



**BALTEX CEOP Reference Site Manager Meeting  
held  
19-20 September 2002  
at  
Arctic Research Centre/Finnish Meteorological Institute, Sodankylä, Finland**

***Meeting minutes***  
(as of 1 November 2002)

Participants:

Frank Beyrich, Lindenberg Observatory/DWD, Germany  
Fred Bosveld, Cabauw/KNMI, The Netherlands  
Bengt Tammelin, Jani Poutiainen, Antti Poikonen, FMI Helsinki, Finland  
Osmo Aulamo, Rigel Kivi, FMI-ARC Sodankylä, Finland  
Hans-Jörg Isemer, International BALTEX Secretariat, GKSS Research Centre, Germany

This meeting was dedicated to discuss details on the data measurement issues, data storage, data quality issues, and data delivery procedures from the European reference sites in the context of CEOP. Representatives of Lindenberg/DWD, Cabauw/KNMI and Sodankylä/FMI took part. No representative of Norunda, the recently approved 4<sup>th</sup> CEOP reference site in Europe, was able to attend. The meeting participants enjoyed an excellent venue at FMI -ARC. Part of the meeting were an overview presentation by Osmo Aulamo on FMI-ARC's activities, and an extended field site visit, where all participants received a lively impression on FMI-ARC's facilities at Sodankylä. Hans-Jörg Isemer briefed the participants on the recently conducted GHP-CEOP meeting in New York, 12 and 13 September 2002. During the extended and lively discussions, several questions remained unanswered and statements and decisions were made. The important ones are summarized in these notes, structured into site-specific and more general CEOP-related issues. There may be also issues of general relevance mentioned among the site-specific issues. Several issues (such as details on averaging procedures, sign conventions, correction and calibration procedures, and others) could not be discussed at all, because of lack of time. Meeting participants considered several of the issues discussed as of importance for all CEOP sites, and, hence, **a technical workshop on details of CEOP reference site data and procedures was suggested to be held with participation of representatives of all CEOP reference sites in due time.**

**General**

G01: The high resolution RS data shall be submitted to the CEOP Central Data Archive (CDA) at Boulder without any site-specific quality control. Quality control will be made at CDA. For information purposes, CDA is asked (**Action #1: Isemer**) to provide a description on the quality check procedures for high resolution RS data done at CDA.



G02: Why are the tower data not part of the suggested composite CEOP data set, as presented to the New York CEOP meeting by Steve Williams (**Action #2: Isemer / Williams**) ? *Note to the protocol: This issue has been clarified already: Steve Williams pointed out that the tower data will be part of the composite data set.*

G03: Does CEOP need the full tower profile, even if the sometimes fine resolution at lower levels is not resolved by models (**Action #3: Isemer / Williams**) ?

G04: It has been noted that the different CEOP sites have submitted flux data in various units, e.g. as covariances, pseudo-fluxes, or fluxes. The latter two require the choice of a flux coefficient scheme and density calculation. Delivering covariances leaves the user with the highest degree of freedom, but requires at the same time the highest efforts to produce fluxes in terms of e.g.  $W/m^2$ . Participants suggested, that a unique method should be followed at all sites, in order to arrange the composite data set in a manner as user-friendly as possible. It was also suggested to deliver energy fluxes completely calculated in terms of  $W/m^2$ , using the experience of the site PIs in choosing the most appropriate calculation procedures (e.g. choice of coefficients, corrections). CDA is requested to give advice considering the suggestions given by the meeting participants (**Action #4: Isemer / Williams**). Other open issues calling for some kind of harmonization are the sign convention for fluxes, the delivery of friction velocity (in m/s) and / or momentum flux (in  $N/m^2$ ) to characterize momentum exchange. It has also been noted that several reference sites have submitted variances as additional turbulence parameters, which are available from the European sites as well, but were not included in the datasets so far since there was no corresponding request.

G05: Do the observed data at the sites have to follow reasonable scientific constraints such as the energy balance closure requirement ? For the international PILPS experiment an energy balance Bowen ratio method was used that automatically conserved energy (see e.g. Beljaars and Bosveld, 1997<sup>1</sup>). However, with the nowadays more commonly used eddy-covariance methods the energy balance is not automatically closed and require manipulation to obtain this closure. Efforts in this direction however require a lot of scientific evaluation and even SVAT type modelling before data are sent to CDA. It was noted that different user communities will most probably have different requirements in this respect. Whether such data requirements may be formulated already at this stage, and, secondly, whether any of such requirements may be fulfilled by the individual sites, remains unanswered at present. It was suggested that this issue should be brought up to the attention of responsible CEOP planning groups (**Action #5: Isemer / Williams**).

G06: "Cloudiness" is mentioned in the CEOP reference site data tables at the CEOP website. Which parameters are actually required here for CEOP (**Action #6: Isemer / Williams**) ?

