Twinning report Danum Valley 2014, Malaysia

Global station in WMO RA II

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General:

The global GAW station was revisited by the WCCAP from May 18th through May 26 2014. The 2013 visit had to be cancelled due to a violent local insurrection near the station. Within the 2 years since our last visit the complete staff of the station had been exchanged. Therefore, training with aerosol instrumentation had to start from scratch. Upon arrival at the station, two of three aerosol instruments (MAAP and TEOM) have not been working properly. TEOM data from September 20th 2013 and MAAP data for 2012 and 2013 are therefore considered questionable. Nephelometer data of the new Ecotech Aurora 3000 are valid.

Instrumentation:

Inlet:

A zero check of the inlet with an absolute filter mounted provided a reasonably good zero value indicating that the inlet system was working properly. We cleaned the PM1o inlet head with the new station staff to provide the necessary training.

Figure 1: Deposits in the PM10 inlet

TEOM:

Upon arrival at the station TEOM was indicating a flow error. This error could be traced to a faulty secondary filter in the aerosol flow of the instrument. Station staff had exchanged this filter according to the failure description in the instruments manual. Unfortunately the replacement filter had been stored open at the station for too long. Due to the high rH at this site the resistance of this new filter was still too high causing a too low aerosol flow of the TEOM. Replacing this filter with a used spare filter solved the flow problems of the TEOM. This problem started to be relevant from September 20th 2013. Therefore TEOM data after this date should be considered questionable.

MAAP:

The MAAP spot looked unusual upon arrival. Parts of the normally circular spot on the filter had not been loaded with aerosol (figure 2). We dismantle the sensor and found that debris from the filterband had clogged parts of the deposition area on the filter. Furthermore the instrument must have been flooded at some time because all sensors used for transmission measurements were dirty. After cleaning the illumination area with compressed air and wiping the sensors first with distilled water and then ethanol the performance of the instrument increased significantly.

Figure 2: (left to right) MAAP spot prior to cleaning, MAAP illumination prior to cleaning, dirty sensors, MAAP illumination after cleaning.

Change of MAAP performance prior to and after cleaning is shown in figure 3: Note that the illumination is probably the most significant reason for the improved performance of the instrument. As the influence of non-even filter spots in the MAAP has never been investigated MAAP results need to be considered questionable.

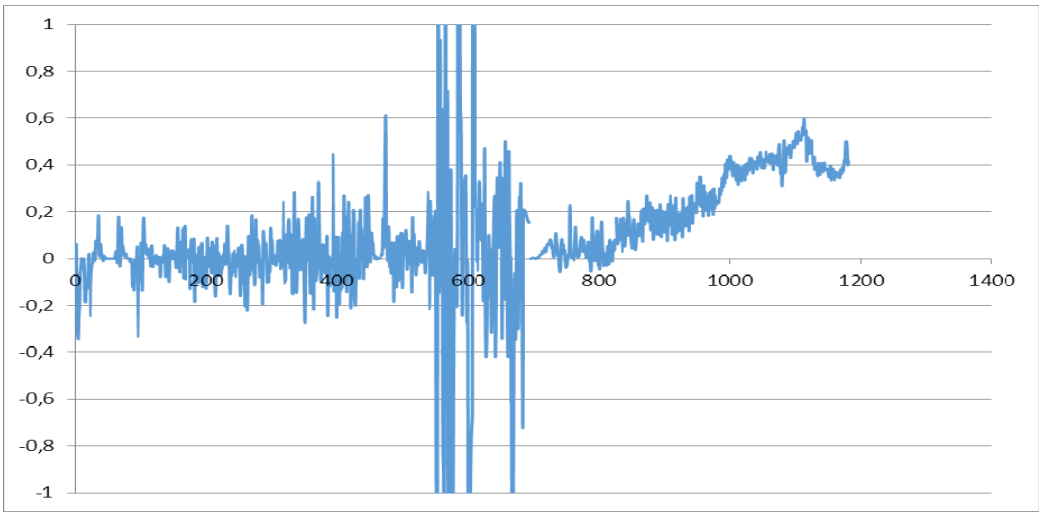


Figure 3: Change of MAAP signal prior to (~700) and after cleaning, One minute data.

