

CEOP Parameters Measured and Instrumentation:

SURFACE METEOROLOGY AND RADIATION INSTRUMENTATION AND

DESCRIPTION: The basic meteorological data are measured at a 10 m lattice mast. This mast is of triangular shape with a side length of 40 cm, the wind sensors are mounted at booms of 1.5 m length oriented towards SW. The rain gauge and the pressure sensor are operated in the vicinity of this mast. The radiation measurements are performed at a bar construction erected about 120 m to the South of the 10 m mast

- **Station pressure** (1 m; [Vaisala](#) PTB220A piezo-resistance)
- **Air Temperature** (2m; [Th. Friedrichs](#) Frakenberger Psychrometer Pt-100)
- **Dew point** (2m derived)
- **Relative humidity** (2m; [Vaisala](#) HMP-35D capacitive)
- **Specific humidity** (2m derived)
- **Wind speed** (10 m; [Climatronics](#) F460 cup)
- **Wind direction** (10 m; [Thiess](#) Wind Dir. Transm. vane)
- **U wind component** (derived) (10 m)
- **V wind component** (derived) (10 m)
- **Precipitation** (1 m; [Ott Hydrometrie](#) Pluvio weighing)
- **Snow depth** (Snow stick manual)
- **Incoming shortwave radiation** (2 m; [Kipp & Zonen](#) CM24 thermopile)
- **Outgoing shortwave radiation** (2 m; [Kipp & Zonen](#) CM24 thermopile)
- **Incoming longwave radiation** (2 m; [Eppley](#) DDPIR thermopile)
- **Outgoing longwave radiation** (2 m; [Eppley](#) DDPIR thermopile)
- **Net radiation** (2 m; derived)
- **Skin temperature** (2 m; [Heitronics](#) KT 15.8D pyro-electric)
- **Incoming Photosynthetically Active Radiation (PAR)** (2 m; [LiCor](#) LI190SZ photo diode)
- **Outgoing Photosynthetically Active Radiation (PAR)** (2 m; [LiCor](#) LI190SZ photo diode)

Note that a replacement of the combined temperature-humidity sensor HMP-35D by the more recent model type HMP-45D was realised at the 10m mast on March 23, 2004.

A few other 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.

The 10 m mast for standard meteorological measurements from SSW (click for full resolution):



METEOROLOGICAL TOWER INSTRUMENTATION AND DESCRIPTION: The central measurement facility at GM Falkenberg is a 99m tower, a lattice construction of rectangular cross section with a side length of 1.2 m. It is equipped with booms to carry sensors at every 10 m, three booms are mounted at each level pointing approximately towards S, W, and N (with a shift of 11 deg). Standard meteorological profile measurements (wind speed, temperature, humidity) are performed at levels 10 m, 20 m, 40 m, 60 m, 80 m, and 98 m.

Wind sensors are mounted on each of the three booms at these height levels in order to ensure that there is always at least one sensor not influenced from the structure of the tower. The measurement levels at 30 m, 50 m, 70 m, and 90 m are planned to be instrumented with turbulence sensors in the future, up to now turbulence measurements were realised during field experiments of several weeks duration in 1998, 2000, 2002, and 2003, respectively.

- **Station pressure** (40 and 98 m; [Vaisala](#) PTB220A piezo-resistance)
- **Air Temperature** (40 and 98 m; [Th. Friedrichs](#) Frankenberger Psychrometer Pt-100)
- **Dew point** (40 and 98 m derived)
- **Relative humidity** (40 and 98 m; [Vaisala](#) HMP-35D capacitive)
- **Specific humidity** (40 and 98 m derived)
- **Wind speed** (40 and 98 m; [Thiess](#) wind transmitter cup)
- **Wind direction** (40 and 98 m; [Thiess](#) wind direction vane)
- **U wind component** (40 and 98 m derived)
- **V wind component** (40 and 98 m derived)

Note that a replacement of the combined temperature-humidity sensor HMP-35D by the more recent model type HMP-45D was realised at the 99m tower on April 14-15, 2004.

A few other 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.

The DWD-MOL boundary layer field site (GM) Falkenberg towards WNW (click for full resolution):



FLUX INSTRUMENTATION AND DESCRIPTION: Flux measurements are performed using omni-directional sonic anemometer-thermometers. Two of these instruments are operated at the western wiring of the 10 m mast (S1) and at the western edge of the field site (S2), respectively, providing flux data representative for the grassland area both for westerly and easterly wind directions. The sonics are mounted on top of tall tube masts. Fast-response infrared hygrometers have been added to the sonics in spring 2003 for the direct measurement of the latent heat flux using the eddy-covariance method.

- **Sensible Heat Flux** (2.4 m; [METEK](#) USA-1 sonic)
- **Latent Heat Flux** (2.4 m; [LiCor](#) LI-7500 infrared hydrometer)
- **CO2 Flux** (NOT MEASURED)
- **Soil Heat Flux** (-5, -10 cm; RIMCO HP3 flux plate)

A few other 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.

Turbulence measurement system S1 (USA-1 + LI7500 hygrometer) (click for full resolution):



SOIL INSTRUMENTATION AND DESCRIPTION: Soil measurements are performed west of the radiation measurements.

- **Soil temperature** (-5, -10, -15, -20, -30, -45, -50, -60, -90, -100, -120, -150 cm; TMG Pt-100)
- **Soil moisture** (-8, -15, -30, -45, -60, -90 cm; [IMKO](#) TRIME EZ TDR)

A few other 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.

RADIOSONDE INSTRUMENTATION AND DESCRIPTION: Operational radiosonde measurements at MOL are performed four times daily. Before July 01, 2004, release time was around 0445 UTC, 1045 UTC, 1645 UTC, and 2245 UTC, respectively and the soundings were performed using Vaisala RS-80-30 (RS-80-30E) radiosondes (Vaisala Oy, Finland - <http://www.vaisala.com>) and Vaisala PC-Cora ground equipment. Wind finding was done by radar tracking of the balloon using Gematronik 300WF radar. Since July 01, 2004, Vaisala RS-92-AGP radiosondes have been used in connection with Vaisala Digi-Cora III ground equipment and GPS wind finding. Release times have been slightly shifted to around 0515 UTC, 1115 UTC, 1715 UTC, and 2315 UTC, respectively.