# Time-resolved Chemical Characterization of Aerosol Particles down to 6 nm Diameter in Stockton, California

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## INTRODUCTION

- Need for time-resolved measurements
- Chemical characterization is important for:
  - a) source apportionment
  - b) exposure and risk assessment studies

***Aim:***

**To combine the simplicity of filter sampling with the data completeness and automation of real time instruments.**

***Approach:***

**To provide a collector with directly analyzable samples and an automated interface to lab-based analytical instruments.**

## NEW CHALLENGES FOR NEW APPLICATIONS

**WCPC output is warm and humid… but collection applications want outputs at ambient temperature and RH**

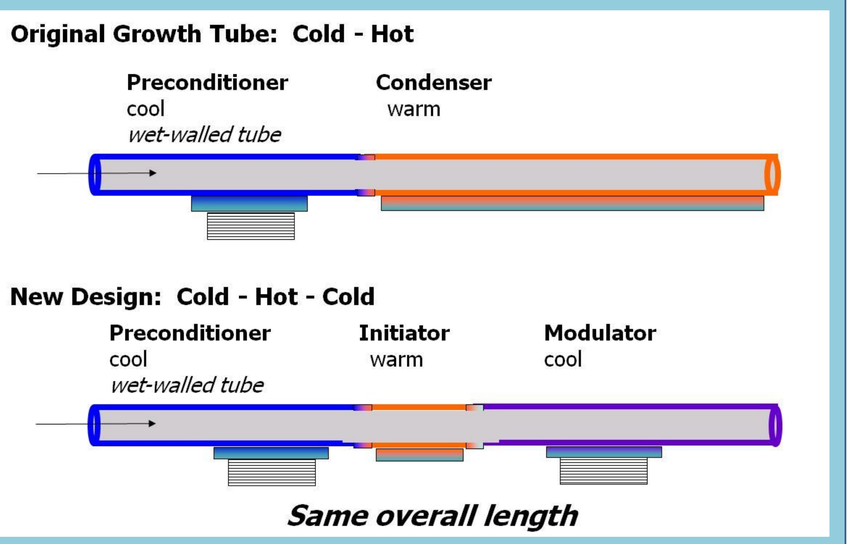


**Figure 1. New approach to laminar flow, water condensation**

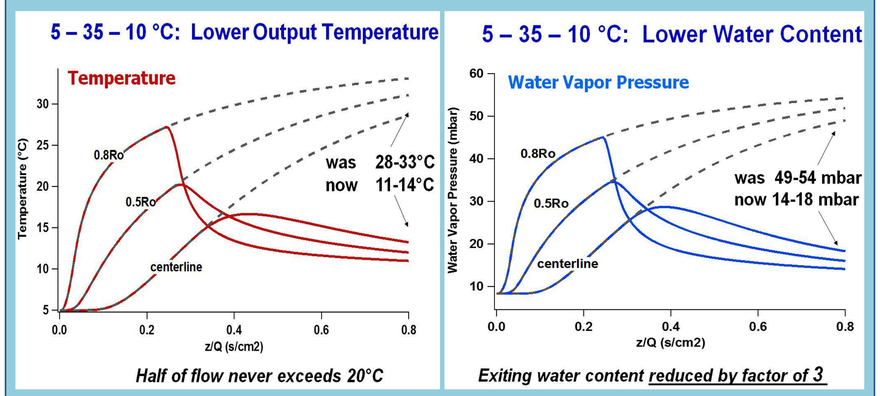


