

Site audit report Kostice Observatory, Czech Republik

Regional fixed station WMO RA VI

Prof. Dr. A. Wiedensohler

Dr. Thomas Tuch

Site description and summary:

Measurements of physical aerosol properties at the EUSAAR station Kostice, Czech Republic have been audited by Prof. Dr. Alfred Wiedensohler and Dr. Thomas Tuch of the WCCAP during the time period of March 9th through March 11th 2010.

Kosetice Observatory is located in the Bohemian Highlands at 49° 34'24.04" N 15° 4'50.54 E (figure 1) in an agricultural countryside at an elevation of 534 m a.s.l. This location is ideal to investigate transport of anthropogenic pollution to and from the Czech Republic.



Figure 1: Google Earth view of Kosetice Observatory and aerosol measurement container.

The station provides fixed housing facilities for permanent staff and laboratories along with measurement containers. Kosetice Observatory is operated by the Czech Hydrometeorological Institute, aerosol measurements are conducted by the Laboratory of

Aerosol Chemistry and Physics, Institute of Chemical Process Fundamentals of the Academy of Science Czech Republic.

The station serves as regional fixed station within GAW RA VI since 1988. Currently aerosol measurements from this site are not reported to GAW. Number size distribution measurements and filter measurements of PM₁₀ and PM_{2.5} are reported to the EUSAAR network. With respect to the intended extension of aerosol measurements (Nephelometer, MAAP) and the recent acquisition of a Sunset labs EC/OC instrument we are confident that this side will not only provide valuable data to the EUSAAR network but will also be a valuable partner for aerosol measurements within GAW.

Documentation and data handling:

Instructions for the SMPS and well prepared documentation forms for other measurements are available at the site. These forms are filled in detail. Documentation for the SMPS is stored in a text file on the SMPS computer and can be remotely accessed using a secured network from Prague. However some of the intermediate calculations are done using “flying leaves”. This information may be easily lost. We recommend using a lab book for this purpose. Data of the SMPS until December 31st 2009 are available in the EUSAAR database EBAS.

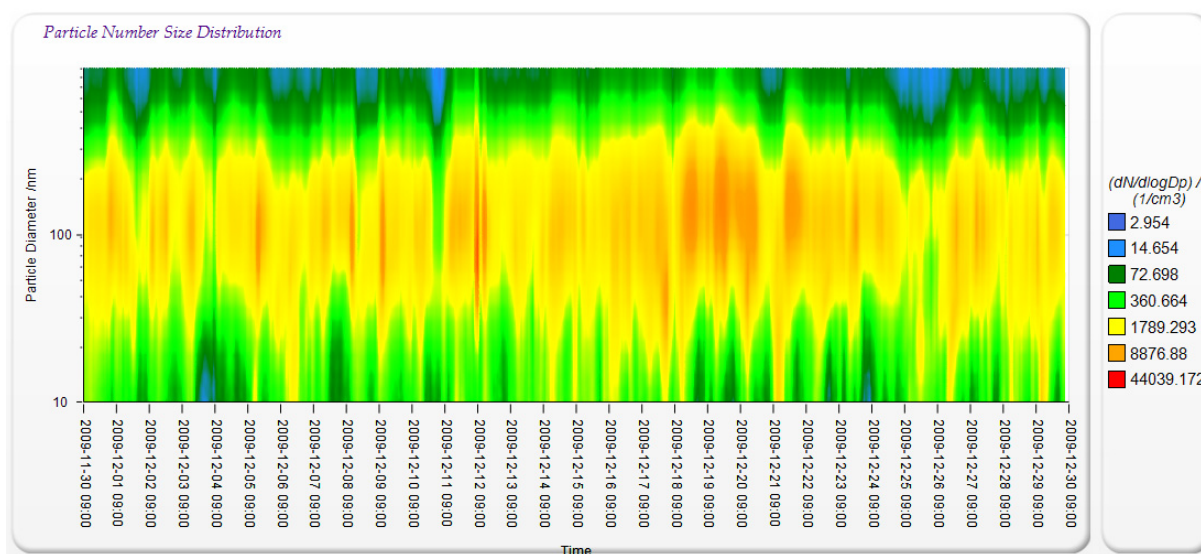


Figure 2: 2009 SMPS data from Kosetice.