G07: Quality control (QC) issues were discussed to some extent (see e.g. remarks at the Lindenberg section below). The following questions arose: Will CEOP provide data including QC flags ? If so, these should most probably be homogeneous and easy to interpret and use. CDA is asked to provide advice on how QC issues shall be included in the CEOP data. As procedures at the CEOP sites, if at all, may be adjusted or implemented according to further requests only before data delivery, requirements should be stated as soon as possible (**Action #7: Isemer / Williams**). ). The European site managers are strongly in favour of reaching

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<sup>1</sup> Beljaars, A.C.M. and F.C. Bosveld, 1997: Cabauw data for the validation of land surface parameterization schemes. J.Climate, 10, 1172-1193.



agreement within CEOP about a simple quality flag scheme or at least about common data rejection / acceptance rules.

G08: All reference sites asked to receive more copies of the CEOP Newsletter (**Action #8: Isemer**).

### **Sodankylä**

S01: The correct height of the tower is 48 meters. It is important to note, that Sodankylä data are originating from 2 sites, which are distant to each other by about 500 m. Some of the parameters in the EOP1 data set have been provided for both sites. It was noted that a detailed site description will have to be provided in order to make users aware of the local infrastructure (**Action #9: Tammelin**).

S02: Quality control (QC) procedures are currently being implemented at FMI-ARC. EOP1 data are, so far, not quality controlled beyond the general FMI data quality check for Synop and Radiosonde data.

S03: The Sodankylä-tower measures sensible and momentum fluxes at 4 different levels, using sonic anemometer-thermometers. Fast-response hygrometers for the measurement of the latent heat flux are currently been installed, and, hence, not available at least for EOP1. Flux data of all 4 levels are at present part of the EOP1 data set. It was assumed that the majority of users may just be interested in one representative flux value for the site, instead of using the data for detailed flux studies. It was, hence, suggested (**Action #10: Tammelin**) to solely include the 25 m level flux data into the CEOP data sets. As a consequence to the previous statement, other fluxes than those from the 25 m level will be deleted from a revised version of the EOP1 data set.

S04: Sodankylä measures snow temperature profiles, however, information on snow depth, in order to properly distinguish between snow and air temperature, is not explicitly included in the data set. Sodankylä is planning to add a "snowstick" to the measurement site and add respective measurements to the CEOP data set at a later stage (**Action #11: Tammelin**). The general expectation of meeting participants for end users' demand was for the highest obtainable data quality. Therefore, snow temperature measurements among other parameters measured on or below ground at the mast site in Sodankylä will be rejected from all following data sets. The reason is that these data are considered highly experimental, and the quality is subjected to be diverse.

S05: With respect to the CEOP data exchange policy: All flux (and probably also the high resolution RS) data will be **category 2** data. Other data are **category 1**. The high resolution RS data are normally not stored at Sodankylä. It is the specific effort of an individual PI at Sodankylä, who collects the high resolution RS data for a specific research project.

S06: 3-hourly and daily averages, which have been submitted as part of the EOP1 data, will be skipped in future. Some of the parameters are measured with different instruments at slightly different locations, as those given in the hourly data, hence, there is no homogeneity among the hourly and the other two sets (**Action #12: Tammelin**). As the temporal resolution for surface data in the composite CEOP data set is one hour, minute radiation values will be replaced by hourly sums of sunshine duration, global, diffuse, and reflected radiation. Also, the composite data set should include precipitation, which is not included in the hourly synoptic aws-data taken at Sodankylä. Therefore, manually measured 12h precipitation



information will be extracted from 3-hourly averages. Some additional data submitted for EOP1 will be skipped in the future, because of falling beyond the scope of CEOP (like UV-B, ozone).

S07: The wind profile data are currently a mixture of cup anemometer and sonic data. It was suggested to use the cup anemometer data for horizontal wind speed, whereas sonic data shall be used for the vertical wind component and fluxes (**Action #13: Tammelin**). As S03 states, only the 25 m height level will be considered for the CEOP data set.

S08: As a conclusion, the Sodankylä data set for CEOP will be re-arranged following the above given suggestions. A revised EOP1 data set will be sent to CDA (**Action #14: Tammelin / Isemer / Williams**). The EOP1 data provided so far are not complete, measured against the sample data set. Sodankylä will complete the EOP1 data set in due time, preferably before the end of October 2002 (**Action #15: Tammelin**).

S09: The recently formulated additional requirements for “hydrology” reference sites may be fulfilled for Sodankylä, because this site was chosen as a measurement site in the NOPEX programme. Runoff data are however not available at FMI-ARC and the data source (probably the Finnish Environment Institute) needs to be explored (**Action #16: Isemer**).

## **Lindenberg**

L01: Lindenberg comprises several measurement sites. All micrometeorological data and the Ceilometer data submitted for EOP1 originate from an L-shaped boundary layer field site with a 99m tower (Falkenberg site). The profile data (wind profiler, RASS, microwave radiometer) are measured at the Lindenberg observatory site, both sites are 5 km apart from each other. Radiosondes are released at the Lindenberg observatory site as well. The Falkenberg tower has 5 levels (10, 20, 40, 80, 98 m), data from only 2 levels (at 40 and 98 m) were delivered. Shall the complete tower data including all available levels be submitted to CEOP (**Action #17: Isemer / Williams**) ?

