Site audit report GAW Station Meteorological Observatory Hohenpeißenberg (MoHp) (13.11.2003-14.11.2003)

General Impression:

A site audit of the physical aerosol instrumentation of the GAW station Hohenpeißenberg has been performed by Drs B.Wehner and Th.M.Tuch (WCC physical aerosol measurements) from November 13th through November 14th 2003.
Uwe Fricke and Reinhard Wilhelm, responsible for the scientific and day to day operation of the station, where present at the station throughout the whole site audit. Both persons demonstrated their extensive knowledge of their instrumentation. We had access to all relevant information. We have found an extremely well equipped and well maintained station with complete documentation for all instruments and extensive logs for routine and special maintenance of the instruments.

Instrumentation:

Data Acquisition: Data acquisition is done by two computer systems attached to the instruments. Raw data can be plotted in real time to provide immediate access to measurement data and to identify possible instrument failures. Upon request data from previous days and months could be displayed graphically.

Aerosol Inlet: Currently ambient aerosol at the MoHp station is sampled using a common horizontal aerosol inlet made of stainless steel. There is no size selective sampling head. The inlet has been optimized to reduce losses in the sampling line. A concept for a new common, vertical aerosol inlet is currently developed. The design of this new head conforms to requirements for GAW aerosol measurements. There is, however, an ongoing discussion about the cut-off size of the inlet head. We would appreciate the use of a size selective inlet according to WMO/GAW Aerosol Measurement procedures guidelines and recommendations (September 2003) (WMO TD No. 1178):

"The design of an aerosol inlet can be customized by qualified engineers to fit the sampling requirements. However, these inlets must be well characterized in terms of the particle cut-off and aerosol transmission efficiencies at selected aerosol sizes spanning the

size range of interest. Specifications of these custom inlets should be submitted to WMO/GAW WCCAP for review, to avoid serious sampling discrepancies between stations in the GAW network. Alternatively, commercially available inlets, whose particle cut-off and transmission efficiencies have been well characterized, can be used for this purpose. Those wishing to establish GAW aerosol measurements are advised to seek advice from the WCCAP.

….Nonetheless, based on the limited data available to date, the following two sets of cut points are recommended: (i) 10 µm ambient RH and 1 µm dry air or (ii) 10 µm ambient RH and 2.5 µm ambient RH. These are consistent with the global average upper end point for the both the coarse and fine fractions."

Primary flow standard: A Gillian Gilbrator is used as a primary flow standard at this station. We verified this standard against our Gilibrator. Good agreement was found for the medium cell. There was, however, a 5 % difference between the large cells. A recalibration of our flow standard at the WCC showed that the differences were due to the positioning of sensor in our Gilibrator. After adjustment both Gilbrators agreed within 1 %.

Particle number concentration: A TSI CPC 3762 (Serial number 1106) is used to measure the total particle number concentrations at the MoHp. This instrument has been purchased after the CPC calibration workshop at WCC for physical aerosol measurements in 2002, which revealed that the previous CPC was defective. A zero check with an absolute filter did yield no false counts. The counting performance of this new instrument has been verified by parallel measurements with a calibrated TSI CPC 3025 (#1258) from the WCC calibration lab. The time series plot of this intercomparison (Fig.1) demonstrates the good agreement of both CPCs.

