



Audit Report „Chacaltaya“, Bolivia



Global Atmospheric Watch Station „Chacaltaya“, Bolivia

Auditor: Kay Weinhold

Date: June 24 to July 5, 2013

The second official audit on the mountain station “Chacaltaya”.

General

I found the station in good condition. Manuals for the instruments and written logbooks have been available at the station. We updated the SMPS manual with the newest version. After the trouble with the flooding of the whole system last year, I checked the DMA of the SMPS system. I realised that the DMA is not in a good condition, inside the head was burnt. We decided to produce new parts of the DMA and bring them the next time.

We used the time and gave the whole group of “Chacaltaya” a second SMPS and MAAP workshop to improve their knowledge in handling the systems.

At this point I would like to say that the whole group did a great job until now and the station is in a very good condition. The logbook is updated and the given checks for each system by TROPOS are done continuous and frequently.

Listing all operating systems:

- **Scanning Mobility Particle Sizer (SMPS)**
 - **DMA and CPC problems -> statement follows**
- **Multi-Angle Absorption Photometer (MAAP)**
 - **It is working well. We did a whole check of the system and calibrated the flow. We had no problems in 2013.**
- Aethalometer (Magee Sci.)
- Nephelometer (Aurora Tech.)
- Neutral Cluster and Air Ion Spectrometer (NAIS)
- Thermo Scientific Model 49i Ozone Analyzer
- Carbon monoxide analyzer Horiba APMA-370
- High-Volume Sampler

- Carbon dioxide analyzer
- Automatic Weather Station (AWS)

The following report is concentrated on the SMPS and MAAP. For the rest of the instruments there was no audit, but they are still operating.

Description of maintenance of SMPS system at Chacaltaya station on June 2013 as stated in Fernando's logbook.

As was described in the report before, the SMPS had lot of troubles due to the malfunctioning of both CPCs. However, after cleaning both CPCs, the system worked in a good way.

On May 31, the internal part (power supply) of the CPC 3772 from the SMPS system was burned. Until today we have no idea as to why this happened. We have never experienced this in the past. After that failure we decided via skype meeting to run the SMPS with the second total CPC 3772.

Kay: "It is more important to have SMPS-data than running a stand alone total CPC. The SMPS was working very well again and the measurements continued."

On June 25, I arrived in Bolivia and helped Fernando to check the broken CPC 3772. We found out that the power supply needs to be changed and there is no way to do this on the station since there are no spare parts available.

We send the CPC back to europe and changed the broken parts. We did a whole CPC calibration with silver particles against a standard CPC 3772 from TROPOS and a TSI electrometer. After that, we send the CPC back to Bolivia.



Figure 1: Trying to fix the problem with the total CPC 3772

During the year, Fernando regularly did the zero, leak and latex 203 nm checks. All of them are in the range what we accept. Here is one example from June 2013. The SMPS system was working properly as it shown in figure 2.

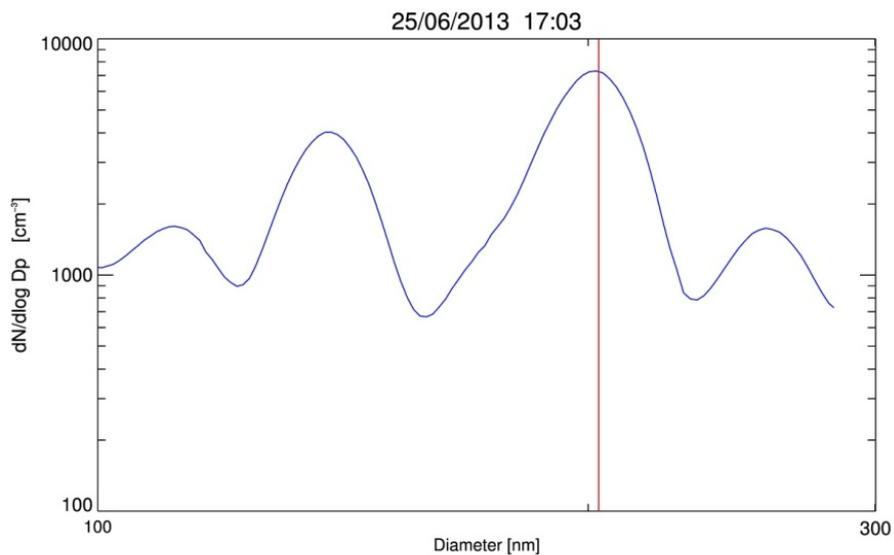


Figure 2: LATEX test made on June 2013 at Chacaltaya station.

