29 04:00 - 2002/12/29 05:00 (2)  
2002/12/30 05:00  
2003/01/02 06:00  
2003/01/19 09:00  
2003/02/21 06:00  
2003/03/01 08:00

#### Skin Temperature

No missing data.

#### Incoming PAR

2002/10/01 00:00 - 2003/03/31 23:00 (ALL)

#### Outgoing PAR

2002/10/01 00:00 - 2003/03/31 23:00 (ALL)

## TITLE

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## DATE OF THIS DOCUMENT

19 Apr. 2006  
(Updated 05. Sep. 2006)

## 1. 0 DATASET OVERVIEW

### 1.7 Introduction

To clarify the energy and water cycle in the Tibetan Plateau, it is important to understand the characteristics of the basic meteorological elements and surface fluxes.

The purpose of Tibet AWS (Automatic Weather Station) observation is to improve the quantitative understanding of land-atmosphere interactions over the Tibetan Plateau and develop the land surface process models by monitoring these meteorological values.

## 1.8 Time period covered by the data

Start: 1 October 2002, 00:00  
End: 30 September 2003, 23:00

## 1.9 Temporal characteristics of the data

All parameters are recorded every hour.

## 1.10 Physical location of the measurement

Latitude : 33.06429 N  
Longitude : 91.94256 E  
Elevation : 5038.6 m a.s.l.  
Landscape : Bare land (with the thin weed-like plant)  
Canopy height : Less than 5cm.  
Soil Characteristics: Silt loam / Sandy loam

## 1.11 Data source

## 1.12 Website address references

<http://monsoon.t.u-tokyo.ac.jp/camp/tibets/>

## 2.0 INSTRUMENTATION DESCRIPTION

### 2.1 Platform

This AWS was constructed in summer 2000 to represent the cold location north of the Tanngra Mts. The site was located in the shallow slope of the mountain. The sensors are mounted on several heights.

### 2.2 Description of the instrumentation

Parameter	Model	Manufacturer
Station Pressure	PTB220C	VAISALA
Air Temperature	TS-801(Pt100)	Okazaki
Relative Humidity	HMP-45D	VAISALA
Wind Speed	WS-D32	Komatsu
Wind Direction	WS-D32	Komatsu
Precipitation	NOAH-II	ETI
Snow Depth	SR-50	CAMPBEL
Incoming Shortwave	CM21	Kipp & Zonen)
Outgoing Shortwave	CM21	Kipp & Zonen)
Incoming Longwave	Precision Infrared Radiometer	Eppley
Outgoing Longwave	Precision Infrared Radiometer	Eppley
Skin Temperature	IRt/C 1X-T50F	Exergen

### 2.4 Instrumentation specification

Station Pressure (0.5m) : Station Pressure at the 0.5m height (hPa)  
Air Temperature (1.0m) : Air Temperature at the 1.0m height (deg.C)

Relative Humidity (1.0m) : Relative Humidity at the 1.0m height (%)  
 Wind Speed (10.0m) : Wind Speed at the 10.0m height (m/s)  
 Wind Direction (10.0m) : Wind Direction at the 10.0m height (deg.)  
 Precipitation (1.0m) : Precipitation at the 1.0m height (mm)  
 Snow Depth (3m) : Snow depth sensed at the 3m height (cm)  
 Incoming Shortwave (1.58m) : Shortwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Shortwave (1.28m) : Shortwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Incoming Longwave (1.58m) : Longwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Longwave (1.28m) : Longwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Skin Temperature (1.42m) : Surface Temperature sensed at the 1.42m height (deg.C)

### 3.0 DATA COLLECTION AND PROCESSING

#### 3.1 Description of data collection

Original data are sampled at every 5 seconds (0.2Hz) and average is computed and stored in a data logger (Campbell CR-10X).

Data are downloaded from the Tower twice every year, in spring and summer. Then, data are sent to Japan, where they are processed.

#### 3.2 Description of derived parameters and processing techniques used

Air Temperature, relative humidity, radiation, Wind speed, Wind direction and Skin Temperature are averaged over the previous hour. Air pressure and Snow depth are instantaneous values of each 1 hour. Precipitation is accumulated over the previous 1 hour.

