



MARGA - Monitoring Instrument for Inorganic Aerosol Composition and Acidifying Gases

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With the use of SJAC (Steam Jet Aerosol Collector) ECN developed MARGA for the determination of a host of air-polluting species. It measures on-line the hourly averaged concentrations of ammonia, nitric acid, nitrous acid, sulphur dioxide, hydrochloric acid in the gas phase and ammonium, nitrate, sulphate, sulphite, chloride, sodium, potassium, magnesium and calcium in aerosols. The species are collected and dissolved in the absorption solutions and analysed on-line. Compared with the classical denuder filter pack method this instrument offers high time resolution, no contamination by off-line handling and no artefacts introduced by semi-volatile ammonium salts. New are the capability of long-term stand-alone measurements (over a week) and the ability to measure anions as well as cations by ion chromatography. On-line analysis of the anions and cations became possible by direct injection of the sample in two 250 μ l loops placed in series with both a Metrohm cat- and anion chromatograph. This way a detection limit of typically 4 ppb in liquid was achieved for the cations, which resembles 0.1 μ g/m³ in air. For the anion typically 0.05 μ g/m³ was achieved. Currently these detection limits were reduced with a factor of 20 by the use of concentrator columns. With this method three MARGA's were tested in parallel over 2 weeks in May 2005 showing correlation coefficients of >95% and a standard deviation of <5% for the major cat- and anions. In respect to former versions the long-term-stand alone performance was achieved by the use of a specially developed multi-channel syringe pump that acts as a precise sample collector over a defined sampling time frame. For the solvent level control in the denuder a capacitive sensor was most reliable, for the SJAC a dual optical fiber with a 450 μ m tip. Also a multi-channel in-line degasser for the sample flows was introduced. In respect to the airflow a Peltier based cold trap and a mass flow controller were introduced for improved accuracy. By syringe pumping a

standard solution containing LiBr was continuously mixed with the sample solution and used in each chromatogram as an internal standard. ECN and Applikon supplied US EPA CASTNET with 3 instruments. CASTNET is the primary source for data on dry acidic deposition and used in conjunction with other US monitoring networks to provide information for evaluating the effectiveness of national emission control strategies. CASTNET consists of over 80 sites. Our instruments are in operation since June 2005. Over the first 4 months a data-coverage of 84% was achieved. The recently developed GRAEGOR, gradient analyser for aerosols and gases, consists of two sampling units connected to one detector unit with an anion chromatograph and an ammonium detector based on conductivity after membrane diffusion. It has not been used for flux measurements yet. Preliminary tests showed a precision of better than 1% for sulphate, nitrate and ammonium at concentration levels of 1 to 10 $\mu\text{g}/\text{m}^3$. Near future development will bring a MARGA system with two sampling units for the simultaneous determination of the PM_{2.5} and PM₁₀ composition.