Documentation and data handling complies with EUSAAR requirements.

Primary flow standard:

A Gilibrator is used as primary flow standard for aerosol measurements at Kosetice Observatory. The serial number of the measurement cell is not readable. A note on the base of the instrument shows, that it has been recalibrated in Prague giving a correction factor of *Indicated flow/1.027*. This correction factor is in good agreement with the inter comparison with the WCCAP reference Gilibrator (Cell 0303865-S) as shown in figure 3.

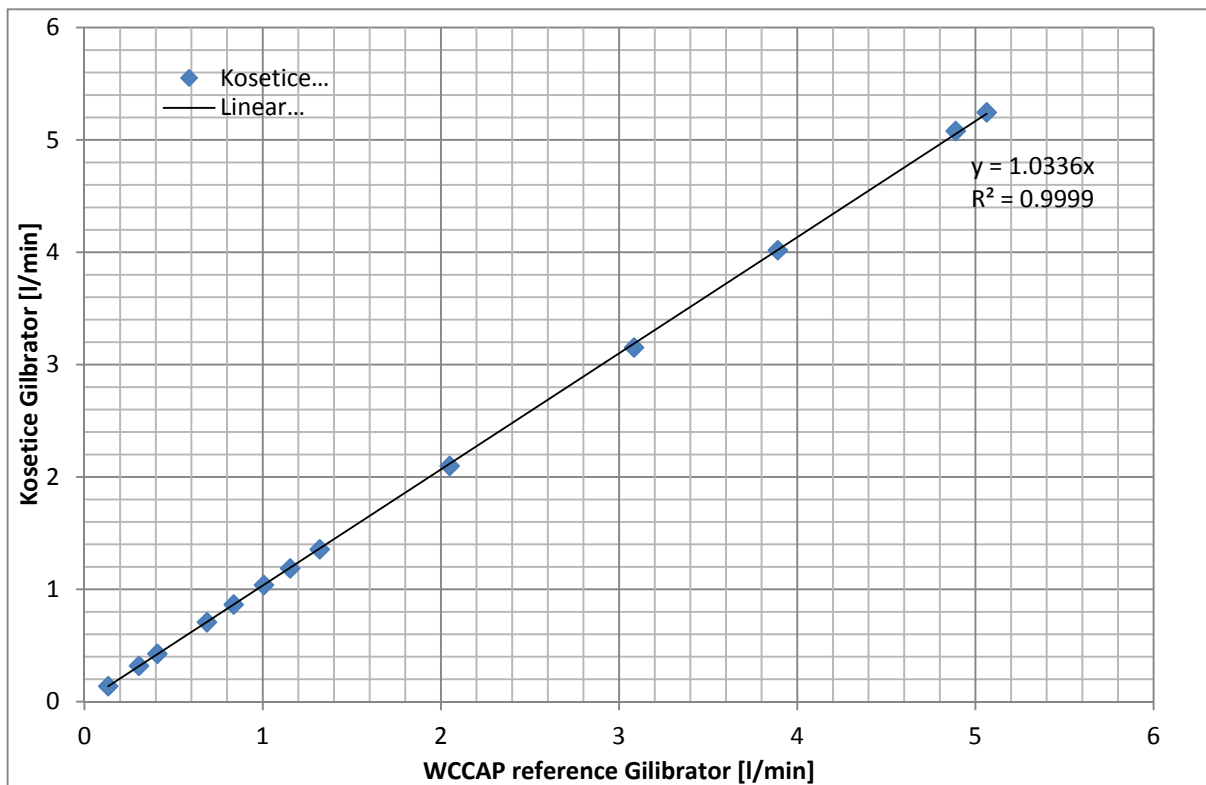


Figure 3: Check of the Kosetice Gilibrator.

Note that up to three liters per minute the slope of the Kosetice Gilibrator versus reference is 1.027 as stated on the Kosetice instrument. The correction factor is used for all SMPS flow checks.

