TITLE

CAMP_Himalayas_Syangboche_20031001_20040331.sfc

DATASET CONTACT

Ken'ichi Ueno
Graduate School of Life and Environmental Sciences
University of Tsukuba
Teno-dai 1-1-1, Tsukuba, Ibaraki
305-8572 - JAPAN
E-mail: kenueno@sakura.cc.tsukuba.ac.jp

Laura Bertolani
Epson Meteo Center
Via M. Viganò de Vizzi 93/95
20092 Cinisello Balsamo – Milan – ITALY
E-mail: laura.bertolani@epson-meteo.org

DATE OF THIS DOCUMENT

9 June 2005

1. 0 DATASET OVERVIEW

1.1 Introduction

Intensive meteorological observations in the Khumbu Valley, Nepal Himalayas, have been conducted since the middle 90's (Ueno et al., 1996; Bertolani et al., 2000; Ueno et al., 2001; Bollasina et al., 2002; Ueno and Pokhrel, 2002) in order to provide long-term monitoring of the monsoon at high altitude. This area, being located on the windward side of the Range with respect to the Indian monsoon, is well exposed to the summer winds. The studies conducted have demonstrated that the region is a significant point of observation both of local climate and large-scale circulation. The Syangboche AWS was established on October 21, 1994, at Syangboche village, Solu-Khumbu district, at an altitude of 3833 m a.s.l., with the cooperation between His Majesty's Government, Department of Hydrology and Meteorology (Nepal) and the Glaciological Expedition in Nepal Project (Japan), and has been kept as one of the GAME/AAN project AWS network. The AWS provides data for basin scale scientific process studies of meteorology, hydrology, glaciology and engineering disaster prevention, and also contributes to monitor 10 years scale climate change as representative station at mid-latitude alpine region.

1.2 Time period covered by the data

Start: 1 October 2003, 00:00
End: 31 March 2004, 23:40

1.3 Temporal characteristics of the data

All parameters are recoded every 20 minutes.

1.4 Physical location of the measurement

Latitude: 27° 48' 36" N
Longitude: 86° 43' 12" E
Elevation: 3833 m a.s.l.

1.5 Data source

Original data provided by the GAME/AAN Committee.

1.6 WWW address references

http://www.suiri.tsukuba.ac.jp/Project/aan/aan.html

2.0 INSTRUMENTATION DESCRIPTION

2.1 Platform

The sensors are mounted on a 3-m mast.

2.2 Description of the instrumentation

Parameter	Model	Manifacturer
Air Temperature	2812	Aandera (Norway)
Precipitation	RT-1 (Tipping bucket type)	Ogasawara (Japan)
Relative Humidity	2820	Aandera (Norway)
Atmospheric Pressure	2810	Aandera (Norway)
Wind Speed	2740	Aandera (Norway)
Wind Direction	2750	Aandera (Norway)
Downward Shortwave Radiation	2770	Aandera (Norway)
Upward Shortwave Radiation	2770	Aandera (Norway)

2.3 Instrumentation specification

Parameter	Sensor Type	Height of sensor (m)	Accuracy	Resolution
Air Temperature	Platinum Resistor	3.1	0.1%	0.1°C
Precipitation	Tipping Bucket	1	0.5 mm	0.5 mm
Relative Humidity	Hygrophiber	3.1	2%	1%
Atmospheric Pressure	Silicon Chip	3.1	0.2 hPa	0.1 hPa
Wind Speed	3-cup anemometer	3.1	2%	0.1m/s
Wind Direction	Potentiometer	3.1	5°	0.1°
Downward Shortwave Radiation	Thermistor Bridge	3.1	20 W/m^2	0.1W/m^2
Upward Shortwave Radiation	Thermistor Bridge	3.1	20 W/m^2	0.1W/m^2

3.0 DATA COLLECTION AND PROCESSING

3.1 Description of data collection

Original N-value data are saved in the Data Storage Unit (DSU). DSU is collected from the AWS twice every year, in spring and autumn.