Nephelometer:

The Nephelometer at the station has been properly calibrated and maintaind during the two years sine we visited the station. Because the new station staff has never been trained on the maintainance of Nephelometers we decided to clean the measurement cell – which was necessary according to figure 4.

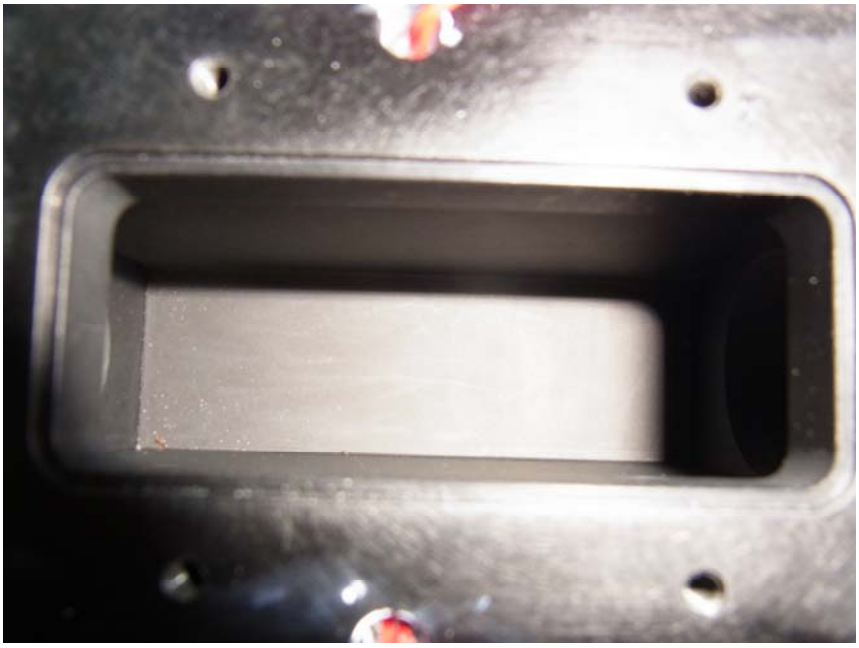


Figure 4: Nephelometer measurement cell prior to cleaning,

With respect to the proper calibration of the Nephelometer we consider all 2012/2013 data from this instrument valid.

All maintaince operation may be found in the logbook (including typos)

Logbook:

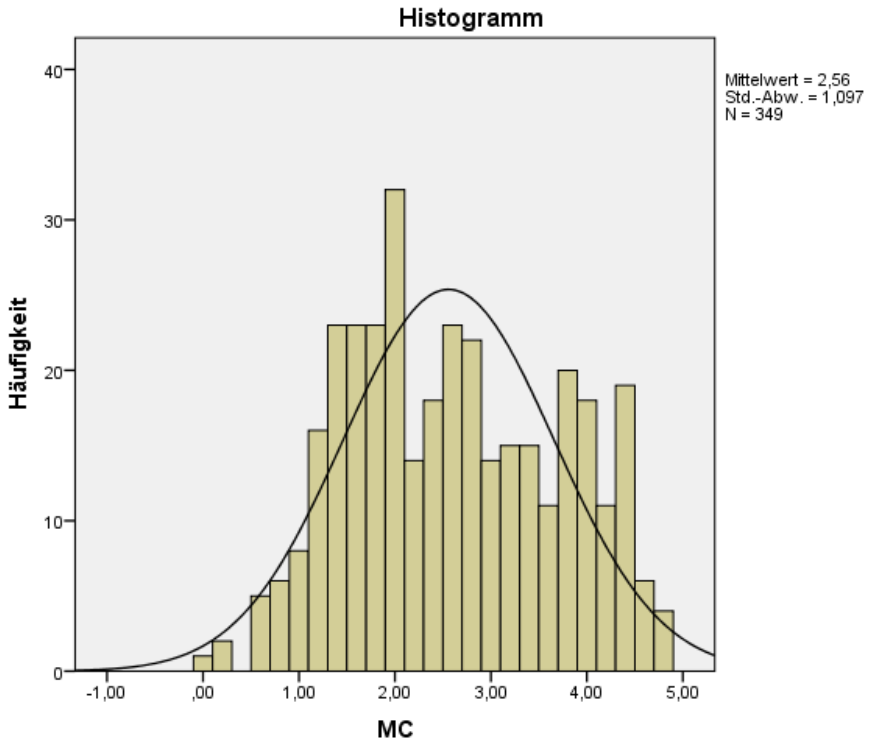
19.05.2014 08:29 Logbook started
19.05.2014 08:30 log 2014 startet
19.05.2014 08:30 local time is 14:30
19.05.2014 08:30 Teom not runing. Flow problem filter problem mass zero
19.05.2014 08:36 Maap spots look strange
19.05.2014 08:54 zero check at the inlet ok,
19.05.2014 08:55 measure total flow on the inlet
19.05.2014 09:05 inlet flow is 15.3 sum of nominal flows 17
19.05.2014 09:05 TEOM filter in front of case mounted wrong direction, should not matter
19.05.2014 09:12 measure Neph flow inline (manual valve used for adjustement)
19.05.2014 09:47 TEOM problem seems to be in the sensor (high resistance)
20.05.2014 02:41 Logbook started
20.05.2014 02:45 Teom running normally
20.05.2014 02:50 zero adjust Neph
20.05.2014 02:50 Local time 8:50
20.05.2014 02:55 compressor dewpoint temperature is 6 deg. C,
20.05.2014 02:57 dry air flow to aerosol driers is 27 l/min increase to 35 l/min
20.05.2014 03:15 rH in Neph is 48%
20.05.2014 03:58 watchdog did not watch Nepha3k - watchdog.ini modified to watch this instrument
20.05.2014 04:40 clean Nephcell training
20.05.2014 04:40 remove cell from Neph
20.05.2014 04:40 replace backup batteries
20.05.2014 04:51 disassemble measurement chamber note: lock screws for pmt not mentioned in the manual
20.05.2014 05:31 get new backup batteries from Infrapro
20.05.2014 06:26 reassemble Neph
20.05.2014 06:27 on startup backscatter is negative see picture -> cleaning was necessary
20.05.2014 06:37 October 2013 rH suddenly down to 30% and lower
20.05.2014 06:45 possible reason for rH drop removal of MAAP for repair but according to logbook a 9 l/min pump was installed to maintain sample flow at the inlet
20.05.2014 06:47 August 10 2013 stop MAAP - 19 November
20.05.2014 06:48 October 12 installation of 9 l/min pump for inlet
20.05.2014 08:50 Start full calibration of Neph
20.05.2014 09:05 stop full calibration do a zero adjust first because values have changed too much
20.05.2014 09:05 Note this is only necessary after cleaning of the measurement chamber
20.05.2014 09:09 overnight zero will take place tonight
20.05.2014 09:44 Logbook started
20.05.2014 09:45 start full calibration A3K
20.05.2014 09:55 zero filter on inlet check PM10 head