The primary flow standard complies with EUSAAR requirements.

Inlet:

A commercially available PM₁₀ inlet (Digitel) is used for aerosol sampling from 2 m above the roof of the measurement container. There are no obstructions near the inlet. All aerosol lines are made of stainless steel or conductive TSI tubing (figure 4). The makeup flow for the inlet is provided by a vacuum pump with a critical orifice. With an aerosol flow of 1.07 l/min we measured a makeup flow of 14.79 l/min. This is slightly low (should be 15.59 l/min) but does not significantly affect aerosol sampling (This differences is probably due to the fact that a Tandem DMPS was attached to the same inlet earlier).

Currently there is no humidity conditioning of the aerosol. Because the only instrument connected uses an own aerosol dryer this is suitable. With respect to a future extension of aerosol measurements we suggest the use of a humidity conditioned inlet in the future.



Figure 4: Aerosol inlet at Kosetice Observatory.

The aerosol inlet complies with EUSAAR standards.

SMPS:

An IFT SMPS is used for measurements of the particle number size distribution at Kosetice. This SMPS complies with EUSAAR recommendations. A sheath air dryer is currently not installed. This is, however, a minor problem because sheath air humidity exceeded 50 % only for 17 hours in the year 2009 (figure 5)

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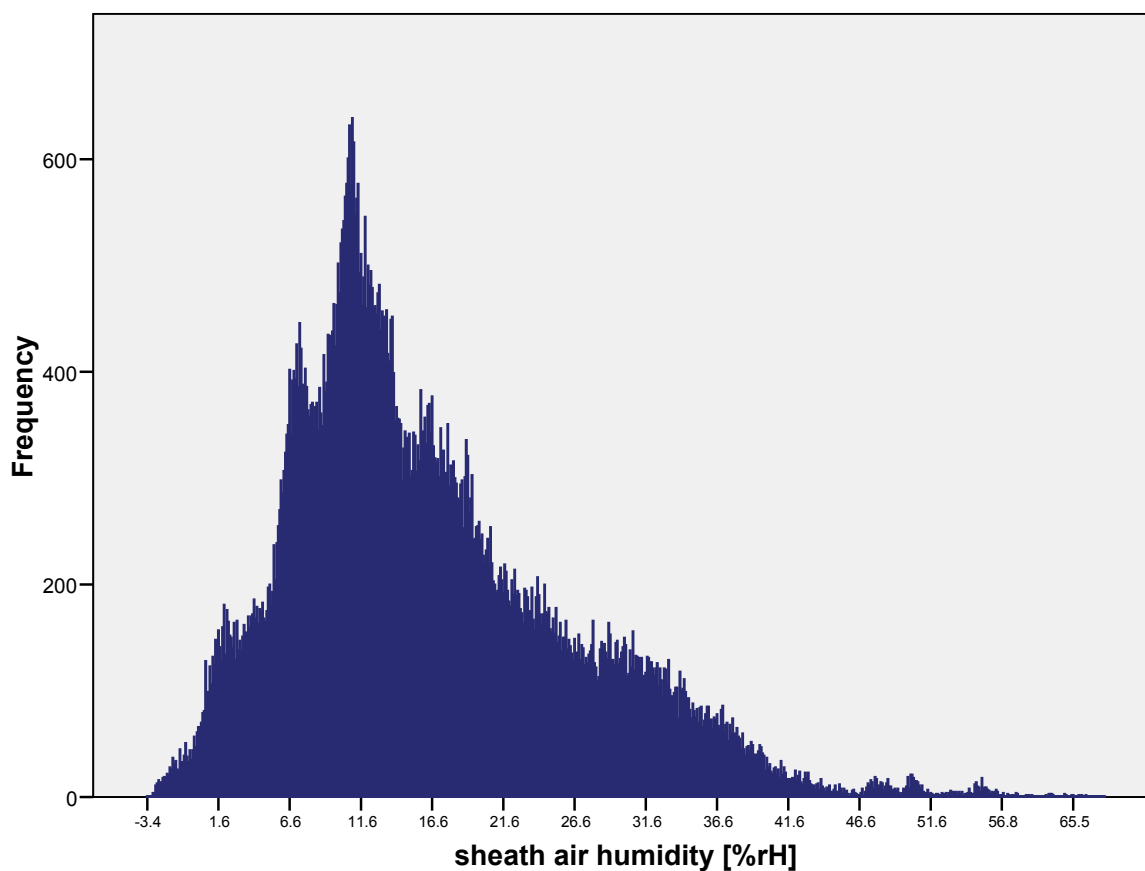