3.2 Description of derived parameters and processing techniques used

The N-value is converted to a meteorological value by using experimental coefficients defined for each sensor. Sensor calibration is conducted every two or three years for radiation, humidity, and pressure. Wind speed and direction sensors has been changed several times due to damages. All values are instantaneous. Precipitation is accumulated on the previous 20 minutes.
The three parameters indicated below were computed by using "CEOP Derived Parameter Equations: http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html. Also put the data flag "I". In the case of calculated by using dubious value flagged "D", the data flag was put "D".

Dew Point Temperature were computed by using (Bolton 1980):

es = 6.112 * exp((17.67 * T)/(T + 243.5));
e = es * (RH/100.0);
Td = log(e/6.112)*243.5/(17.67-log(e/6.112));
where:
T = temperature in deg C;
es = saturation vapor pressure in mb;
e = vapor pressure in mb;
RH = Relative Humidity in percent;
Td = dew point in deg C

Specific Humidity were computed by using (Bolton 1980):

e = 6.112*exp((17.67*Td)/(Td + 243.5));
q = (0.622 * e)/(p - (0.378 * e));
where:
e = vapor pressure in mb;
Td = dew point in deg C;
p = surface pressure in mb;
q = specific humidity in kg/kg.

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

U = -sin(direction) * wind_speed;
V = -cos(direction) * wind_speed;

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.
Nocturnal shortwave radiation data has been checked for non-zero values; wind direction reached sometimes values above 360° (these values have been corrected to 360). Precipitation data has been checked for delayed measurement due to the melting of solid precipitation. Where possible, cross-checking among the variation of different measured parameters (e.g., precipitation with relative humidity) was also performed to assure the consistency among the variations of different variables under the same conditions. The

consistency of downward and upward shortwave radiation was also verified calculating the albedo (at high sun elevations).
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

Wind vane was found to be shifted from the center on February 2004, and it has not rotated with proper balance. Wind direction data was not corrected (flag B). Relative humidity seems to be underestimated in comparison with Namche AWS, and never reaches saturation (flag D).

6.1.2 Quality issues

Due to slow melting of solid precipitation in the not-heated rain gauge, precipitation is sometimes recorded with delay in case of below-zero air temperature. Zero-precipitation is also recorded during snowfall if air temperature is below 0°C. All these data were considered dubious.

6.2 Missing data periods

Relative Humidity data are missing until 5 March 2004 at 7:20.
Upward Short Wave Radiation is missing from 5 March at 6:40 on.
All data are missing from 3 March 2003 at 4:20 to 7:00.

7.0 REFERENCE REQUIREMENTS

The data was collected under the GEWEX/GAME project funded by Ministry of Education, Science, Sports and Culture and Asian Pacific Network, and special research foundation of the University of Shiga prefecture.

8.0 REFERENCES

Ueno K., and A. P. Pokhrel, 2002: Intra-seasonal air temperature variation in the Nepal Himalayas, Mausam, **53**, 281-288.

Bollasina, M., L. Bertolani, and G. Tartari, 2002: Meteorological observations in the Khumbu Valley, Nepal Himalayas, 1994-1999, *Bull. Glac. Res.*, **19**, 1-11.

Ueno K., R. B. Kayastha, M. R. Chitrakar, O. R. Bajracharya, A. P. Pokhrel, H. Fujinami, T. Kadota, H. Iida, D. P. Manandhar, M. Hattori, T. Yasunari, and M. Nakawo, 2001:

Meteorological observations during 1994-2000 at the Automatic Weather Station (GEN-AWS) in Khumbu region, Nepal Himalayas, *Bull. Glac. Res.*, **18**, 23-30.

Bertolani, L., M. Bollasina, and G. Tartari, 2000: Recent biennial variability of meteorological features in the Eastern Highland Himalayas, *Geophys. Res. Lett.*, **17**, 2185-2188.

Ueno K., H. Iida, H. Yabuki, K. Seko, A. Sakai, G. S. Lhakupa, R. B. Kayastha, A. P. Pokhrel, M. L. Shrestha, T. Yasunari, and M. Nakawo, 1996: Establishment of the GEN Automatic Weather Station (AWS) in Khumbu region, Nepal Himalayas, *Bull. Glac. Res.*, **14**, 13-22.