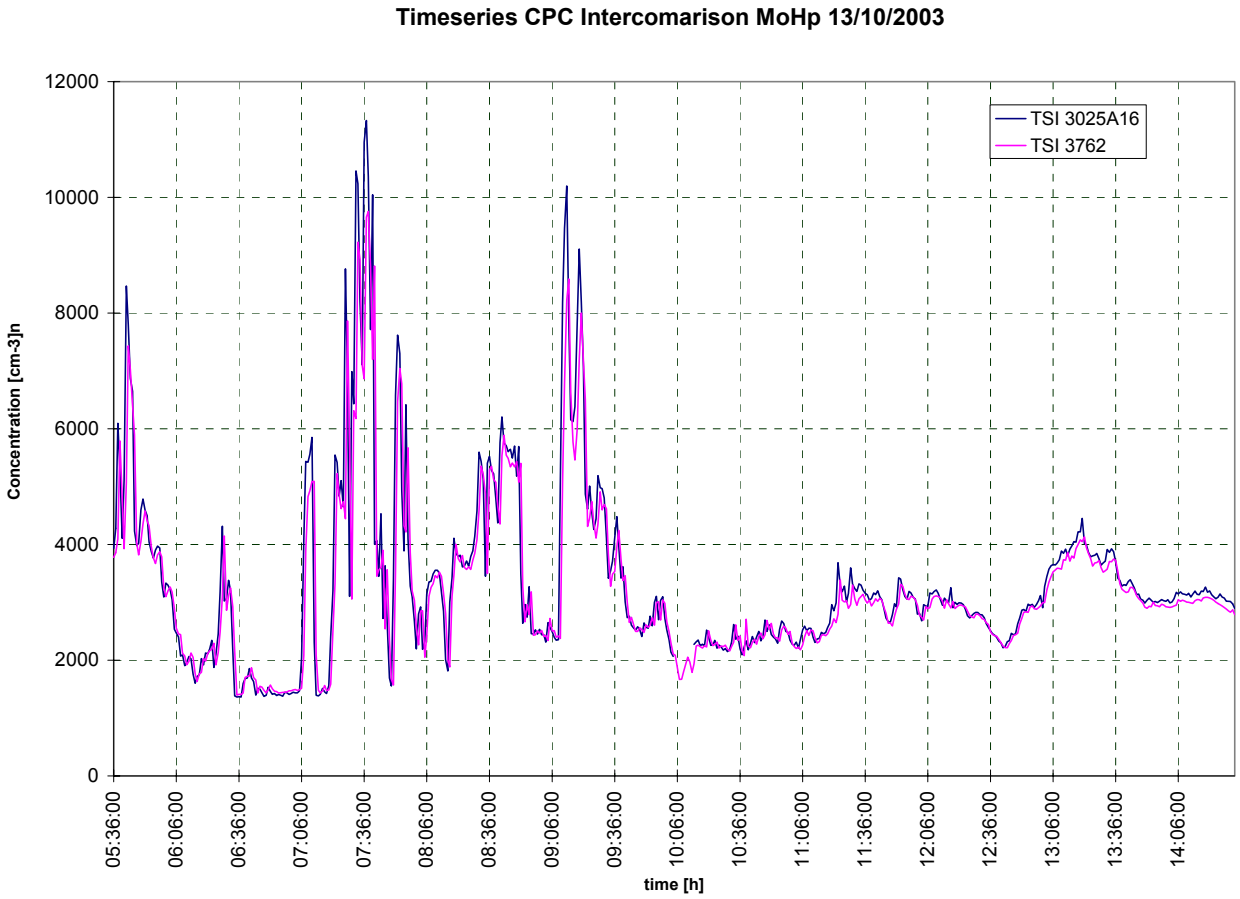

Fig.1: Time series of the CPC intercomparison at the MoHp

Currently, Butanol is not changed on a regular basis. The lower size cut of this instrument is influenced by water uptake of the Butanol. We recommend to replace the Butanol every other week to minimize this effect.

A second water CPC is stationed on the Zugspitze (Schneefernerhaus). Parallel measurements with the TSI revealed a weak correlation of the data from these two instruments. Furthermore, the time resolution of the water CPC (5 minutes) is not sufficient to observe possible pollution effects from the recreation area at the Zugspitzplatt. We recommend to replace this CPC by a better defined instrument with shorter time resolution.

Particle Size Distribution: Particle size distribution of particles larger than 0.1 µm in diameter is measured with a LAS-X optical particle counter (#31730-1293-411). This instrument is calibrated every year by the manufacturer. The next calibration is due September 2004. The instrument recorded zero counts with an absolute filter. The nominal flow of 250 cm^3/min was correct. Laser power was in the recommend range. It needs to be

noticed, that the LAS-X is calibrated with monodisperse PSL particles. Sizing performance is therefore influenced by the unknown refractive index of the ambient aerosol.

Aerosol Mass Concentration: Particle mass concentration is measured continuously by a TEOM 1400 A. (Sensor # 1200A 123419509, control unit 140AA 209509509). The Sensor is placed on the roof of the building. It is currently equipped with a R&P whole air inlet. We recommend to replace this inlet by a sharp-cut cyclone with a cut-off diameter of 10.0 µm.
A calibration mass is available to check the absolute performance of the Sensor. Both the reference weight and a zero measurement did yield satisfying results. A flow check revealed a minor error. The regular check did only control bypass flow and total flow. The sample flow was calculated from these flows. A control of the sample flow revealed however, a leak. Due to this leak mass concentrations measured by the TEOM were 10 % too high. The leak was sealed. All three flows of the TEOM will be controlled the future.

Light Scattering: Light scattering coefficients are determined by a three wavelength integrating nephelometer (TSI 3563, # 1032). The sample flow rate was set within the range recommended in the manual. The lamp has been replaced in April 2003. During the site audit a routine calibration with particle free air and CO_2 was performed by the operators. Calibration factors were virtually unchanged compared to those in the log books. The instrument was maintained and calibrated during the Nephelometer workshop at the WCC in November 2003.

Absorption: A GIV Aethalmometer (#70010) is used for absorption measurements. The flow rate of this instrument was within factory limits. This instrument is run parallel to the new Carusso model 5012 (#013). The performance of this instrument exceeds the performance of the aethalometer. This instrument allows to observe, that aethalometer measurements start to give unreliable readings with less than 30 % of the maximum filter load. We would appreciate, if data from this long-term intercomparison could be made available to the scientific community.

Conclusion: We want to thank the staff of this GAW station for their hospitality. We were impressed by their station. The quality of their work is extremely helpful because this station may serve as an exemplary aerosol station for GAW operators participating in GAWTECH courses at the Schneefernerhaus.