20.05.2014 10:23 Neph time is used for daq - hey Sasha....
20.05.2014 10:47 Note: Clock must be set after change of backup battery
20.05.2014 11:15 NEPH full calibration success
20.05.2014 11:22 set date and time on Neph A3K
20.05.2014 11:23 Start overnight zero run
21.05.2014 02:36 Logbook started
21.05.2014 02:38 Stop overnight zero
21.05.2014 02:38 local time 8:38
21.05.2014 02:44 Check TEOM zero does not look good
21.05.2014 02:50 TEOM average with filter is 2.8 µg/m³ check for leak
21.05.2014 03:10 Start leakcheck on TEOM
21.05.2014 03:11 Step one check aerosol flow in and out of the Microbalance
21.05.2014 03:11 in line using Drycal
21.05.2014 03:18 4.54 l/min front panel of TEOM indicates 4.46 l/min
21.05.2014 03:19 in line measurement after filter 5.47 l/min
21.05.2014 03:35 In and out flow ok, leak seem to be in the black tubing from flow splitter to TEOM
21.05.2014 03:41 Gilibrator measures 4.57 l/min at inlet Drycal 4.56 l/min
21.05.2014 04:02 adjust
21.05.2014 04:03 adjust TEOM main flow from 4.57 to 4.48 using software calibtration (service manual)
21.05.2014 04:03 restart TEOM
21.05.2014 04:06 monthly system zero for teom checked
21.05.2014 04:20 average of zeros excluding 2 outliers is .23 but huge standard deviation
21.05.2014 04:20 2 outliers not acceptable
21.05.2014 04:21 recommendation: change TEOM filter on arrival for monthly check and do zero check on Tuesday
21.05.2014 04:42 check watchdog restart procedure of aerosol pc
21.05.2014 04:45 restart failed because of genuine windows check failed
21.05.2014 05:16 Plug Teom outlet of flow splitter
21.05.2014 05:16 filter on TEOM including original tubing
21.05.2014 05:32 Stop MAAP DAQ for filter tape check and attempt to solve bad spot problem
21.05.2014 05:36 unscrew transmission sensor to get access to filter bed
22.05.2014 02:48 Logbook started
22.05.2014 02:48 DAQ PC stopped 4 am due to windows update
22.05.2014 02:48 local time 8:48
22.05.2014 02:50 TEOM is still 2.56 with zero filter
22.05.2014 02:50 need to solve the TEOM problem
22.05.2014 02:50 need urgently to solve the PC Windows problem
22.05.2014 03:07 TEOM offset is constant
22.05.2014 03:08 connect TEOM to main inlet
22.05.2014 03:12 Within the next two weeks an officer from KL will bring TEOM reference weights to check TEOM
22.05.2014 03:27 aerosol computer may have a virus
22.05.2014 03:42 Software of DANUM PC copied for installation on new PC end of this year

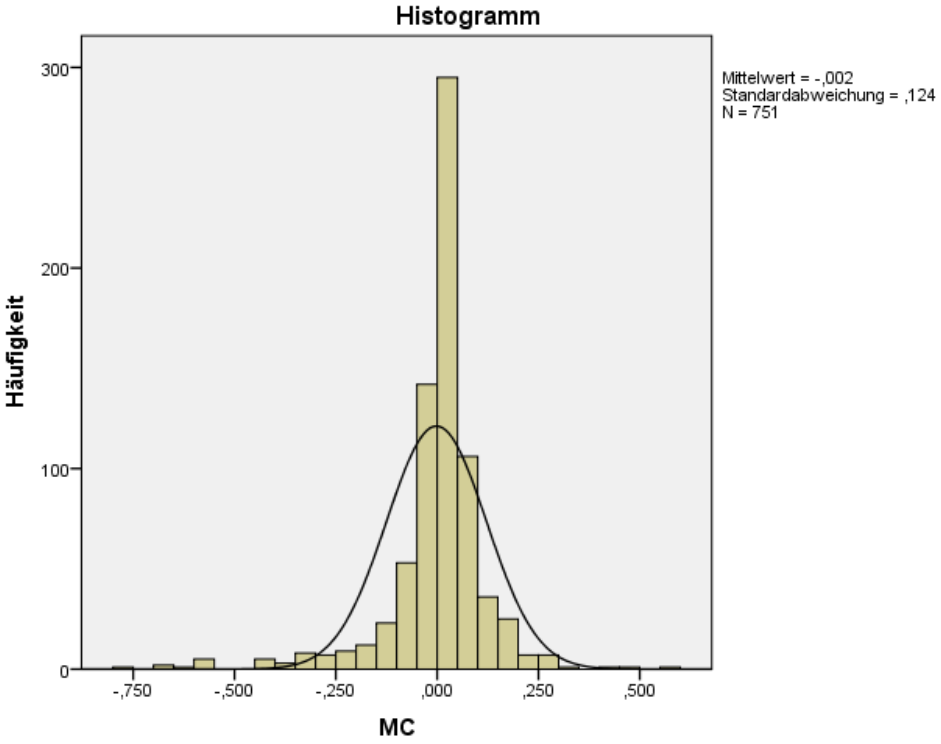
22.05.2014 05:02 TEOM data almost useless 2014 filter flow out of range most of the time
22.05.2014 05:16 TEOM problem started around September 20 and got really serious in October
22.05.2014 05:47 Check TEOM flow at setpoint 1.2 l/min and compare with Drycal
22.05.2014 06:21 Weekly spikes on Tuesday mornings caused by car - need to be removed from data set
22.05.2014 06:39 TEOM flow set to 1.2 l/min gives correct Drycal reading, data are usable
22.05.2014 08:01 Sugestion to use TEOM data with flow rates higher than 1.2 l/min
22.05.2014 10:12 MAAP data show peak every Tuesday morning
22.05.2014 10:13 finsihing audit and training
24.05.2014 05:18 Logbook started