One humidity sensor is set up for the comparison the performance of No.1 (9.3 m) and No.2 (1.0m) humidity sensor. This reference sensor is exchanged its level (From 1.0 m to 8.2 m) or down (From 9.3m to 1.0m) for every operation. We selected the couple of dataset (No.1 main sensor and No.1 reference sensor; No2. main sensor and No. 2 reference sensor) just before or after 5 days of the operation, and made the linear regressions.

$$RH1 = a1 * RH\_ref + b1$$

$$RH2 = a1 * RH\_ref + b2$$

From these two equations, the regression function between RH1 and RH2 can be derived as

$$RH2 = a * RH1 + b$$

$$(a = 1.0030, b = 0.9339)$$

RH2 (1.0 m) was corrected as a reference of RH1 using above relation and put the data flag "I".

And the Two parameters indicated below were computed by using "CEOP Derived Parameter Equations : [http://www.joss.ucar.edu/ghp/ceopdm/refdata\\_report/eqns.html](http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html)" . also put the data flag "I",

U,V Components were computed by using (GEMPAK):

$$U = -\sin(\text{direction}) * \text{wind\_speed};$$

$$V = -\cos(\text{direction}) * \text{wind\_speed};$$

Net radiation were computed by using (GEMPAK):

$$\text{NET\_radiation} = \text{down(in)short} + \text{down(in)long} - \text{up(out)short} - \text{up(out)long};$$

Specific Humidity (Qv) was computed by using

$$Qv = 0.622 Rv / (1 + Rv)$$

$$Rv = Evap / Air\_Pressure$$

$$Evap = Rh * 0.01 * Evap\_sat$$

$$Evap\_sat = 6.1078^{(a*Air\_Temp/(b+Air\_Temp))}$$

( a = 7.5, b = 237.3 for Air\_Temp >= 0 degC; a = 9.5, b = 265.3 for Air\_Temp < 0)

#### 4.0 QUALITY CONTROL PROCEDURES

For all parameters, the data has been visually checked, looking for extremely and unusual low/high values and/or periods with constant values thorough the CAMP Quality Control Web Interface.

The quality control flags follow the CEOP data flag definition document.

#### 5.0 GAP FILLING PROCEDURES

No gap filling procedure was applied.

#### 6.0 DATA REMARKS

##### 6.1 PI's assessment of the data

##### 6.1.1 Instruments problems

Rain gauge: The liquid inside the gauge was sometimes frozen.

Regarding the snow depth there is sporadic noise in the data and the reason is still not be sure. Then the Quality control flag was put "D".

##### 6.1.2 Quality issues

Relative humidity data more than 100% was replaced 100% and data flag was put "I".

Snow depth was measured by ultra-sonic sensor. Snow depth was measured by ultra-sonic sensor. There are unknown noise data at D105 site, and those are treated as missing. Then, the data was corrected by filtering the relative distance between land surface or vegetation surface, but still the noise was found due to scattering of precipitation, movement of arm with strong wind, or short-term movement of vegetation. The noise was removed manually, but this process is imperfect. Therefore, data flag was put "D". Snow depths in the warm season (June-Sep.) are supposed to be 0 cm, except for hail due to sporadic Cumulonimbus activity.

##### 6.2 Missing data periods

Snow depth: sporadic errors

Please see the chapter 9.0.

#### 7.0 REFERENCE REQUIREMENTS

Original data was collected and is provided within the framework of GAME/CAMP Tibet Scientific and Technological Research Project, funded by the Ministry of Education, Culture, Sports, Science and Technology; the Japan Science and Technology Agency; the Frontier Research System for Global Change; the Japan Aerospace Exploration Agency; the Chinese Academy of Sciences; and the Chinese Academy of Meteorological Sciences.

## 8.0 REFERENCES

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Ueno, K., H. Fujii, H. Yamada and L. Liu, (2001) Weak and Frequent Monsoon Precipitation over the Tibetan Plateau. J. Meteor. Soc. Japan, 79, 1B, 419-434.

