Aerosol system installation

Giordan Lighthouse, Malta

Regional fixed station in WMO RA VI

20.-26.9.2010 Dr. Thomas Tuch, WCCAP

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Site description:

Giordan Lighthouse is located on the island of Gozo at 36.07333 N,14.21917 E, 167 m a.s.l. It serves as regional fixed station for GAW in RA VI. Vegetation is very sparse except for some minor farming activity. Climate is typically Mediterranean with prevailing NW winds. The site is operated by the University of Malta.

Figure 1: Giordan Lighthouse, Gozo, Malta.

Until September 2010 only gaseous pollutants have been measured at this station. From September 20th through 24th an aerosol measurement system designed by the WCCAP has been installed at the site. This system consists of an aerosol inlet with dryer, a SMPS, an OPC and a MAAP mounted in an air-conditioned rack. Aerosol humidity in the MAAP is measured by a dedicated sensor.

Aerosol inlet:

The aerosol inlet is mounted on top of the roof of the laboratory. Details are shown in Figure 2.

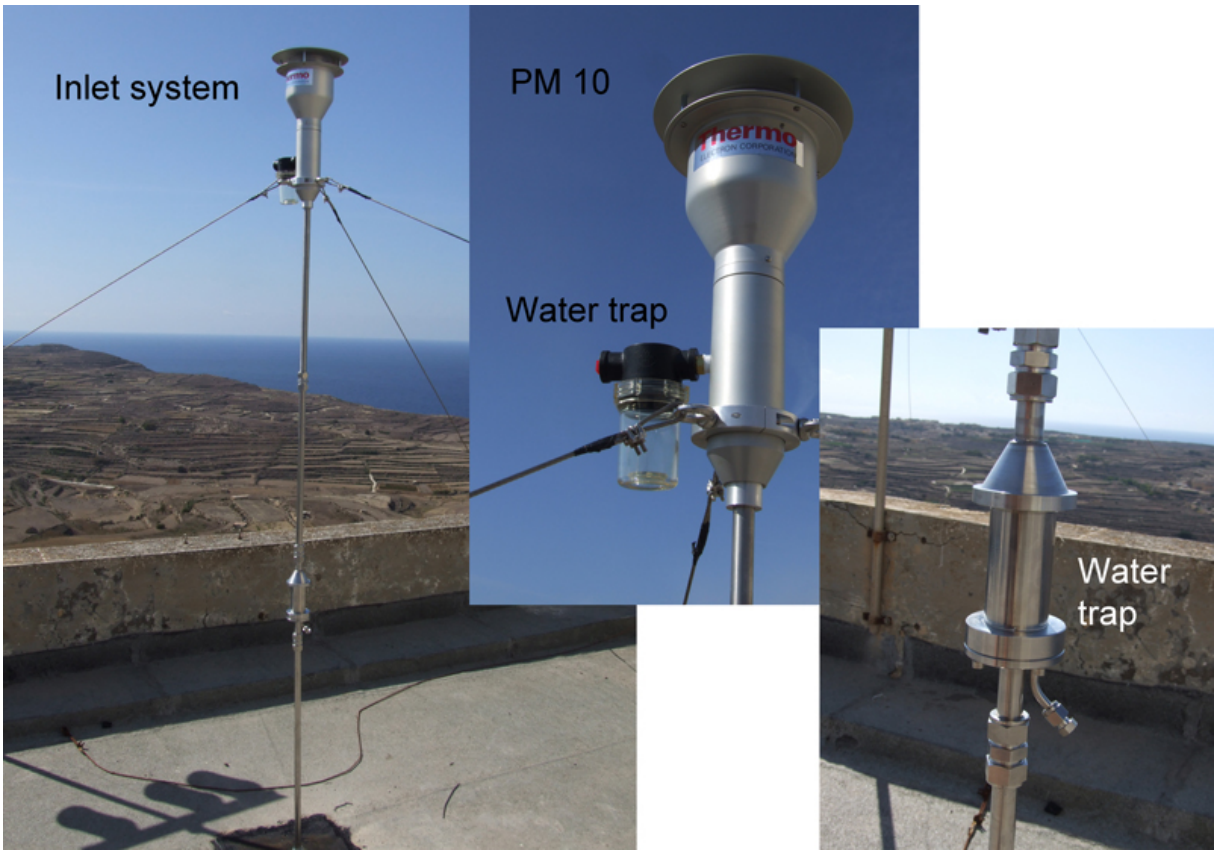

Figure 2: Outdoor inlet system.