Results of zero checks on May 22nd

TEOM:



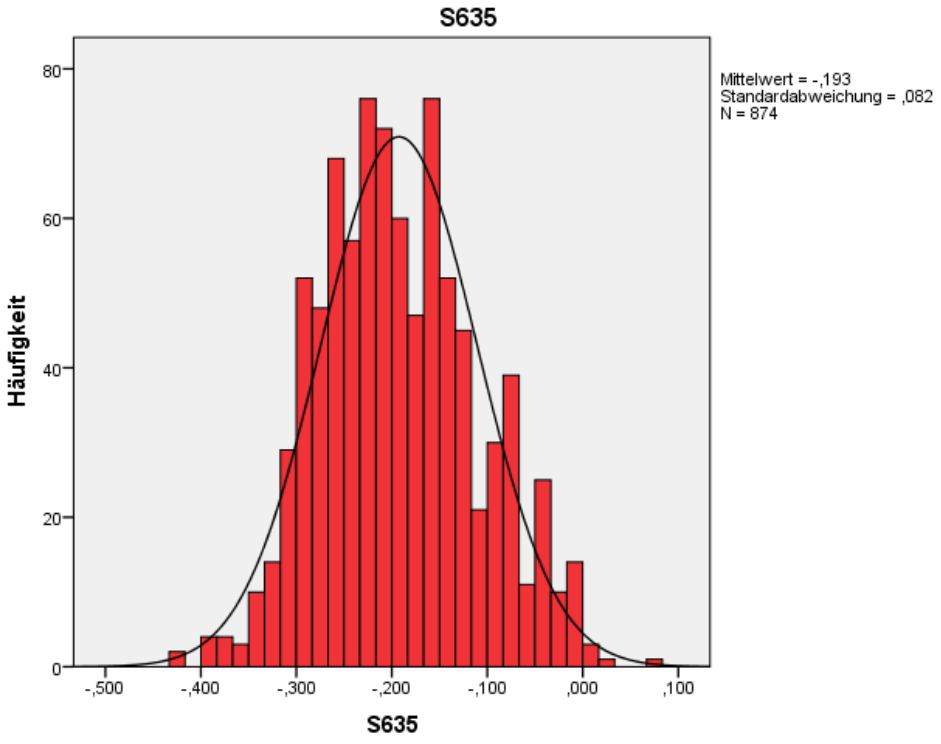
MAAP:



Nephelometer:

Statistiken

		S635	S525	S450	BS635	BS525	BS450
N	Gültig	874	874	874	874	874	874
	Fehlend	0	0	0	0	0	0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,000
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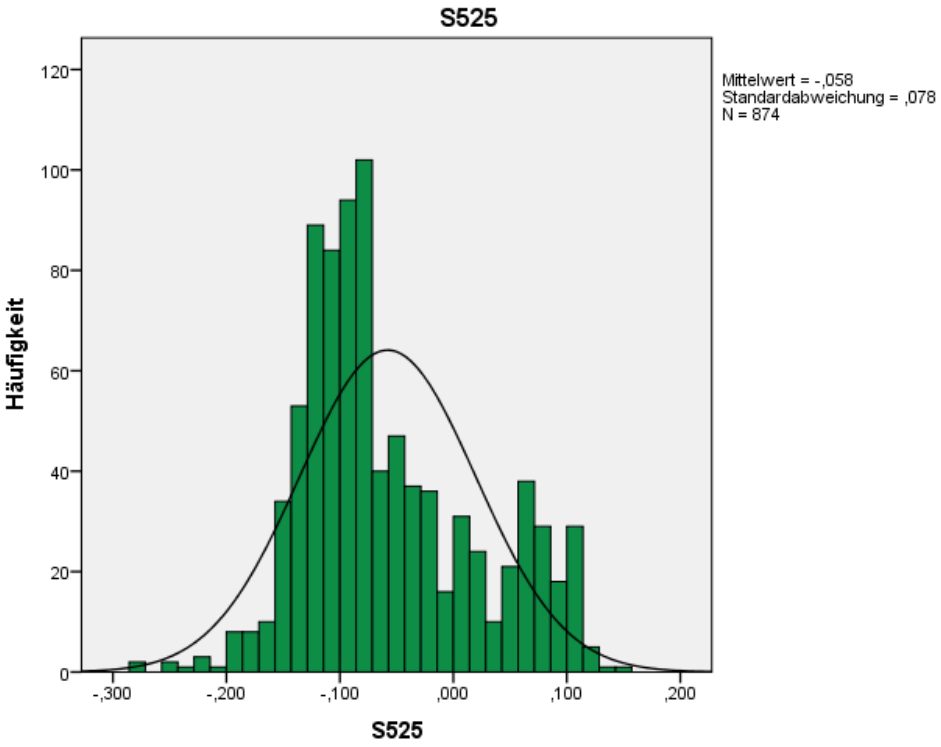
