

CEOP Reference Site Data Set Metadata Information

Reference Site: BALTEX Lindenberg
Station Identifiers: Falkenberg / Forest
Time Period: January 01, 2005 to December 31, 2005

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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, 2005 to December 31, 2005. 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, 2005 - 0030 UTC to December 31, 2005 - 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 2005 data set.

2.1 The Falkenberg Field Site

No changes of the general set-up occurred in 2005.

2.2 The Forest Station

No changes of the general set-up occurred in 2005.

2.3 Sensor List

No changes of instrumentation occurred in 2005.

A few sensor replacements (e.g., of the turbulence 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***. The user is referred to this document. The following paragraphs just report on the modifications relevant for the 2005 data set.

3.1 Data Collection

Sampling rate of the high-resolution radiosonde data has been modified to 5 sec. with the introduction of the Vaisala RS-92-AGP radiosondes in July 2004.

3.2 Data Processing

The following modifications of the data processing were introduced in 2005:

Soil moisture

Soil moisture determination using the gravimetric method and the Lumbricus sonde (<http://www.meteolabor.ch>) is performed regularly during frost-free periods for comparison with

the continuous TDR measurements. A detailed analysis of these measurements and the comparison with additional TDR profile data at two test sites at GM Falkenberg have lead to an update of the STM data set for CEOP Phase 1 (October 01, 2002, - December 31, 2004). The background of this re-submission is a recalculation of the soil moisture profile data. Initially, the soil moisture measurements from the Falkenberg field site had been corrected based on a laboratory calibration of the TDR sondes performed at Lindenberg in order to adjust the measurements to the specifics of the soil at the site. The comprehensive long-term measurements (over two years, from November 2003 to December 2005) between the TDR sondes, gravimetry and soil moisture profiling using the Lumbricus system have shown that the initial correction to the TDR data appears to be not suitable. Based on this two-year intercomparison data set it has been therefore decided to recalculate the soil moisture data by removing the initial correction. Moreover, an improved quality control scheme has been implemented resulting in a more reliable detection of dubious or bad soil moisture data in cases of frozen soil (If upper soil layers were frozen for longer time periods during the winter, this lead to unphysical soil moisture values which were given Flag = B). The data revision covered the whole EOP-3 and EOP-4 periods from October 01, 2002 till December 31, 2004. The 2005 data were treated according to the revised procedures.

Turbulent fluxes

The procedures to create a composite flux data set from the measurements with the two sonics (see section 2.2) at the **GM Falkenberg** taking into account the corresponding fetch conditions have been slightly modified:

- The southern sector for averaging data from the S1 and S2 stations has been enlarged, the new sectors are:
 - wind direction from sector > 000...010 deg: data were taken from S1
 - wind direction from sector > 010...030 deg: fluxes from S1 and S2 were averaged
 - wind direction from sector > 030...150 deg: data were taken from S2
 - wind direction from sector > 150...190 deg: fluxes from S1 and S2 were averaged
 - wind direction from sector > 190...360 deg: data were taken from S1.
- The averaging for the sectors (010..030 deg) and (150 .. 190 deg) has been changed from arithmetic to weighted.
- Bad data from the selected station were replaced by the measurements from the other station if a lower quality flag was assigned to these data.

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, 2005 to December 31, 2005.

6. Data Remarks

This section gives specific additional information on different parameters the user should be aware of when using the data. General remarks on the different data 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 2005 data set.

General

High voltage during a thunderstorm caused a damage of several data loggers at the Forest Station on July 29, 2005. As a consequence, no radiation data are available for the time period July 29, 0630 UTC – August 04, 0830 UTC, and no soil data are available for the time period July 29, 0630 UTC – August 17, 1130 UTC. Additional logger problems caused data losses at the Forest Station on August 14 (part of SFC data), August 19 (part of SFC and TWR data), and September 01 (part of STM data).

No data are available at all for GM Falkenberg on February 04, 1130-1200 UTC, and on December 17, 1100-1130 UTC due to power failure.

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. Larger periods of missing psychrometer measurements indicated in Table 8 during May / June were due to a contamination of water resulting in disturbed wetting of the wicks. Additional problems with the proper wetting of the wicks occurred during the summer months..

GM Falkenberg		Forest Station
2 m (SFC data)	40 / 98 m (TWR data)	SFC + TWR data
Apr 01 – May 11	Apr 01 – May 05	Apr 01 – May 01
Jun 03 – Jun 14	Jun 10 – Jul 11	Jun 11 – Sep 17
Jun 17 – Aug 20	Jul 15 – Jul 18	Sep 20 – Nov 07
Sep 03 – Sep 14	Aug 02 – Aug 10	
Sep 20 – Oct 31	Aug 20 – Aug 25	
	Aug 30 – Oct 31	

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 1-4, 6, 10) and in October (October 14-19).

Wind Speed

Icing during winter conditions caused a series of missing data values in the GM Falkenberg surface data set and in the Forest Station tower data set, especially during the periods 20050122-20050124, 20050223-20050228, 20051121-20051122, 20051206, 20051210, 20051213, 20051216, and 20051221.

Precipitation

Precipitation data at the Forest Station are missing for the periods May 22 to Jun 07 (due to data logger power failure), and Sep 03 to Sep 06 (due to sensor failure).

Radiation

No radiation data are available at the Forest Station for the time period July 29, 0630 UTC – August 04, 0830 UTC due to data logger damage and on August 14 due to data logger malfunction.

Soil Temperature

A data logger problem occurred at GM Falkenberg during the time period May 05 to June 18, causing a number of slight jumps and offsets for some of the soil temperature measurement levels (namely at -150, -120, -90, -60, -45, -30, -20, and -5 cm), these weak perturbations were difficult to detect, the measurements over the whole period were therefore flagged as questionable (Flag = D) and 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 2005

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.

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).