Two Naphion dryers with supply of dried compressed air are mounted inside the laboratory. An aerosol splitter distributes the sample air to the individual instruments. A bypass valve built into the aerosol path to the SMPS is used for sizing and zero checks. The knob must be in line with the aerosol line during normal operation, it should only be switched perpendicular to the aerosol line for above mentioned checks.

Figure 3: Flow splitter with bypass valve (left: measurement, right SMPS zero check)

The main system is housed in an indoor shelter. The SMPS is located on the left side. MAAP and OPC are mounted on the right side of the rack.

Figure 4: Measurement rack.

The Scanning Mobility Particle Sizer (SMPS):

Aerosol enters the SMPS system through a Nafion dryer. The aerosol flow is then measured by a capillary and a pressure transducer. A sensor measures temperature and relative humidity of the aerosol. Particles are brought in the the bipolar charge equilibrium in the bipolar diffusion charger. The aerosol enters the DMA where particles of identical mobility are selected and counted by a CPC. The sheath air system is designed as a closed loop system with a blower, heat exchanger, Nafion dryer, mass flow meter and two HEPA filters. A sketch of the SMPS according to EUSAAR requirements is shown in figure 5.

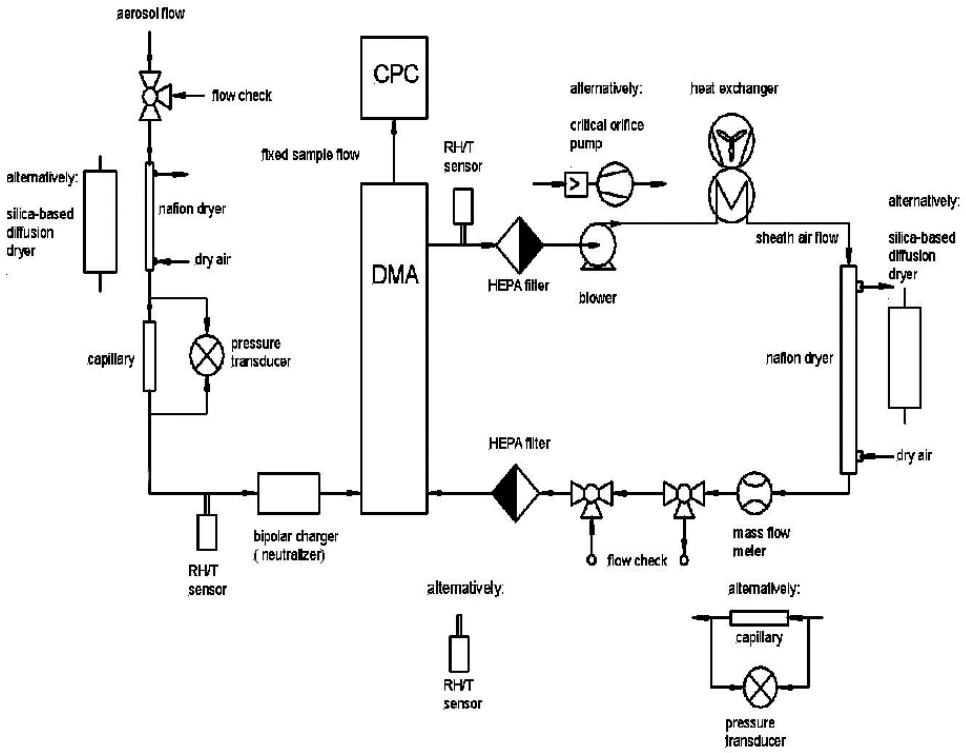

Figure 5: Sketch of the SMPS setup.