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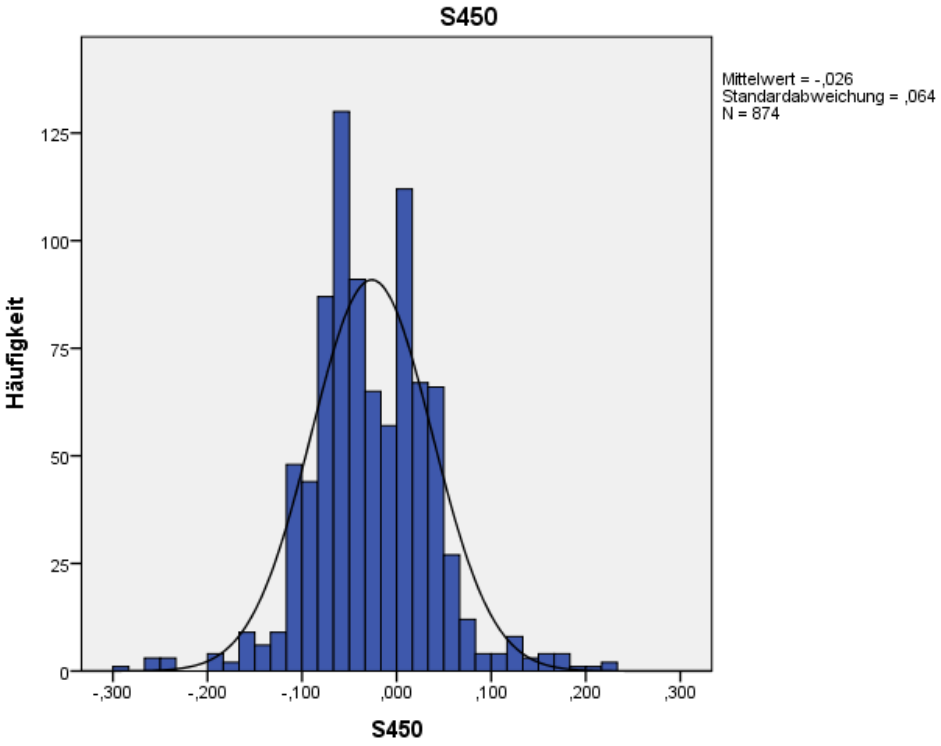
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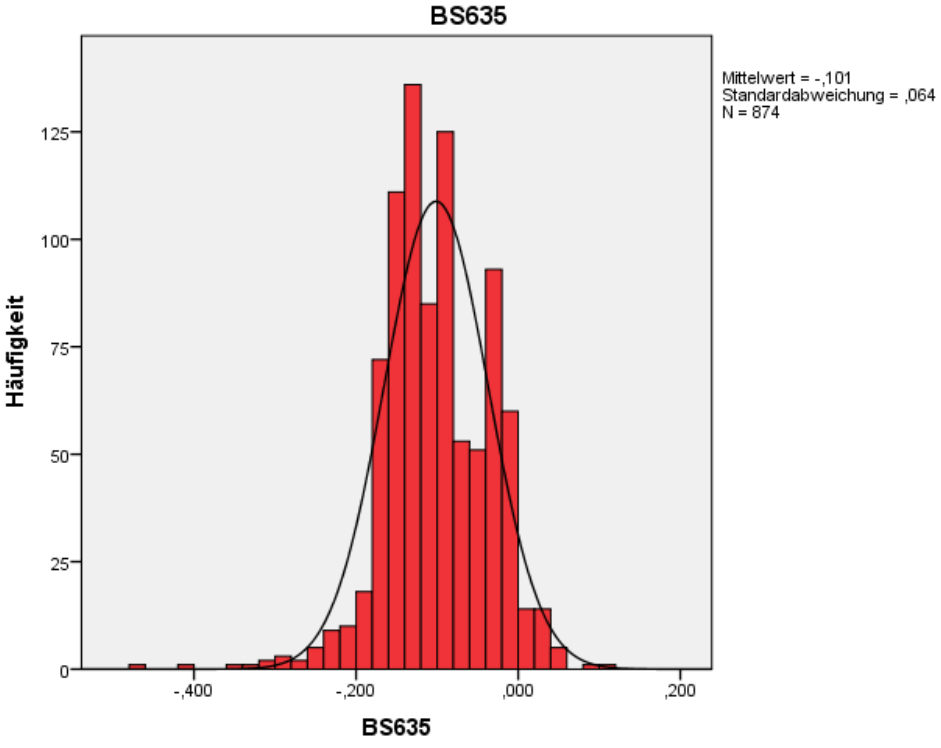