L02: The RS data taken at Lindenberg include advanced moisture corrections, which are specific for the RS type used (Vaisala RS 80). These corrections are accepted by WMO for operational GTS use. High resolution RS data at Lindenberg have 10 sec resolution for temperature and humidity and 30 sec for wind.

L03: The Microwave Radiometer data will be delivered as vertically integrated (rather than profile) atmospheric water vapour.

L04: There will be a specific LITFASS field experiment conducted at Lindenberg during May/June 2003. Much more sophisticated instrumentation will be installed by various other groups for this experiment. Would these data be of interest for CEOP (**Action #18: Isemer / Williams**) ? This seems to be a more general questions, because specific enhanced experimental studies may be conducted at much of the other CEOP sites as well.

L05: Part of the Lindenberg facilities is another site located in a forest about 12 km to the West of Falkenberg. This site has all micrometeorology data available for the suggested CEOP composite data set, including a 30 m tower. Roughly 45% of the surrounding of Lindenberg is covered by forest, another 45% by agricultural land (the latter type of environment is represented by the Falkenberg site). Data of the forest site would give



additional information on a major land use type near Lindenberg, and hence add data in terms of regional heterogeneity. Shall the forest site be included in CEOP (**Action #19: Isemer / Williams**) ?

L06: The GABLS (GEWEX Atmospheric Boundary Layer Study) was mentioned, where Cabauw and Lindenberg have commitments to participate at. Co-ordination between GABLS and CEOP, and other GEWEX initiatives with possible site data requirements, was strongly recommended (**Action #20: Isemer/Williams/Benedict**).

L07: Lindenberg will have difficulties to fulfil the recently formulated additional requirements for "hydrology" reference sites. The local hydrology is rather complex and weakly defined. Around Lindenberg, there is a number of small brooks which may fall dry during summer and the run-off is strongly buffered by some lakes along these brooks. Moreover, surface hydrology and soil hydrology are partly decoupled and surface / subsurface run-off areas do not always match. It is thus difficult to directly relate the run-off to precipitation measured at Lindenberg or nearby. At a somewhat larger scale (about 25 \* 25 km<sup>2</sup>), the Falkenberg field site might be considered as representative concerning atmospheric measurements, and the area around Lindenberg / Falkenberg is surrounded at three sides by the Spree river. Regional precipitation across this area is measured by a network of registering rain gauges and water table data from the Spree river might be available from the authorities of the Land of Brandenburg.

L08: The data management at Lindenberg follows a detailed quality control system resulting in a hierarchy of up to ten QC flags (0 = ok, to 9 = missing, with gradually increasing fault level according to several QC steps) for most of the measurements. This system was considered to be too complex for an easy use within CEOP. Other options were discussed and both a 3 QC flag system (missing, ok, conditionally ok) and the simplest 2 QC flag system (ok or missing) were considered useful for CEOP. It was however stressed that one harmonized system should be used by data providers, because the transfer of several QC systems into one system by CDA was considered too laborious and, hence, ineffective.

**Action #21: Isemer/Williams** to initiate a discussion on data rejection / acceptance criteria among the CEOP reference sites in order to achieve some common sense on it.

L09: The EOP1 data provided so far are not complete, measured against the sample data set. Lindenberg will complete the EOP1 data set in due time, preferably before the end of October 2002 (**Action #22: Beyrich**).

L10: With respect to the CEOP data exchange policy: The basic meteorology, standard radiosonde, wind profiler / RASS, soil temperature and radiation data are considered as **category 1** data. All flux (sensible heat, latent heat, soil heat, momentum) and tower data, soil moisture and microwave radiometer data, and also the high resolution radiosonde data will be **category 2** data.

## Cabauw

C01: The RS station at De Bilt, which was planned to deliver data to CEOP together with the Cabauw site data, is currently not in operation due to financial problems. Decision on whether to continue the station is expected before the end of 2002. If De Bilt comes back into



operation, it will deliver data only twice per day. **Action #23: Bosveld**, to keep Isemer/Williams informed on the De Bilt RS station.

C02: The QC steps performed at Cabauw so far are different from those at Lindenberg. There are automatic procedures (similar to those used with data from automated weather stations) applied to tower and radiation data while eddy covariance and other non-standard data are subject to visual and subjective inspections. Cabauw is currently implementing additional, mostly objective, controls. Topic G07 and related action items were reinforced. Several corrections are applied to eddy covariance data as part of the 10 minutes averaging procedure (such as density corrections, low frequency loss corrections, influence of mast and boom constructions).

C03: The likelihood for Cabauw to fulfil the recently formulated additional requirements for “hydrology” reference sites is low. Cabauw is located inside a defined polder, however, the local hydrology is not well defined, and physical details of the water balance are currently an objective of a research project.

C04: The complete EOP1 data have been sent to CDA but not all the data are available yet at the CEOP web-site (**Action #24: Williams**).

C05: All Cabauw data provided for CEOP are **category 1** data.

Draft minutes  
Hans-Jörg Isemer  
16 October 2002

Finally approved by meeting participants  
31 October 2002