## 9.0 Missing data periods

### Air Temperature

2003/05/26 08:00  
2003/07/23 10:00 - 2003/07/23 12:00 (3)  
2003/07/25 06:00  
2003/08/03 07:00

### Specific Humidity

2003/05/26 08:00  
2003/07/23 10:00 - 2003/07/23 12:00 (3)  
2003/07/25 06:00  
2003/08/03 07:00

### Precipitation

2003/04/01 00:00 - 2003/05/25 16:00 (1313)

### Snow Depth

2003/04/02 19:00 - 2003/04/03 00:00 (6)  
2003/04/05 19:00 - 2003/04/06 00:00 (6)  
2003/04/06 22:00 - 2003/04/07 00:00 (3)  
2003/04/07 03:00 - 2003/04/07 10:00 (8)  
2003/04/07 17:00 - 2003/04/08 00:00 (8)

2003/04/08 04:00 - 2003/04/08 07:00 (4)  
2003/04/09 06:00 - 2003/04/09 07:00 (2)  
2003/04/09 23:00 - 2003/04/10 00:00 (2)  
2003/04/10 22:00 - 2003/04/11 00:00 (3)  
2003/04/11 04:00 - 2003/04/11 09:00 (6)  
2003/04/12 18:00 - 2003/04/12 20:00 (3)  
2003/04/13 17:00 - 2003/04/14 00:00 (8)  
2003/04/16 03:00 - 2003/04/16 04:00 (2)  
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2003/04/17 19:00 - 2003/04/18 00:00 (6)  
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2003/05/22 12:00  
2003/06/13 18:00 - 2003/06/13 20:00 (3)  
2003/06/13 22:00 - 2003/06/13 23:00 (2)  
2003/06/14 01:00  
2003/07/02 03:00 - 2003/07/02 04:00 (2)  
2003/07/10 09:00 - 2003/07/10 10:00 (2)  
2003/07/15 02:00 - 2003/07/15 04:00 (3)  
2003/07/31 03:00 - 2003/07/31 04:00 (2)  
2003/09/01 07:00 - 2003/09/01 08:00 (2)  
2003/09/15 03:00 - 2003/09/30 23:00 (381)

#### Outgoing Longwave

2003/04/05 05:00  
2003/04/06 07:00  
2003/04/11 05:00  
2003/04/18 04:00 - 2003/04/18 05:00 (2)  
2003/04/18 07:00  
2003/04/19 03:00 - 2003/04/19 05:00 (3)  
2003/04/19 08:00 - 2003/04/19 12:00 (5)  
2003/04/20 04:00 - 2003/04/20 16:00 (13)  
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2003/07/28 14:00

## TITLE

CAMP\_Tibet\_D105-AWS\_20031001\_20041128.sfc

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## DATE OF THIS DOCUMENT

7 July, 2006

## 1. 0 DATASET OVERVIEW

### 1.13 Introduction

To clarify the energy and water cycle in the Tibetan Plateau, it is important to understand the characteristics of the basic meteorological elements and surface fluxes.

The purpose of Tibet AWS (Automatic Weather Station) observation is to improve the quantitative understanding of land-atmosphere interactions over the Tibetan Plateau and develop the land surface process models by monitoring these meteorological values.

### 1.14 Time period covered by the data

Start: 1 October 2003, 00:00  
End: 28 November 2004, 23:00

### 1.15 Temporal characteristics of the data

All parameters are recoded every hour.

### 1.16 Physical location of the measurement

Latitude : 33.06429 N  
Longitude : 91.94256 E  
Elevation : 5038.6 m a.s.l.  
Landscape : Bare land (with the thin weed-like plant)  
Canopy height : Less than 5cm.  
Soil Characteristics: Silt loam / Sandy loam

### 1.17 Data source

### 1.18 Website address references

<http://monsoon.t.u-tokyo.ac.jp/camp/tibets/>

## 2.0 INSTRUMENTATION DESCRIPTION

### 2.1 Platform

This AWS was constructed in summer 2000 to represent the cold location north of the Tanngla Mts. The site was located in the shallow slope of the mountain. The sensors are mounted on several heights.

### 2.2 Description of the instrumentation

Parameter	Model	Manufacturer
Station Pressure	PTB220C	VAISALA
Air Temperature	TS-801(Pt100)	Okazaki
Relative Humidity	HMP-45D	VAISALA
Wind Speed	WS-D32	Komatsu
Wind Direction	WS-D32	Komatsu
Precipitation	NOAH-II	ETI
Snow Depth	SR-50	CAMPBEL
Incoming Shortwave	CM21	Kipp & Zonen)
Outgoing Shortwave	CM21	Kipp & Zonen)
Incoming Longwave	Precision Infrared Radiometer	Eppley
Outgoing Longwave	Precision Infrared Radiometer	Eppley
Skin Temperature	IRt/C 1X-T50F	Exergen

### 2.5 Instrumentation specification

Station Pressure (0.5m) : Station Pressure at the 0.5m height (hPa)  
Air Temperature (1.0m) : Air Temperature at the 1.0m height (deg.C)  
Relative Humidity (1.0m) : Relative Humidity at the 1.0m height (%)  
Wind Speed (10.0m) : Wind Speed at the 10.0m height (m/s)  
Wind Direction (10.0m) : Wind Direction at the 10.0m height (deg.)

