METHODS

The firmware of the Partector 2 was adapted to step periodically through either 3 or 4 different precipitation voltages. As a result of one such voltage scan, we now have either 4 or 5 electrometer signals characteristic of the aerosol – the signal of the first electrometer, plus 3 or 4 signals of the second electrometer corresponding to the different precipitation voltages used. The total scan time is determined by the integration time per precipitation voltage, the necessary settling time between voltage steps, and the number of different precipitation voltages used. For typical values, it takes 24 seconds to complete one full scan. We use a data inversion algorithm to produce a particle size distribution with 8 size classes of diameters 10...300nm. From this size distribution, the usual characteristic values such as total particle number, geometric standard deviation, average particle diameter etc. can be determined.

To test the performance of this new mode of operation, we compared the results obtained by it with size distributions as reported by a scanning mobility particle sizer (SMPS, TSI 3082/3775), and those of a standard Partector 2. In the laboratory, we produced aerosols of increasing sizes with a tube furnace to test the data inversion algorithm over the entire size range of 10-300nm; further long-term measurements in an ambient monitoring station are ongoing.

RESULTS

The figure (cf. Figure 2) shows a typical result from a laboratory experiment, where a box of 1m3 volume is filled sequentially with furnace-generated aerosol of increasing size.

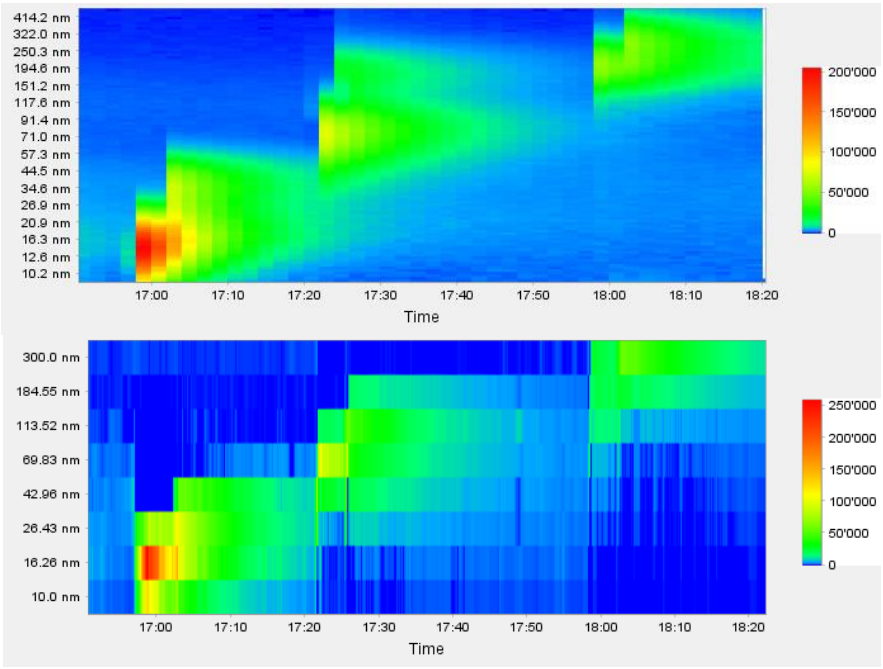

Figure 2. Size distributions in the laboratory experiment as function of time, for SMPS (top) and Partector 2 (bottom)

DISCUSSION/CONCLUSION

First results using the Partector 2 to measure particle size distributions are encouraging. In particular, it appears that the artefacts that appear for aerosols far away of the standard Partector 2 assumption of $\sigma = 1.9$ (e.g. monodisperse aerosols) are no longer present. However, like many sizing devices, the new mode of operation has the disadvantage of a lower time resolution due to the scan time.

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