TITLE

CAMP_Himalayas_Syangboche_20040401_20041231.sfc

DATASET CONTACT

Ken'ichi Ueno
Graduate School of Life and Environmental Sciences
University of Tsukuba
Teno-dai 1-1-1, Tsukuba, Ibaraki
305-8572 - JAPAN
E-mail: kenueno@sakura.cc.tsukuba.ac.jp

Laura Bertolani
Epson Meteo Center
Via M. Viganò de Vizzi 93/95
20092 Cinisello Balsamo – Milan – ITALY
E-mail: laura.bertolani@epson-meteo.org

DATE OF THIS DOCUMENT

26 October 2005

1. 0 DATASET OVERVIEW

1.7 Introduction

Intensive meteorological observations in the Khumbu Valley, Nepal Himalayas, have been conducted since the middle 90's (Ueno et al., 1996; Bertolani et al., 2000; Ueno et al., 2001; Bollasina et al., 2002; Ueno and Pokhrel, 2002) in order to provide long-term monitoring of the monsoon at high altitude. This area, being located on the windward side of the Range with respect to the Indian monsoon, is well exposed to the summer winds. The studies conducted have demonstrated that the region is a significant point of observation both of local climate and large-scale circulation. The Syangboche AWS was established on October 21, 1994, at Syangboche village, Solu-Khumbu district, at an altitude of 3833 m a.s.l., with the cooperation between His Majesty's Government, Department of Hydrology and Meteorology (Nepal) and the Glaciological Expedition in Nepal Project (Japan), and has been kept as one of the GAME/AAN project AWS network. The AWS provides data for basin scale scientific process studies of meteorology, hydrology, glaciology and engineering disaster prevention, and also contributes to monitor 10 years scale climate change as representative station at mid-latitude alpine region.

1.8 Time period covered by the data

Start: 1 April 2004, 00:00
End: 31 December 2004, 23:40

1.9 Temporal characteristics of the data

All parameters are recoded every 20 minutes.

1.10 Physical location of the measurement

Latitude: 27° 48' 36" N
Longitude: 86° 43' 12" E
Elevation: 3833 m a.s.l.

1.11 Data source

Original data provided by the GAME/AAN Committee.

1.12 WWW address references

http://www.suiri.tsukuba.ac.jp/Project/aan/aan.html

2.0 INSTRUMENTATION DESCRIPTION

2.1 Platform

The sensors are mounted on a 3-m mast.

2.2 Description of the instrumentation

Parameter	Model	Manifacturer
Air Temperature	2812	Aandera (Norway)
Precipitation	RT-1 (Tipping bucket type)	Ogasawara (Japan)
Relative Humidity	2820	Aandera (Norway)
Atmospheric Pressure	2810	Aandera (Norway)
Wind Speed	2740	Aandera (Norway)
Wind Direction	2750	Aandera (Norway)
Downward Shortwave Radiation	2770	Aandera (Norway)
Upward Shortwave Radiation	2770	Aandera (Norway)

2.4 Instrumentation specification

Parameter	Sensor Type	Height of sensor (m)	Accuracy	Resolution
Air Temperature	Platinum Resistor	3.1	0.1%	0.1°C
Precipitation	Tipping Bucket	1	0.5 mm	0.5 mm
Relative Humidity	Hygrophiber	3.1	2%	1%
Atmospheric Pressure	Silicon Chip	3.1	0.2 hPa	0.1 hPa
Wind Speed	3-cup anemometer	3.1	2%	0.1m/s
Wind Direction	Potentiometer	3.1	5°	0.1°
Downward Shortwave Radiation	Thermistor Bridge	3.1	20 W/m^2	0.1W/m^2
Upward Shortwave Radiation	Thermistor Bridge	3.1	20 W/m^2	0.1W/m^2

3.0 DATA COLLECTION AND PROCESSING

3.1 Description of data collection

Original N-value data are saved in the Data Storage Unit (DSU). DSU is collected from the AWS twice every year, in spring and autumn.