Precipitation (1.0m) : Precipitation at the 1.0m height (mm)  
 Snow Depth (3m) : Snow depth sensed at the 3m height (cm)  
 Incoming Shortwave (1.58m) : Shortwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Shortwave (1.28m) : Shortwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Incoming Longwave (1.58m) : Longwave Downward Radiation sensed at the 1.58m height (W/m<sup>2</sup>)  
 Outgoing Longwave (1.28m) : Longwave Upward Radiation sensed at the 1.28m height (W/m<sup>2</sup>)  
 Skin Temperature (1.42m) : Surface Temperature sensed at the 1.42m height (deg.C)

### 3.0 DATA COLLECTION AND PROCESSING

#### 3.1 Description of data collection

Original data are sampled at every 5 seconds (0.2Hz) and average is computed and stored in a data logger (Campbell CR-10X).

Data are downloaded from the Tower twice every year, in spring and summer. Then, data are sent to Japan, where they are processed.

#### 3.2 Description of derived parameters and processing techniques used

Air Temperature, relative humidity, radiation, Wind speed, Wind direction and Skin Temperature are averaged over the previous hour. Air pressure and Snow depth are instantaneous values of each 1 hour. Precipitation is accumulated over the previous 1 hour.

One humidity sensor is set up for the comparison the performance of No.1 (9.3 m) and No.2 (1.0m) humidity sensor. This reference sensor is exchanged its level (From 1.0 m to 8.2 m) or down (From 9.3m to 1.0m) for every operation. We selected the couple of dataset (No.1 main sensor and No.1 reference sensor; No2. main sensor and No. 2 reference sensor) just before or after 5 days of the operation, and made the linear regressions.

$$RH1 = a1 \cdot RH\_ref + b1$$

$$RH2 = a1 \cdot RH\_ref + b2$$

From these two equations, the regression function between RH1 and RH2 can be derived as

$$RH2 = a \cdot RH1 + b$$

$$(a = 1.0030, b = 0.9339)$$

RH2 (1.0 m) was corrected as a reference of RH1 using above relation and put the data flag "I".

And the Two parameters indicated below were computed by using "CEOP Derived Parameter Equations : [http://www.joss.ucar.edu/ghp/ceopdm/refdata\\_report/eqns.html](http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html)" . also put the data flag "I",

U,V Components were computed by using (GEMPAK):

$$U = -\sin(\text{direction}) * \text{wind\_speed};$$

$$V = -\cos(\text{direction}) * \text{wind\_speed};$$

Net radiation were computed by using (GEMPAK):

$$NET\_radiation = \text{down(in)short} + \text{down(in)long} - \text{up(out)short} - \text{up(out)long};$$

Specific Humidity (Qv) was computed by using

$Q_v = 0.622 R_v / (1 + R_v)$   
 $R_v = \text{Evap} / \text{Air\_Pressure}$   
 $\text{Evap} = \text{Rh} * 0.01 * \text{Evap\_sat}$   
 $\text{Evap\_sat} = 6.1078^{(a * \text{Air\_Temp} / (b + \text{Air\_Temp}))}$   
( a = 7.5, b = 237.3 for Air\_Temp >= 0 degC; a = 9.5, b = 265.3 for Air\_Temp < 0)

#### **4.0 QUALITY CONTROL PROCEDURES**

For all parameters, the data has been visually checked, looking for extremely and unusual low/high values and/or periods with constant values through the CAMP Quality Control Web Interface.

The quality control flags follow the CEOP data flag definition document.

#### **5.0 GAP FILLING PROCEDURES**

No gap filling procedure was applied.

#### **6.0 DATA REMARKS**

##### 6.1 PI's assessment of the data

###### 6.1.1 Instruments problems

Rain gauge: The liquid inside the gauge was sometimes frozen.

Regarding the snow depth there is sporadic noise in the data and the reason is still not be sure. Then the Quality control flag was put "D".

