

CEOP Reference Site Data Set Metadata Information

Reference Site: BALTEX Lindenberg
Station Identifiers: Falkenberg / Forest
Time Period: January 01, 2006 to December 31, 2006

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Abstract

This document includes specific information the user should be aware of when using any of the BALTEX Lindenberg reference site data from the CEOP Central Data Archive (CDA) submitted for the measurement period January 01, 2006 to December 31, 2006. It relies on the ***CEOP Reference Site Data Set Metadata Information document*** for the ***BALTEX Lindenberg*** site during ***CEOP Phase I*** where a detailed description of the measurement sites, the instrumentation, and the data collection and quality control procedures is given.

1. Data Set Overview

1.1 Site and Time Period

This description refers to the data from the BALTEX Lindenberg reference site for the period January 01, 2006 - 0030 UTC to December 31, 2006 - 2400 UTC. The BALTEX Lindenberg reference site comprises two independent stations named Falkenberg and Forest. These represent the two major land use types in the Lindenberg area (grassland / farmland, forest).

1.2 Site Co-ordinates

All surface ~, soil ~, tower ~ and flux measurements of the Falkenberg station have been performed at the Falkenberg Boundary Layer Field Site (in German: Grenzschichtmessfeld <GM> Falkenberg) of the Meteorological Observatory Lindenberg - Richard-Aßmann Observatory (MOL-RAO).

The co-ordinates of the GM Falkenberg are given by:

52°10' 01" N	14°07' 27" E	73 m NN
52.17°N	14.12°E	

The radiosondes are released at the site of the Meteorological Observatory Lindenberg – Richard-Aßmann Observatory (MOL-RAO) which is about 5 km to the North of the Falkenberg site.

The co-ordinates of the radiosonde release point at MOL-RAO are given by:

52°12' 36" N	14°07' 12" E	112 m NN
52.21°N	14.12°E	

The Forest Station is situated in a pine forest about 10 km to the West of the Falkenberg site. The co-ordinates of the Forest Station are given by:

52°10' 56" N	13°57' 14" E	49 m NN
52.18°N	13.95°E	

1.3 Site Operator

The Meteorological Observatory Lindenberg – Richard-Aßmann Observatory (MOL-RAO) is part of the business area Research and Development of the Deutscher Wetterdienst (DWD), the national meteorological service of Germany.

1.4 General Site Description

The detailed site description is given in the **CEOP Reference Site Data Set Metadata Information document** for the **BALTEX Lindenberg** site during **CEOP Phase I**. Since no changes occurred the user is referred to this document.

2. Instrumentation Description

A detailed instrumentation description is given in the ***CEOP Reference Site Data Set Metadata Information document*** for the ***BALTEX Lindenberg*** site during ***CEOP Phase I***. The user is referred to this document. The following paragraphs just report on the modifications relevant for the 2006 data set.

2.1 The Falkenberg Field Site

No major changes of the general set-up occurred in 2006. Due to building activities in connection with renewing the infrastructure at GM Falkenberg, the eddy-covariance station for the measurement of the turbulent fluxes that is operated at the western edge of the grassland field site (see section 2.2 of the main reference document) had been slightly moved towards East on October 18, 2006. The new position since then was about 10 m from the edge of the field. Fetch conditions are only marginally affected from this re-positioning.

2.2 The Forest Station

No changes of the general set-up occurred in 2006.

2.3 Sensor List

No changes of instrumentation occurred in 2005.

A few sensor replacements (e.g., of the turbulence and radiation sensors, and of the cup anemometers in connection with configuration updates or regular maintenance and calibration activities, respectively) were performed without changing the sensor type.

Vaisala sensor HMP-45D was used throughout the year to perform humidity measurements in addition to the psychrometric measurements during the summer season.

Operational radiosonde measurements at MOL are performed four times daily using Vaisala RS-92-AGP radiosondes in connection with Vaisala Digi-Cora III ground equipment and GPS wind finding. Release times are around 0515 UTC, 1115 UTC, 1715 UTC, and 2315 UTC, respectively.

3. Data Collection and Processing

A detailed description of the data collection and processing algorithms is given in the ***CEOP Reference Site Data Set Metadata Information document*** for the ***BALTEX Lindenberg*** site during ***CEOP Phase I***. A few modifications concerning the processing of the soil moisture and turbulence data had been introduced in 2005. They are described in the ***CEOP Reference Site Data Set Metadata Information document*** valid for the ***BALTEX Lindenberg*** site over the period January 01, 2005 to December, 31, 2005. These modified procedures have been applied without further changes to the data set from 2006. The user is referred to these two documents.