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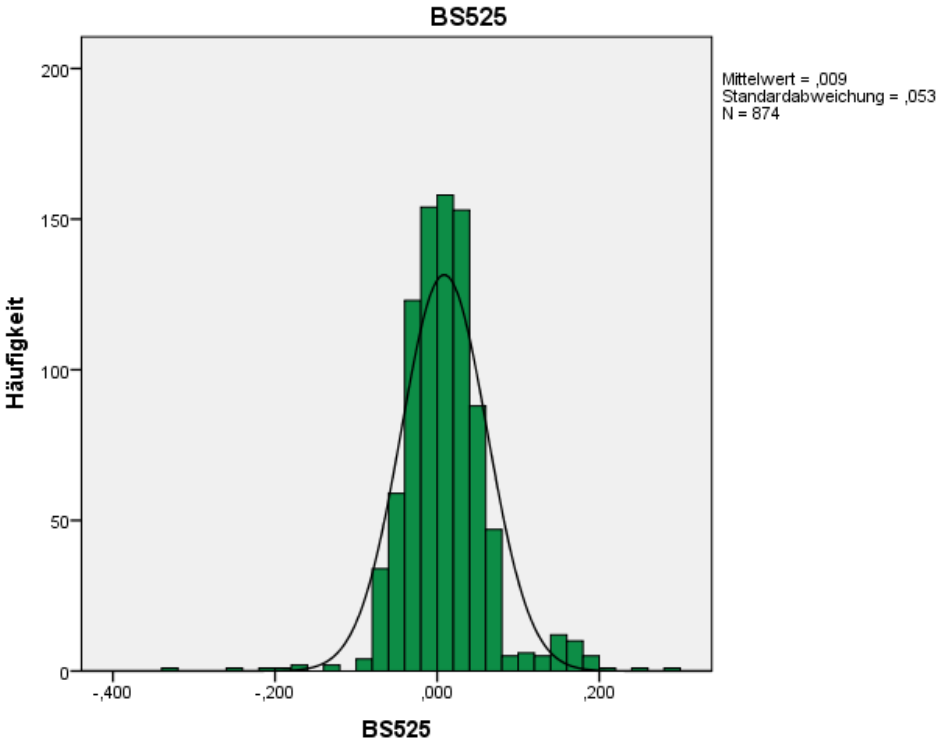
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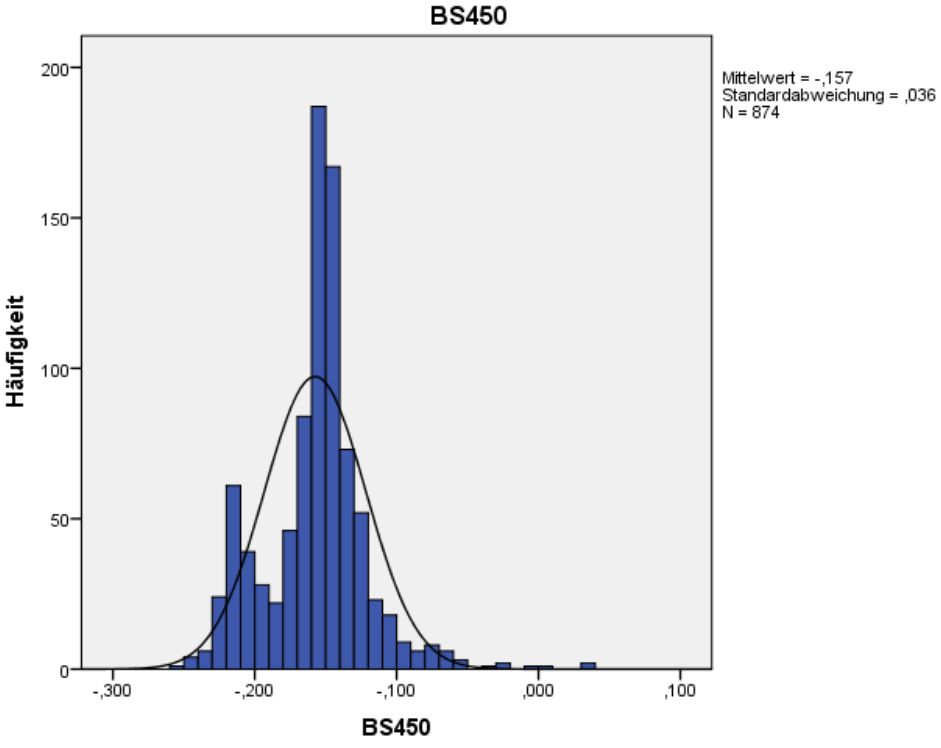
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