###### 6.1.2 Quality issues

##### 6.2 Missing data periods

Please see the chapter 9.0.

#### **7.0 REFERENCE REQUIREMENTS**

Original data was collected and is provided within the framework of GAME/CAMP Tibet Scientific and Technological Research Project, funded by the Ministry of Education, Culture, Sports, Science and Technology; the Japan Science and Technology Agency; the Frontier Research System for Global Change; the Japan Aerospace Exploration Agency; the Chinese Academy of Sciences; and the Chinese Academy of Meteorological Sciences.

#### **8.0 REFERENCES**

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K. Tanaka, I. Tamagawa, H. Ishikawa, Y. Ma and Z. Hu, 2003: Surface energy and closure of the eastern Tibetan Plateau during the GAME-Tibet IOP 1998, J. Hydrology, vol. 283, pp. 169-183

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Ueno, K., H. Fujii, H. Yamada and L. Liu, (2001) Weak and Frequent Monsoon Precipitation over the Tibetan Plateau. J. Meteor. Soc. Japan, 79, 1B, 419-434.

## 9.0 Missing data periods

-----  
File Name : CAMP\_Tibet\_D105-AWS\_20031001\_20041128.sfc  
Data Period : 2003/10/01 00:00 - 2004/11/28 23:00  
-----

### Station Pressure

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

### Air Temperature

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

### Dew Point Temperature

2003/10/01 00:00 - 2004/11/28 23:00 (ALL)

### Relative Humidity

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

### Specific Humidity

2003/11/02 04:00 - 2003/11/02 10:00 (7)  
2004/04/22 03:00  
2004/09/28 06:00  
2004/10/08 11:00  
2004/10/11 13:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

### Wind Speed

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)

2004/11/24 17:00 - 2004/11/27 04:00 (60)

Wind Direction

2004/04/22 03:00

2004/10/30 18:00 - 2004/11/20 03:00 (490)

2004/11/24 17:00 - 2004/11/27 04:00 (60)

U Wind Component

2004/04/22 03:00

2004/10/30 18:00 - 2004/11/20 03:00 (490)

2004/11/24 17:00 - 2004/11/27 04:00 (60)

V Wind Component

2004/04/22 03:00

2004/10/30 18:00 - 2004/11/20 03:00 (490)

2004/11/24 17:00 - 2004/11/27 04:00 (60)

Precipitation

2003/10/01 00:00 - 2004/02/06 15:00 (3088)

2004/03/31 17:00 - 2004/11/28 23:00 (5815)

Snow Depth

2003/10/01 00:00 - 2004/11/28 23:00 (ALL)

Incoming Shortwave

2004/04/22 03:00

2004/10/30 18:00 - 2004/11/20 03:00 (490)

2004/11/24 17:00 - 2004/11/27 04:00 (60)

Outgoing Shortwave

2004/01/13 02:00

2004/01/30 06:00

2004/01/30 17:00

2004/01/31 06:00

2004/02/04 07:00 - 2004/02/04 14:00 (8)

2004/02/05 05:00

2004/02/05 09:00 - 2004/02/05 14:00 (6)

2004/02/08 09:00

2004/02/09 07:00

2004/02/10 13:00 - 2004/02/10 17:00 (5)

2004/02/12 07:00 - 2004/02/12 10:00 (4)

2004/02/13 10:00

2004/02/14 06:00

2004/02/14 09:00

2004/02/15 05:00

2004/02/23 03:00

2004/03/05 03:00 - 2004/03/05 05:00 (3)

2004/03/12 03:00

2004/03/13 02:00 - 2004/03/13 03:00 (2)

2004/03/14 04:00

2004/03/16 03:00 - 2004/03/16 04:00 (2)

2004/03/16 08:00

2004/03/17 02:00 - 2004/03/17 03:00 (2)

2004/03/17 05:00

2004/03/17 08:00 - 2004/03/17 09:00 (2)

2004/03/18 02:00 - 2004/03/18 03:00 (2)