Figure 5: Frequency distribution of sheath air humidity at KOS in 2009.

The SMPS was running Ift, Software Version 2.2.1, 4.2.2008, TT (special version for 3022) upon arrival. A CPC TSI 3022 SN 269 /1992 is used. An initial zero check and sizing of 200 nm Latex particles showed that the instrument was running within EUSAAR specifications. All flow rates measured agreed with those recorded by the program.

We did, however, find a minimal discrepancy in SMPS plumbing times. Figure 6 shows both up and down scan with 200 nm Latex particles. The thin lines represent measured data whereas the thick lines represent Gauss fits. Note: Even with the incorrect plumbing time the peak of the size distribution is well represented. The wrong plumbing time is therefore negligible for ambient measurements.

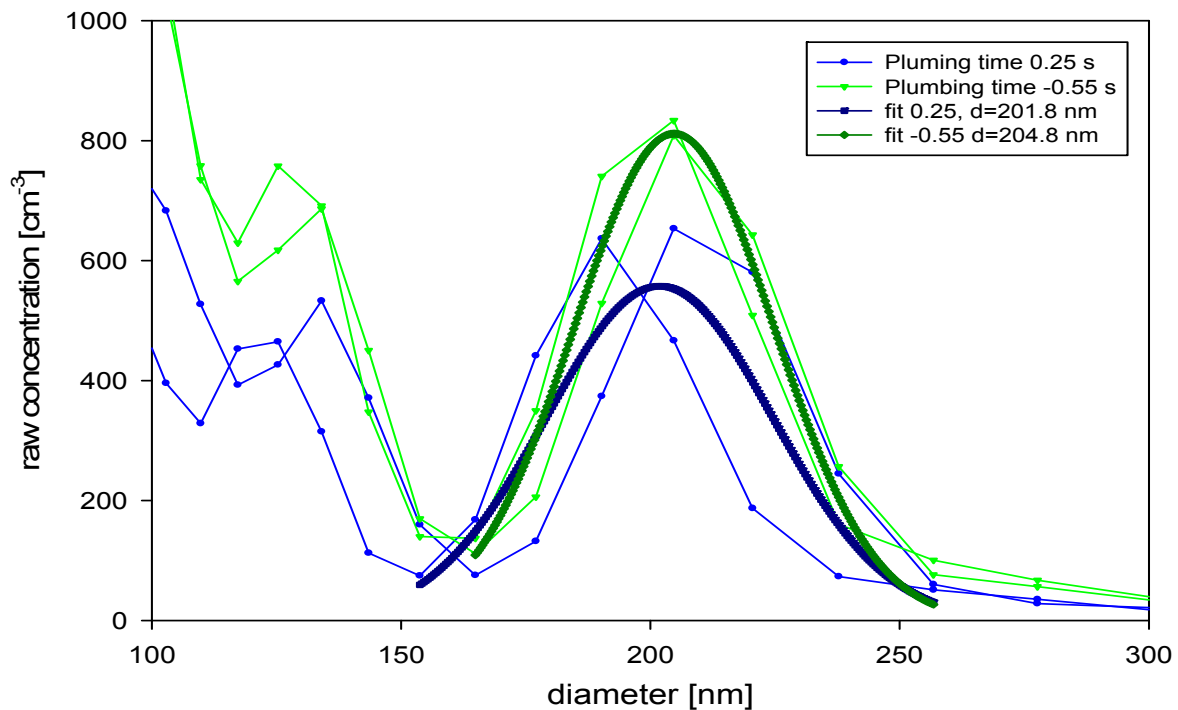


Figure 6: Effects of different plumbing times in Kosetice SMPS.