Conclusion:

The SMPS system is working properly besides the CPC trouble.

Report of the SMPS_Bolivia during my visit**Basic information**

Location of the quality assurance:	Bolivia, Chacaltaya
Audit period:	June 25, 2013 – July 28, 2013
Instrument:	SMPS Chacaltaya
TROPOS Reference Instrument:	no instrument
Total CPC:	CPC 3772 from Chacaltaya is defected
Involved people:	Fernando Velarde, Isabel Moreno, Kay Weinhold

Summary

The audit on the mountain station Chacaltaya included an overall review of the system and a SMPS-Training for the employees.

Incoming status of the system: The SMPS Chacaltaya was running without the nafion-dryer in the aerosol inlet. In the past we had problems with the old one. Because of that it was necessary to change the dryer. The second point is the total CPC 3772 was not working. We tried to reactivate the CPC 3772 on the station but we found out that the high voltage power supply was broken. It was necessary to ship the CPC back to Germany for repair. Important: After the CPC was broken they took the CPC out of the system and forgot to close the inlet. From this day until now we sucked a mix sample between ambient and lab air! We cleaned also the CPC 3772 in the SMPS. We found a lot of Latex-particles in the optical nozzle. After the whole cleaning, the CPC worked very well.



Figure 3: CPC 3772 from SMPS Chacaltaya: Picture of the cleaning.

The third point is the DMA of the SMPS. The ambient size distribution showed a peak at the upper end of the spectrum which indicates that sparks are occurring inside the DMA. We opened the DMA and found out that the DMA is in a bad condition. We cleaned the whole DMA and set the SMPS-Settings down to a lower voltage. We reduced the size range until we had no sparks. It is necessary to polish the DMA in TROPOS!

We checked the MAAP (flow check) and the data transfer to the SMPS-System.

First day on the station: June 25, 2013

- Stop the system at 03:50 pm
- measure flow from the SMPS:
 - total CPC 3772 flow:
 - flow: 0.987 l/min
 - info: correct but not working because of the power supply problem
 - SMPS aerosol flow:

flow: 0.9880 l/min

info: correct

- zero-check:
 - start: June 25, 2013 ; 04:02 pm
 - end: June 25, 2013; 04:15 pm
 - info: 0 pp/cm³ -> o.k.

- high voltage check and calibration:
 - start: 04:20 pm

	max	output
0 mV:	0	0
5 mV:	6.25	6.25
10 mV:	12.5	12.5
20 mV:	25	25
40 mV:	50	50
80 mV:	100	100
200 mV:	250	249
400 mV:	500	499
600 mV:	750	750

 - end: 04:50 pm

- PSL -> Latex 203 nm +/- 4 nm
 - start: 04:40 pm -> end: 06:00 pm
 - Information: from December 2012 to today the system was calibrated with the older Latex.
 - run with the old latex -> 212.68 nm
 - run with the new latex -> 212.68 nm (3.6 sheath slope)
 - run latex after change sheath slope to 3.7 -> 208 nm
 - run latex after change sheath slope to 3.8 -> 204.1 nm