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#### Incoming Longwave

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

#### Outgoing Longwave

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2004/05/09 18:00 - 2004/05/09 19:00 (2)  
2004/05/10 05:00 - 2004/05/10 06:00 (2)  
2004/05/10 10:00 - 2004/05/10 16:00 (7)  
2004/05/10 18:00 - 2004/05/10 20:00 (3)  
2004/05/11 02:00 - 2004/05/11 07:00 (6)  
2004/05/11 09:00 - 2004/05/11 16:00 (8)  
2004/05/11 19:00 - 2004/05/11 22:00 (4)  
2004/05/12 02:00 - 2004/05/12 06:00 (5)  
2004/05/12 10:00 - 2004/05/12 18:00 (9)  
2004/05/13 03:00 - 2004/05/13 10:00 (8)  
2004/05/13 13:00 - 2004/05/13 18:00 (6)  
2004/05/13 20:00  
2004/05/14 03:00  
2004/05/14 05:00  
2004/05/14 07:00 - 2004/05/14 10:00 (4)  
2004/05/14 12:00 - 2004/05/14 18:00 (7)  
2004/05/15 03:00 - 2004/05/15 17:00 (15)  
2004/05/16 02:00 - 2004/05/16 06:00 (5)  
2004/05/16 12:00 - 2004/05/16 16:00 (5)  
2004/05/17 02:00 - 2004/05/17 17:00 (16)  
2004/05/18 03:00  
2004/05/18 13:00 - 2004/05/18 16:00 (4)  
2004/05/18 18:00  
2004/05/19 15:00 - 2004/05/19 16:00 (2)  
2004/05/20 05:00 - 2004/05/20 06:00 (2)  
2004/05/20 08:00  
2004/05/20 10:00 - 2004/05/20 12:00 (3)  
2004/05/20 19:00 - 2004/05/20 20:00 (2)  
2004/05/21 02:00 - 2004/05/21 05:00 (4)  
2004/05/21 13:00 - 2004/05/21 14:00 (2)



2004/05/22 02:00 - 2004/05/22 16:00 (15)  
 2004/05/23 02:00 - 2004/05/23 15:00 (14)  
 2004/05/24 02:00 - 2004/05/24 15:00 (14)  
 2004/05/25 02:00 - 2004/05/25 17:00 (16)  
 2004/05/26 02:00  
 2004/05/26 18:00 - 2004/05/26 19:00 (2)  
 2004/05/27 04:00 - 2004/05/27 10:00 (7)  
 2004/05/29 06:00 - 2004/05/30 04:00 (23)  
 2004/05/31 00:00 - 2004/05/31 01:00 (2)  
 2004/05/31 18:00 - 2004/05/31 19:00 (2)  
 2004/06/01 02:00 - 2004/06/01 18:00 (17)  
 2004/06/02 04:00 - 2004/06/02 18:00 (15)  
 2004/06/05 18:00  
 2004/06/07 01:00 - 2004/06/07 11:00 (11)  
 2004/06/09 06:00  
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 2004/06/14 11:00 - 2004/06/14 12:00 (2)  
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 2004/07/18 15:00 - 2004/07/19 19:00 (29)  
 2004/07/20 03:00 - 2004/07/20 18:00 (16)  
 2004/07/21 03:00 - 2004/07/21 05:00 (3)  
 2004/10/19 04:00 - 2004/10/20 01:00 (22)  
 2004/10/20 03:00 - 2004/10/20 23:00 (21)  
 2004/10/21 04:00 - 2004/10/21 20:00 (17)  
 2004/10/22 03:00 - 2004/10/23 01:00 (23)  
 2004/10/27 12:00 - 2004/10/29 02:00 (39)  
 2004/10/29 04:00 - 2004/10/29 08:00 (5)  
 2004/10/30 16:00  
 2004/10/30 18:00 - 2004/11/20 15:00 (502)  
 2004/11/21 03:00 - 2004/11/21 21:00 (19)  
 2004/11/22 03:00 - 2004/11/22 16:00 (14)  
 2004/11/23 03:00  
 2004/11/23 05:00 - 2004/11/23 14:00 (10)  
 2004/11/24 04:00 - 2004/11/24 14:00 (11)  
 2004/11/24 17:00 - 2004/11/28 01:00 (81)  
 2004/11/28 03:00 - 2004/11/28 20:00 (18)