A 6.8 V offset was found for the High voltage power supply used in the instrument (figure 7). This offset causes a size misclassification (eg. the program assumes 5 Volts HV but the real voltage is 11.8 V). This primarily influences small particle sizes.

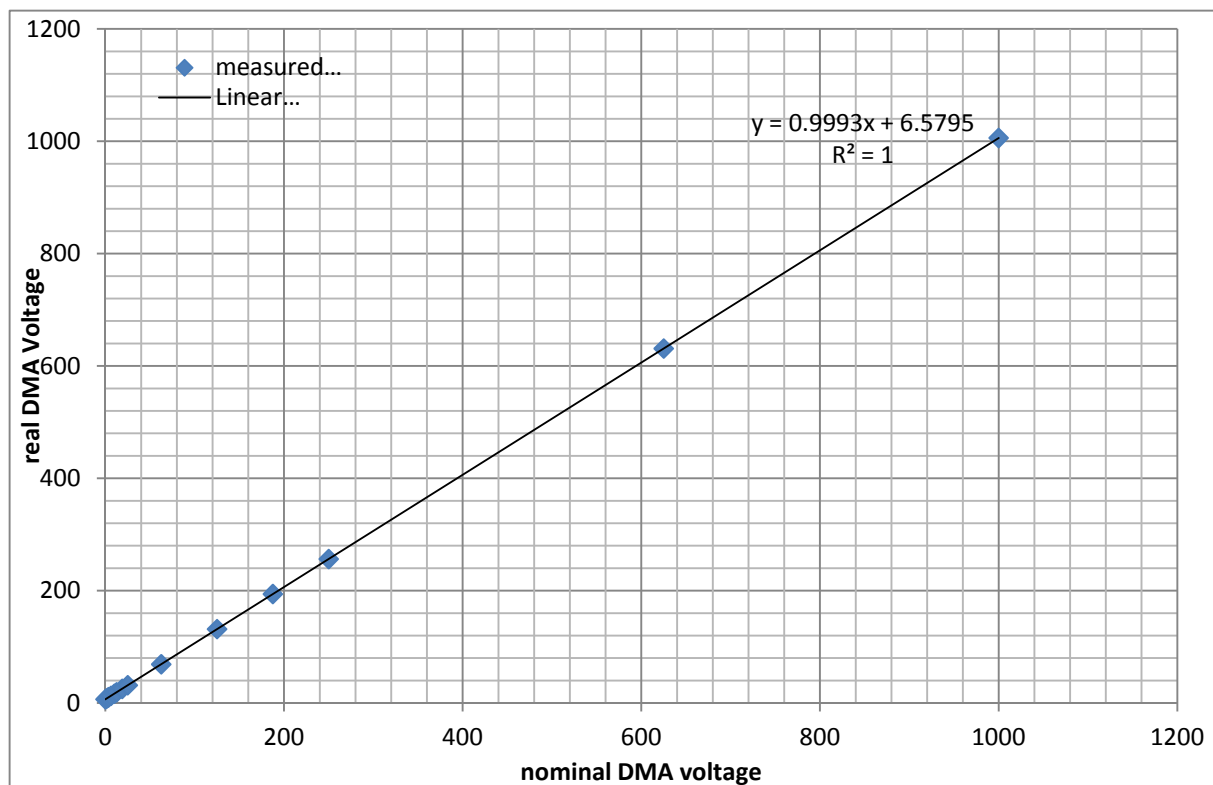


Figure 7: High voltage calibration of the Kosetice SMPS.

We do recommend more frequent high voltage checks of the SMPS.

The SMPS at Kosetice complies with EUSAAR standards.

Final remark:

Kosetice Observatory offers a unique opportunity to investigate both natural and anthropogenic pollution in central Europe. Dedicated staff along with good infrastructure are available at this site. We are sure that Kosetice Observatory can provide more relevant data both for EUSAAR and GAW in the future.