3.2 Description of derived parameters and processing techniques used

The N-value is converted to a meteorological value by using experimental coefficients defined for each sensor. Sensor calibration is conducted every two or three years for radiation, humidity, and pressure. Wind speed and direction sensors has been changed several times due to damages. All values are instantaneous. Precipitation is accumulated on the previous 20 minutes.
The three parameters indicated below were computed by using "CEOP Derived Parameter Equations: http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/eqns.html. Also put the data flag "I". In the case of calculated by using dubious value flagged "D", the data flag was put "D".

Dew Point Temperature were computed by using (Bolton 1980):

es = 6.112 * exp((17.67 * T)/(T + 243.5));
e = es * (RH/100.0);
Td = log(e/6.112)*243.5/(17.67-log(e/6.112));
where:
T = temperature in deg C;
es = saturation vapor pressure in mb;
e = vapor pressure in mb;
RH = Relative Humidity in percent;
Td = dew point in deg C

Specific Humidity were computed by using (Bolton 1980):

e = 6.112*exp((17.67*Td)/(Td + 243.5));
q = (0.622 * e)/(p - (0.378 * e));
where:
e = vapor pressure in mb;
Td = dew point in deg C;
p = surface pressure in mb;
q = specific humidity in kg/kg.

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

U = -sin(direction) * wind_speed;
V = -cos(direction) * wind_speed;

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.
Nocturnal shortwave radiation data has been checked for non-zero values; wind direction reached sometimes values above 360° (these values have been corrected to 360). Precipitation data has been checked for delayed measurement due to the melting of solid precipitation. Where possible, cross-checking among the variation of different measured parameters (e.g., precipitation with relative humidity) was also performed to assure the consistency among the variations of different variables under the same conditions. The

consistency of downward and upward shortwave radiation was also verified calculating the albedo (at high sun elevations).
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

6.1.2 Quality issues

Due to slow melting of solid precipitation in the not-heated rain gauge, precipitation is sometimes recorded with delay in case of below-zero air temperature. Zero-precipitation is also recorded during snowfall if air temperature is below 0°C. All these data were considered dubious.

6.2 Missing data periods

All data are missing: 13 August 2004 at 5:00, from 13 August 2004 at 16:00 to 23:40.
Precipitation is missing from 13 August 2004 at 5:00 to the end of the period
Outgoing shortwave radiation is missing from 1 April 2004 at 00:00 to 5 October 2004 at 08:00

7.0 REFERENCE REQUIREMENTS

The data was collected under the GEWEX/GAME project funded by Ministry of Education, Science, Sports and Culture and Asian Pacific Network, and special research foundation of the University of Shiga prefecture.

8.0 REFERENCES

Ueno K., and A. P. Pokhrel, 2002: Intra-seasonal air temperature variation in the Nepal Himalayas, Mausam, **53**, 281-288.

Bollasina, M., L. Bertolani, and G. Tartari, 2002: Meteorological observations in the Khumbu Valley, Nepal Himalayas, 1994-1999, *Bull. Glac. Res.*, **19**, 1-11.

Ueno K., R. B. Kayastha, M. R. Chitrakar, O. R. Bajracharya, A. P. Pokhrel, H. Fujinami, T. Kadota, H. Iida, D. P. Manandhar, M. Hattori, T. Yasunari, and M. Nakawo, 2001: Meteorological observations during 1994-2000 at the Automatic Weather Station (GEN-AWS) in Khumbu region, Nepal Himalayas, *Bull. Glac. Res.*, **18**, 23-30.

Bertolani, L., M. Bollasina, and G. Tartari, 2000: Recent biennial variability of meteorological features in the Eastern Highland Himalayas, *Geophys. Res. Lett.*, **17**, 2185-2188.

Ueno K., H. Iida, H. Yabuki, K. Seko, A. Sakai, G. S. Lhakupa, R. B. Kayastha, A. P. Pokhrel, M. L. Shrestha, T. Yasunari, and M. Nakawo, 1996: Establishment of the GEN Automatic Weather Station (AWS) in Khumbu region, Nepal Himalayas, *Bull. Glac. Res.*, **14**, 13-22.