Net Radiation

2003/10/21 03:00  
 2003/10/24 02:00 - 2003/10/24 03:00 (2)  
 2003/10/25 02:00 - 2003/10/25 06:00 (5)  
 2003/10/28 20:00  
 2003/10/30 04:00 - 2003/10/30 05:00 (2)  
 2003/10/31 13:00 - 2003/10/31 15:00 (3)  
 2003/11/01 12:00 - 2003/11/01 13:00 (2)  
 2003/11/02 04:00 - 2003/11/02 11:00 (8)  
 2003/11/03 10:00 - 2003/11/03 11:00 (2)  
 2003/11/04 04:00  
 2003/11/07 06:00  
 2003/11/10 05:00 - 2003/11/10 06:00 (2)  
 2003/11/22 05:00  
 2003/12/19 03:00 - 2003/12/19 04:00 (2)  
 2003/12/21 04:00  
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2004/01/17 04:00  
2004/01/17 09:00  
2004/01/26 08:00  
2004/01/26 19:00  
2004/01/27 04:00  
2004/01/28 09:00  
2004/01/30 06:00  
2004/01/30 17:00 - 2004/01/30 18:00 (2)  
2004/01/31 06:00  
2004/02/01 00:00  
2004/02/01 04:00  
2004/02/01 16:00  
2004/02/03 05:00  
2004/02/03 16:00  
2004/02/04 07:00 - 2004/02/04 14:00 (8)  
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2004/02/05 05:00  
2004/02/05 09:00 - 2004/02/05 14:00 (6)  
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2004/02/09 19:00  
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2004/02/11 05:00 - 2004/02/11 06:00 (2)  
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2004/02/14 04:00 - 2004/02/14 06:00 (3)  
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2004/02/15 05:00  
2004/02/16 03:00 - 2004/02/16 04:00 (2)  
2004/02/21 12:00  
2004/02/23 02:00 - 2004/02/23 03:00 (2)  
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2004/03/05 03:00 - 2004/03/05 05:00 (3)  
2004/03/09 04:00  
2004/03/12 03:00  
2004/03/13 00:00  
2004/03/13 02:00 - 2004/03/13 03:00 (2)  
2004/03/14 04:00  
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2004/03/16 02:00 - 2004/03/16 04:00 (3)  
2004/03/16 08:00  
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2004/03/18 02:00 - 2004/03/18 03:00 (2)  
2004/03/19 10:00  
2004/03/20 01:00 - 2004/03/20 03:00 (3)  
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2004/03/25 02:00 - 2004/03/25 03:00 (2)  
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2004/03/30 07:00 - 2004/03/30 09:00 (3)  
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2004/04/02 07:00 - 2004/04/02 10:00 (4)  
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2004/04/07 05:00  
2004/04/08 02:00 - 2004/04/08 05:00 (4)  
2004/04/08 10:00  
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2004/04/09 02:00  
2004/04/09 04:00 - 2004/04/09 19:00 (16)  
2004/04/10 02:00 - 2004/04/10 15:00 (14)  
2004/04/11 03:00 - 2004/04/11 14:00 (12)  
2004/04/12 02:00  
2004/04/13 04:00 - 2004/04/13 14:00 (11)  
2004/04/14 04:00 - 2004/04/14 07:00 (4)  
2004/04/14 21:00 - 2004/04/15 04:00 (8)  
2004/04/15 16:00 - 2004/04/15 17:00 (2)  
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2004/04/16 04:00  
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2004/04/17 02:00  
2004/04/17 04:00  
2004/04/17 07:00 - 2004/04/17 11:00 (5)  
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2004/04/18 02:00 - 2004/04/18 16:00 (15)  
2004/04/19 01:00 - 2004/04/19 15:00 (15)  
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2004/04/22 02:00 - 2004/04/22 08:00 (7)