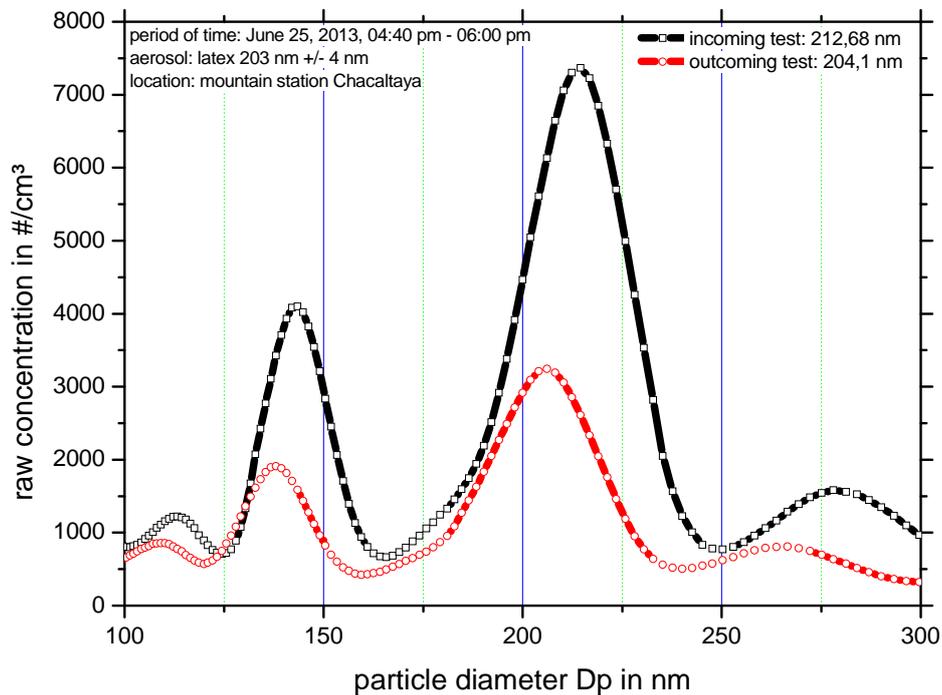


Figure 2: PSL 203 nm Latex for SMPS Chancaltaya: Particle size distribution (raw concentration) for latex 203 nm on June 25, 2013 between 04:40 pm and 06:00 pm.

- Ambient measurements overnight -> start at 06:10 pm

Second day on the station: June 28, 2013

- The system was stopped at 02:50 pm
- new nafion dryer was installed
- zero-check:
 - start: June 28, 2013; 04:02 pm
 - end: June 28, 2013; 04:15 pm
 - info: 0 pp/cm³ -> o.k.
- PSL -> Latex 203 nm +/- 4 nm
 - start: 05:33 pm
 - end: 05:55 pm
 - info: 203 nm -> ok (sheath slope 3.9)

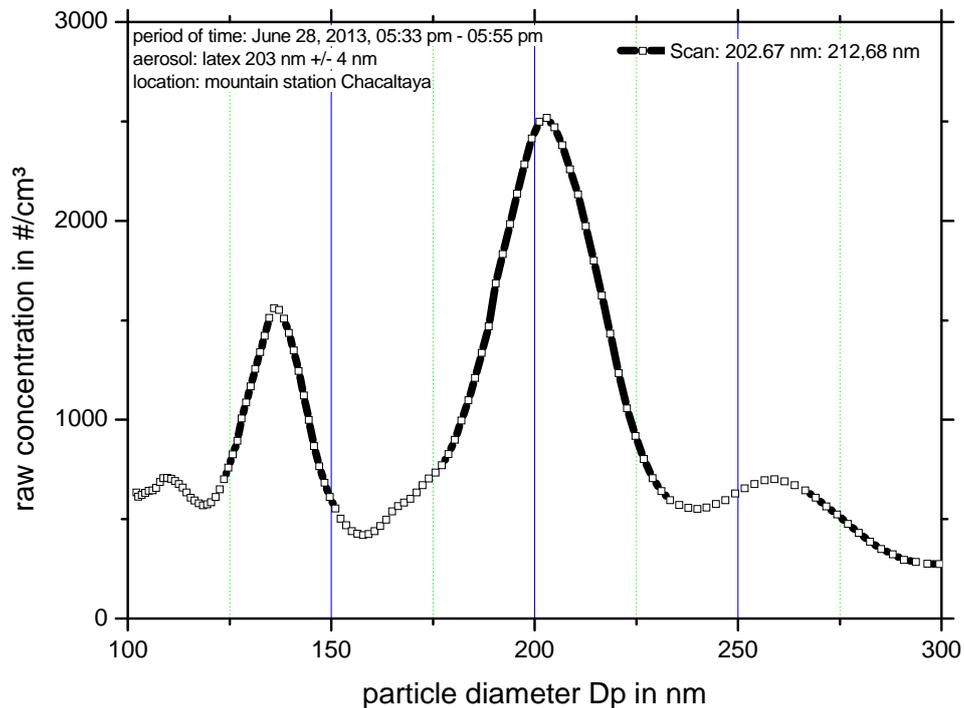


Fig.3. PSL 203 nm Latex for SMPS Chancaltaya: Particle size distribution (raw concentration) for latex 203 nm on June 28, 2013 between 05:33 pm and 05:55 pm. The pick is at 202.67 nm.

- measure aerosol flow SMPS:
 - flow: 0.9880 l/min
 - info: correct
- measure nafion flow
 - flow: 1.000 l/min
 - info: correct
- change the settings of the high voltage ramp for 6 to 8000 V because the ambient size distribution showed at the upper end sparks in the DMA
- check data upload to the ftp server and Team Viewer -> status o.k.

Conclusion:

The SMPS system is working properly. We fixed all open problems. The total CPC is on the way to Germany for repair. It is necessary to change the DMA against a new one next year!