4. Quality control procedures

A detailed description of the quality control procedures is given in the **CEOP Reference Site Data Set Metadata Information document** for the **BALTEX Lindenberg** site during **CEOP Phase I**. The user is referred to this document. No modifications were introduced in 2005.

5. Gap Filling Procedures

No gap filling procedures using model assumptions have been applied for the data period January 01, 2006 to December 31, 2006.

6. Data Remarks

This section gives specific additional information on different parameters the user should be aware of when using the data. General remarks given in the **CEOP Reference Site Data Set Metadata Information document** for the **BALTEX Lindenberg** site during **CEOP Phase I** are not included here again. The user is referred to this document. The following paragraphs just report on the specific issues relevant for the 2006 data set.

General

No data are available for GM Falkenberg between July 03, 2230 UTC and July 04, 0200 UTC, and on July 06, 0730 UTC due to power failure (except for the turbulent fluxes). Logger failure caused missing pressure and radiation data for the Forest station on July 06, September, 24, and November 01 (whole day), and on December 25, 2030-2400 UTC. A few hours of data gaps due to maintenance activities at the Forest tower occurred on April 05, and October 25.

Humidity

Relative Humidity (both in the surface and tower data sets) was measured simultaneously by HMP-45D capacitive humidity sensor and by aspirated psychrometer during the warm season. If available, the psychrometer data were selected for the CEOP data set. Problems with the proper wetting of the wicks occurred over different time periods both during spring when the pollen load of the air was very high and during the very warm and dry summer months. Moreover, problems with the climbing security system at the Falkenberg tower prevented maintenance activities of the tower sensors (including the refilling of the water supply for the psychrometers) during the period August 26 till September 13. Unreliable psychrometer data during these periods were replaced by the HMP measurements. An overview on the periods for which psychrometer data were available is given in Table 1.

GM Falkenberg		Forest Station	
2 m (SFC data)	40 / 98 m (TWR data)	2 m (SFC data)	14.5 / 28 m (TWR data)
Apr 01 – May 11	May 09 – Jun 01	Apr 05 – Jun 01	14.5 m
May 16 – Jun 09	Jun 09 – Jun 13	Jun 03 – Aug 18	Apr 05 – May 07
Jun 14 – Jun 23	Jun 17 – Jun 25	Aug 21 – Oct 24	May 10 – Oct 24
Jun 27 – Jul 08	Jun 28 – Jul 02		28 m
Jul 11- Jul 13	Jul 11 – Jul 14		Apr 05 – Jul 02
Jul 19 – Jul 22	Jul 19 – Jul 21		Jul 05 – Jul 24
Aug 03 – Aug 06	Jul 25 – Aug 18		Aug 05 – Aug 19
Aug 11 – Aug 30	Aug 21 – Aug 27		Aug 21 – Aug 23
Sep 06 – Sep 13	Sep 16 – Oct 31		Aug 25 – Aug 27
Sep 16 – Sep 20			Sep 07 – Oct 24
Sep 27 – Oct 24			

Moreover, HMP-45D measurements had to be included in the data set as well during periods with (mainly nighttime) temperatures below freezing point when the psychrometer wet bulb temperature measurement becomes unreliable. This concerns a few nights in the beginning of April (April 6-12).

Wind Speed and Wind Direction

Icing during winter conditions caused a series of missing data values in the GM Falkenberg surface data set and in the Forest Station surface and tower data sets, especially during the periods January 20-24, and December 27-28. A logger failure caused missing wind data in the Falkenberg surface data set on August 09, 0100-0300 UTC.

Wind direction data from the Falkenberg tower show Flag = D for about 6 % of the measurements indicating that the independent wind direction measurements on the three booms differed by more than 10 deg. In contrast to the 2003-2005 data sets these flags were not reset to Flag = G in the process of manual data control to indicate some uncertainty of the wind direction values which, nevertheless, should be reliable enough for most applications.

Precipitation

Precipitation data at the Forest Station are missing for the periods Jan 01 – Jan 03 and Mar 12 – Mar 14 (due to data logger failure).

Surface Temperature

Surface temperature measurements performed with the KT15.82 sensors are representative for a small spot of the underlying surface only. Shadow effects from the guy wire of the mounting structure on these spots are visible on clear sky days in the time series between around 0800 UTC and 0900 UTC during the summer season, corresponding data have been marked with Flag = D.

Moreover, during the hot and dry summer 2006, the grassland surface at GM Falkenberg showed small-scale differences in the overall status of the vegetation cover. As a consequence, the threshold for the comparison of the measured surface temperature with the surface temperature calculated from the outgoing longwave radiation was exceeded on a number of days – data got Flag = D in these cases although we believe that the measurements are correct, but their representativeness is limited.