2004/04/22 23:00 - 2004/04/23 06:00 (8)  
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2004/04/26 19:00 - 2004/04/26 20:00 (2)  
2004/04/26 23:00 - 2004/04/27 15:00 (17)  
2004/04/28 17:00  
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2004/05/01 06:00 - 2004/05/01 21:00 (16)  
2004/05/02 03:00 - 2004/05/02 04:00 (2)  
2004/05/02 21:00 - 2004/05/03 06:00 (10)  
2004/05/03 11:00 - 2004/05/03 15:00 (5)  
2004/05/03 22:00  
2004/05/04 03:00 - 2004/05/04 15:00 (13)  
2004/05/04 17:00 - 2004/05/04 18:00 (2)  
2004/05/04 20:00  
2004/05/05 04:00 - 2004/05/05 05:00 (2)  
2004/05/05 11:00 - 2004/05/05 12:00 (2)  
2004/05/05 19:00 - 2004/05/05 20:00 (2)  
2004/05/06 02:00  
2004/05/06 04:00 - 2004/05/06 07:00 (4)  
2004/05/06 13:00 - 2004/05/06 16:00 (4)  
2004/05/07 02:00 - 2004/05/07 04:00 (3)  
2004/05/07 08:00  
2004/05/07 11:00 - 2004/05/07 17:00 (7)  
2004/05/08 02:00 - 2004/05/08 07:00 (6)  
2004/05/09 01:00 - 2004/05/09 06:00 (6)  
2004/05/09 08:00  
2004/05/09 11:00 - 2004/05/09 16:00 (6)  
2004/05/09 18:00 - 2004/05/09 19:00 (2)  
2004/05/10 05:00 - 2004/05/10 06:00 (2)  
2004/05/10 10:00 - 2004/05/10 16:00 (7)  
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2004/05/13 03:00 - 2004/05/13 18:00 (16)  
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2004/05/14 03:00 - 2004/05/14 18:00 (16)  
2004/05/15 03:00 - 2004/05/15 17:00 (15)  
2004/05/16 00:00 - 2004/05/16 06:00 (7)  
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2004/05/17 02:00 - 2004/05/17 17:00 (16)  
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2004/05/18 13:00 - 2004/05/18 16:00 (4)  
2004/05/18 18:00  
2004/05/19 15:00 - 2004/05/19 16:00 (2)  
2004/05/20 05:00 - 2004/05/20 12:00 (8)  
2004/05/20 19:00 - 2004/05/20 20:00 (2)  
2004/05/21 02:00 - 2004/05/21 05:00 (4)  
2004/05/21 13:00 - 2004/05/21 14:00 (2)  
2004/05/22 00:00 - 2004/05/22 16:00 (17)  
2004/05/23 02:00 - 2004/05/23 15:00 (14)  
2004/05/24 02:00 - 2004/05/24 15:00 (14)  
2004/05/25 00:00 - 2004/05/25 17:00 (18)  
2004/05/26 02:00  
2004/05/26 18:00 - 2004/05/26 19:00 (2)

2004/05/27 04:00 - 2004/05/27 10:00 (7)  
2004/05/29 06:00 - 2004/05/30 04:00 (23)  
2004/05/31 00:00 - 2004/05/31 01:00 (2)  
2004/05/31 18:00 - 2004/05/31 19:00 (2)  
2004/06/01 02:00 - 2004/06/01 18:00 (17)  
2004/06/02 04:00 - 2004/06/02 18:00 (15)  
2004/06/05 18:00  
2004/06/06 23:00 - 2004/06/07 11:00 (13)  
2004/06/09 06:00  
2004/06/11 11:00  
2004/06/14 11:00 - 2004/06/14 12:00 (2)  
2004/06/19 15:00  
2004/06/26 00:00 - 2004/06/26 18:00 (19)  
2004/07/18 15:00 - 2004/07/19 19:00 (29)  
2004/07/20 03:00 - 2004/07/20 18:00 (16)  
2004/07/21 03:00 - 2004/07/21 05:00 (3)  
2004/10/19 04:00 - 2004/10/20 01:00 (22)  
2004/10/20 03:00 - 2004/10/20 23:00 (21)  
2004/10/21 04:00 - 2004/10/21 20:00 (17)  
2004/10/22 01:00 - 2004/10/23 01:00 (25)  
2004/10/27 12:00 - 2004/10/29 08:00 (45)  
2004/10/30 16:00  
2004/10/30 18:00 - 2004/11/20 15:00 (502)  
2004/11/21 01:00 - 2004/11/21 21:00 (21)  
2004/11/22 01:00 - 2004/11/22 16:00 (16)  
2004/11/23 03:00  
2004/11/23 05:00 - 2004/11/23 14:00 (10)  
2004/11/24 04:00 - 2004/11/24 14:00 (11)  
2004/11/24 17:00 - 2004/11/28 20:00 (100)

#### Skin Temperature

2004/04/22 03:00  
2004/10/30 18:00 - 2004/11/20 03:00 (490)  
2004/11/24 17:00 - 2004/11/27 04:00 (60)

#### Incoming PAR

2003/10/01 00:00 - 2004/11/28 23:00 (ALL)

#### Outgoing PAR

2003/10/01 00:00 - 2004/11/28 23:00 (ALL)