Title: README for water-soluble aerosol components PILS data

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1.0 Data Set Description

Final data for PILS (Particle-into-Liquid-Sampler) water-soluble aerosol composition measurements collected aboard the University of Wyoming King Air aircraft during phase 1 and 2 of the TRANS²AM field campaign. PILS data status is final data - revision R0. Data are collected at 2 minute intervals and converted to STP (T = 273.15K and P = 1 atm) for reporting. Measured species include:

- Sodium
- Ammonium
- Potassium
- Magnesium
- Calcium
- Acetate
- Propionate
- Formate
- Methanesulfonic acid (MSA)
- Chloride
- Nitrite
- Nitrate
- Glutarate
- Succinate
- Sulfate
- Oxalate
- Levoglucosan

The base of operations for the UWKA aircraft during the TRANS²AM field campaign was Laramie Airport in Laramie, WY (KLAR). Phase 1 of the field intensive took place in July and August 2021. Phase 2 of the field intensive took place in August and September 2022.

Use of data requires prior okay from data authors (please see list above).

2.0 Instrument Description

The Particle-into-Liquid Sampler system allows for collection of liquid samples for off-line analysis by ion chromatography to determine the anion and cation composition of aerosols. The PILS collects ambient particles (PM_1) into purified water. After particles are grown inside the body of the PILS by mixing cool air with hot steam, the particles are collected by an impactor, and then washed off by a continuous flow of liquid passed over the impactor, providing a liquid sample with the aerosol particles dissolved in it for analysis [*Orsini et al.*, 2003]. Denuders were placed upstream of the PILS to remove gaseous interferences. The liquid sample from the PILS was sent to a Bretchel Fraction Collector to collect samples for off-line analysis [*Sorooshian et al.*, 2006]. This fraction collector holds seventy-two 2 mL polypropylene vials and was started manually for continuous collection across an entire flight. At the completion of each flight, the vials were capped and stored in a 2°C cold room until analysis began.

3.0 Data Collection and Processing

Each off-line sample was analyzed for cations, anions/organic acids, and levoglucosan. Cations were determined using a Dionex ICS-3000 ion chromatography with a pump, conductivity detector, and self-regenerating cation suppressor. A Dionex IonPac CS12A analytical column (3×150 mm) using 20 mM methanesulfonic acid at a flowrate of 0.5 mL/min was used for the cation separation. The injection volume and analysis time were 190 µL and 17 minutes, respectively. Anions/organic acids were measured using a Dionex ICS-4000 capillary ion chromatograph. A Dionex AS11-HC capillary column with a potassium hydroxide gradient provided by an eluent generator at a flowrate of 0.015 mL/min was used for the separation. The complete run time was 65 min with an injection volume of 35 µL. Levoglucosan was determined via high-performance anion-exchange chromatography with pulsed amperometric detection (HPAEC-PAD) using a Dionex DX-500 series ion chromatograph with an ED-50/ED-50A electrochemical cell. The cell includes two electrodes: a pH-Ag/AgCl (silver/silver chloride) reference electrode and "standard" gold working electrode. For the separation, a Dionex CarboPac PA-1 column (4x250 mm) employing a sodium hydroxide gradient was used. The complete run time was 50 min and injection volume was 100 µL.

4.0 Data Format

PILS data files are reported in ICARTT format. PILS data are reported on a 2 minute time base. Missing data are flagged as -9999. Data below the limit of detection (1 ng/m^3) are flagged as -8888.

5.0 Data Remarks

Use of data requires prior okay from data authors (please see list above).

RF04 and RF05 are missing aerosol data as the background filter was not switched off during flight. RF10, RF11, RF12, and RF14 are missing potassium due to an unexpected high background from a different supplier of pipet tips.

6.0 References

Orsini, D. A., Y. Ma, A. Sullivan, B. Sierau, K. Baumann, and R. J. Weber (2003), Refinements to the particle-into-liquid sampler (PILS) for ground and airborne measurements of water soluble aerosol composition, *Atmos. Environ.*, *37*(9), 1243-1259, doi:10.1016/S1352-2310(02)01015-4.

Sorooshian, A., F. J. Brechtel, Y. Ma, R. J. Weber, A. Corless, R. C. Flagan, and J. H. Seinfeld (2006), Modeling and Characterization of a Particle-into-Liquid Sampler (PILS) *Aerosol Science and Technology*, *40*(6), 396-409, doi:10.1080/02786820600632282.