Soil Temperature

Data logger problems occurred at GM Falkenberg during the time periods between January 12 and February 08, and again between June 19 and August 31, causing a number of slight jumps and offsets for some of the soil temperature measurement levels (namely at –150, –120, –90, –60, and –45 cm), these weak perturbations were difficult to detect, the measurements over the periods with disturbed behaviour were therefore flagged as questionable (Flag = D) and should be used with some caution.

Soil Moisture

Soil moisture measurements performed with TDR sondes are not reliable in case of frozen soil (since the dielectricity constant of water is much different from that of ice). During the period January to March 2006 frost penetrated into the soil down to about 50 cm. Corresponding soil moisture values are marked by either Flag = B (if freezing effects are obvious) or by Flag = D (if freezing effects could not be excluded) and should be disregarded.

At a depth of –15 cm, one of the three sensors was not working between January 08, 1730 UTC and April 11, 0830 UTC due to a power supply failure. During this time period, reported soil moisture values at –15 cm are an average of two sensors (instead of three) only, and slight jumps with a magnitude of about 1 Vol-% occur at the transition times.

For the forest site, some unusual behaviour in the soil moisture profiles has been found (which was partly present also in 2005). However, control measurements with an independent system did not clearly falsify the data in question. Further work will be undertaken analyse the features that are unexplained yet. It might therefore happen that a revised STM data set for the forest station has to be submitted at a later time. For now, this data set should be used with some caution.

Turbulent Fluxes

Flux measurements of both eddy-covariance systems are affected from poorly defined fetch conditions and flow distortion effects for a certain wind direction sector. Flow distortion is unavoidable due to the mounting of the infrared hygrometer close to the sonic. Additional flow distortion arises from the vicinity of the 10m-mast in case of S1. The following disturbed sectors were valid for the measurements in 2006

Falkenberg, S1 system	030-120 deg
Falkenberg, S2 system	300-010 deg
Forest Station	330-030 deg

Original flux data for the two systems at GM Falkenberg generally got Flag = D, if the wind direction was within these ranges. The setup of the S1 and S2 systems ensures, that no flow distortion and limited fetch effects occur for the flux composite (see section 3.2) at GM Falkenberg.

Icing during winter conditions caused a number of sensor faults of the sonic anemometer.

The infrared hygrometers at the S1 and S2 stations were replaced in connection with the regular maintenance and calibration schedule by two instruments of a different production charge. These appeared to be more sensitive to certain types of surface pollution than the older sensors resulting in large differences between the mean absolute humidity of the infrared hygrometer when compared with the psychrometer reference. Although no clear effects on the latent heat fluxes could be proven in the data it has been decided to set Flag = D over the time period when these problems occurred (May 23 to June 24). An adjustment of the maintenance procedures finally brought a solution.

Soil Heat Flux

High voltage during a thunderstorm caused a logger damage at the soil heat flux data acquisition unit twice on June 30 and again on August 18, resulting in data losses over the periods June 30, 2200 UTC till July 02, 0730 UTC and August 18, 1130 UTC till August 29, 1230 UTC, respectively. Independent soil heat flux measurements were available from a test measurement program at GM Falkenberg run over the summer 2006. Data from these second site were fitted to the measurements of the standard soil heat flux sensors for the time periods around the periods with no data, and the second-site data were then used to fill the gaps.

Additional gaps on May 03, 1230-1430 UTC and June 21, 0730 (–10 cm only) were caused by logger failures.

Disclaimer

The data from the Lindenberg reference site have undergone the QA/QC procedure described in section 4 before being transferred to the CEOP Central Data Archive (CDA). The data supplier, however, can not guarantee the absence of any errors and can not take over any responsibility for results coming out of the use of the data. Data users who should discover problems, inconsistencies or any questionable effects when using the Lindenberg data are kindly invited to contact the Lindenberg site and / or data managers.

7. Reference Requirements

Use of the Lindenberg reference site data should be made according to the CEOP data policy rules outlined in the CEOP Reference Sites Data Release Guidelines. In particular every data user who should discover internal inconsistencies, questionable effects, missing data, or any other problems is encouraged to contact the responsible site and / or data managers.

The data source should be referred to as:

Deutscher Wetterdienst (DWD) - Meteorologisches Observatorium Lindenberg / Richard-Aßmann Observatorium.

Data users are requested to send a copy of any publication making use of Lindenberg data to MOL-RAO (see address above).