TITLE

CAMP_Himalayas_Syangboche_20021001_20030331.sfc

DATASET CONTACT

Ken'ichi Ueno
School of Environmental Science
University of Shiga Prefecture
Hassaka 2500 Hikone
Shiga 522-8533 - JAPAN
E-mail: kueno@ses.usp.ac.jp

Massimo Bollasina
Epson Meteo Center
Via M. Viganò de Vizzi 93/95
20092 Cinisello Balsamo - Milan - ITALY
E-mail: massimo.bollasina@epson-meteo.org

DATE OF THIS DOCUMENT

15 January 2004

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 2002, 00:00
End: 31 March 2003, 23:40

1.3 Temporal characteristics of the data

All parameters are recoded every 20 minutes. This station includes air temperature, relative humidity, dew point, specific humidity, station pressure, wind speed, wind direction, U wind component, V wind component, incoming shortwave radiation, outgoing shortwave radiation and precipitation.

The following parameters are completely missing: incoming PAR, outgoing PAR, incoming longwave radiation, outgoing longwave radiation, net radiation, skin temperature and snow depth.

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/m2 | 0.1W/m2 |
| Upward Shortwave Radiation | Thermistor Bridge | 3.1 | 20 W/m2 | 0.1W/m2 |

## 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.

### 3.3 Data format

These data are in the CEOP EOP-3 data format agreed to by the CEOP Scientific Steering Committee. This format is described in detail as part of the CEOP Reference Site Data Set Procedures Report which is available at the following URL:

http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/ceop_sfc_met_format.html

## 4.0 QUALITY CONTROL PROCEDURES

Nocturnal shortwave radiation data has been checked for non-zero values; wind speed for above-normal values (data above 9.5 m/s were set to undefined); relative humidity reached sometimes values above 100% (these values were corrected to 100%); winter precipitation (that is, during the cold season) was recorded as 0 even when snowfall occurred, because the rain gauge is not heated (all the values were considered dubious). 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.

4.2 UCAR/JOSS Quality Control Procedures

UCAR/JOSS conducted two primary quality assurance/control procedures on the reference
site data. First the data has been evaluated by a detailed QA algorithm that verifies the format is correct, examines any QC flags, and conducts basic checks on data values. Second, JOSS conducts a manual inspection of time series plots of each parameter.

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

Sensor calibration and level check is scheduled for 2004.

6.1.2 Quality issues

Overestimate of radiation data is reported in comparison to the Ev-K2-CNR Namche AWS. The rain gauge is not able to measure solid precipitation, as the instrument is not heated.

6.2 Missing data periods

Humidity data is missing after June 26, 2003.

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

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Ken'ichi Ueno
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Shiga 522-8533 - JAPAN
E-mail: kueno@ses.usp.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

24 January 2005

## 1. 0 DATASET OVERVIEW

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### 1.2 Time period covered by the data

Start: 1 April 2003, 00:00
End: 30 September 2003, 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.

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| Upward Shortwave Radiation | 2770 | Aandera (Norway) |

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| 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 $W/m^2$ | 0.1$W/m^2$ |
| Upward Shortwave Radiation | Thermistor Bridge | 3.1 | 20 $W/m^2$ | 0.1$W/m^2$ |

## 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

Sensor calibration and level check is scheduled for 2004.

6.1.2 Quality issues

Overestimate of radiation data is reported in comparison to the Ev-$K^2$-CNR Namche AWS.
The rain gauge is not able to measure solid precipitation, as the instrument is not heated.
Wind direction has been defined as Dubious when wind speed reached values less or equal 0.2 m/s.

6.2 Missing data periods

Humidity data is missing after June 26, 2003, 08:20
All data are missing from July 05, 2003, 11:20 to August 12, 2003, 05:40

## 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

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