During an intensive training of the station personnel after installation of the system several flow, high voltage, zero and sizing checks have been made. An exemplary result for a sizing test with 200 nm Latex is shown in figure 6

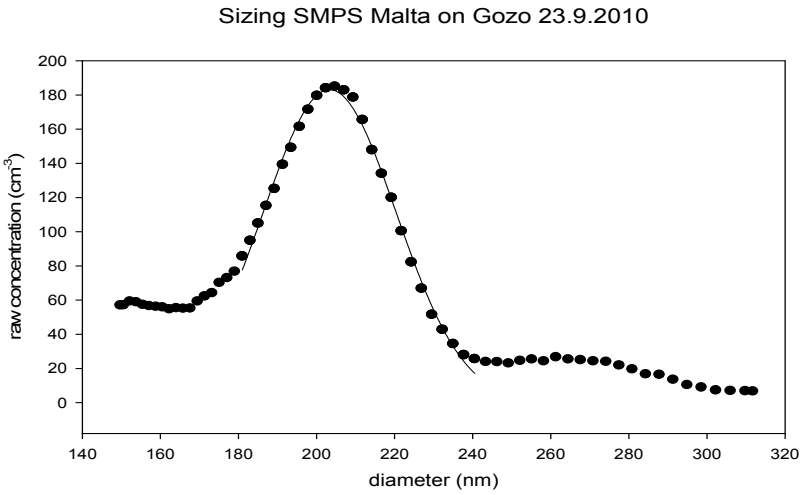

Figure 6: Latex calibration of the SMPS 2010/09/23 203 nm.

OPC measurements with a Grimm 1.909 are synchronized with SMPS measurements. MAAP measures at a time resolution of 1 minute. A typical screenshot of the running system is shown in figure 7.

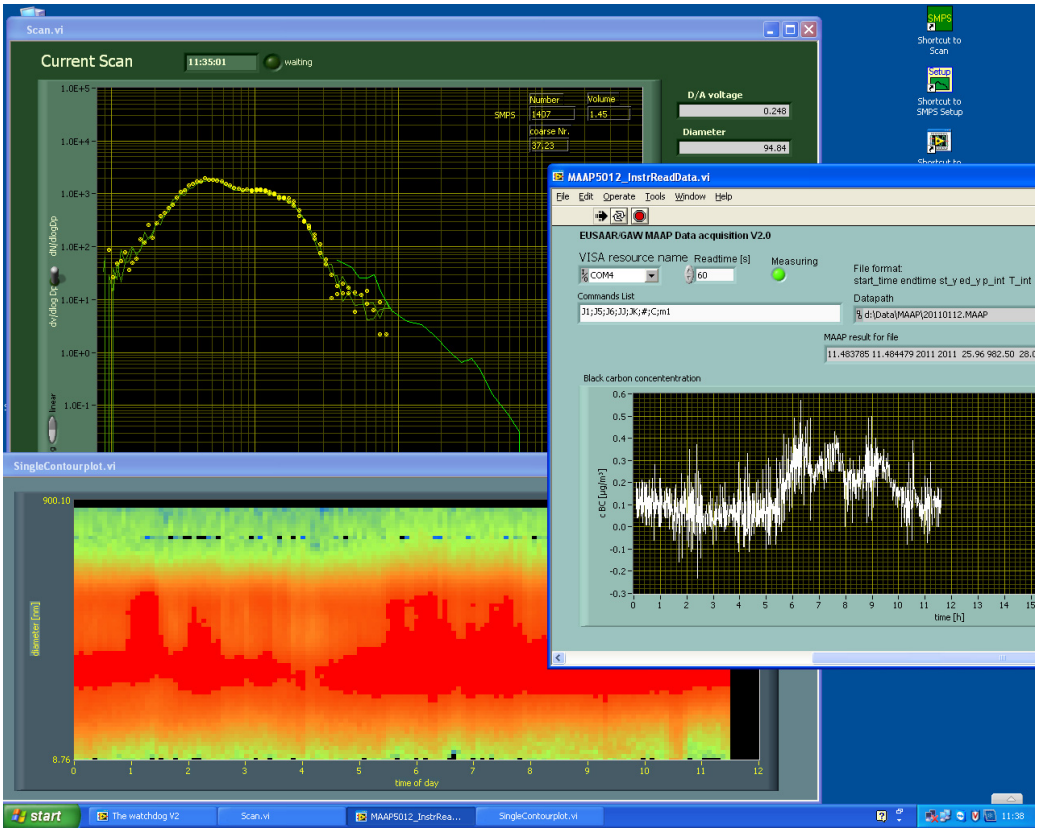

Figure 7: Screenshot of the data acquisition system on Gozo.

Remote access to the sytem is available at the WCCAP. We are confident that aerosol data from Gozo will contribute significantly to the understanding of aerosols in the Mediterranean.