**Figure 2. Temperature and Water Vapor Pressure of the transport flow**

## SYSTEM DESIGN

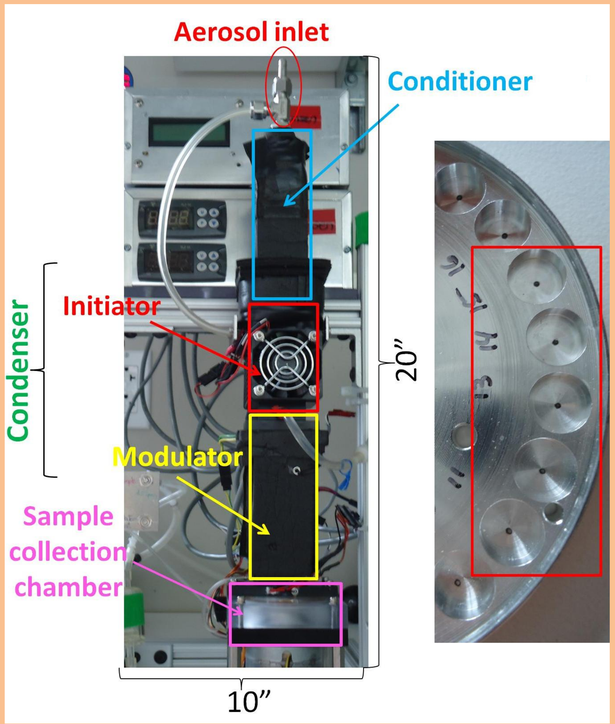


**Figure 3. Spot sampler, collection plate and sample spots**

- **The 3-stage growth system works at low temperatures.**
- **PM samples are collected by impaction as dry deposits in small spots (<1 mm).**

## COLLECTION EFFICIENCY

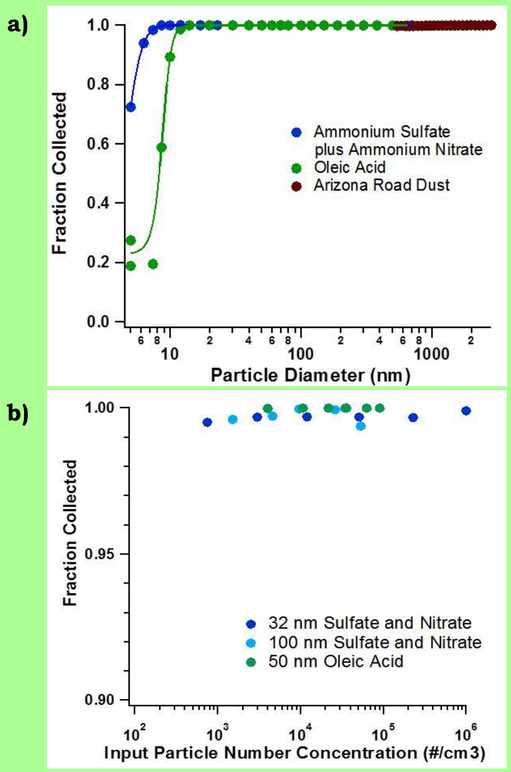


**Figure 4. Collection efficiencies for different particle types: a) size, and b) concentration**

## AUTOMATED EXTRACTION AND ANALYSIS

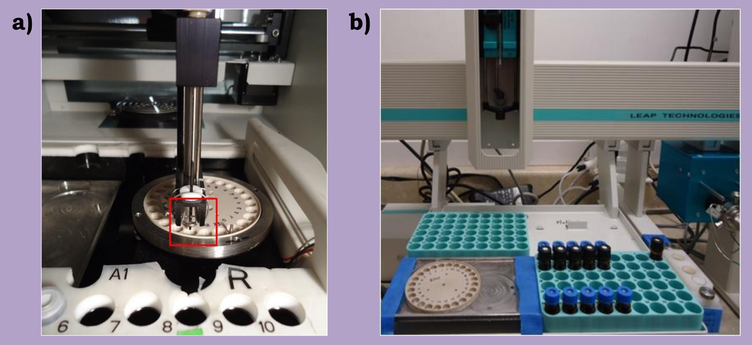


**Figure 5. Automated extraction of collected samples for a) anions, and b) PAH analyses**

## SAMPLER FIELD PERFORMANCE

- **Location: ARB-station, Stockton, CA**
- **Collection: Nov. 2011 – Feb. 2012**
- **Sequential 12hr samples @ 1.5 lpm**
- **Samplers run unattended for weeks**
- **Parallel 48-hr filter collection**
- **Analyses: PAHs (HPLC-FL); anions (IC-ED)**

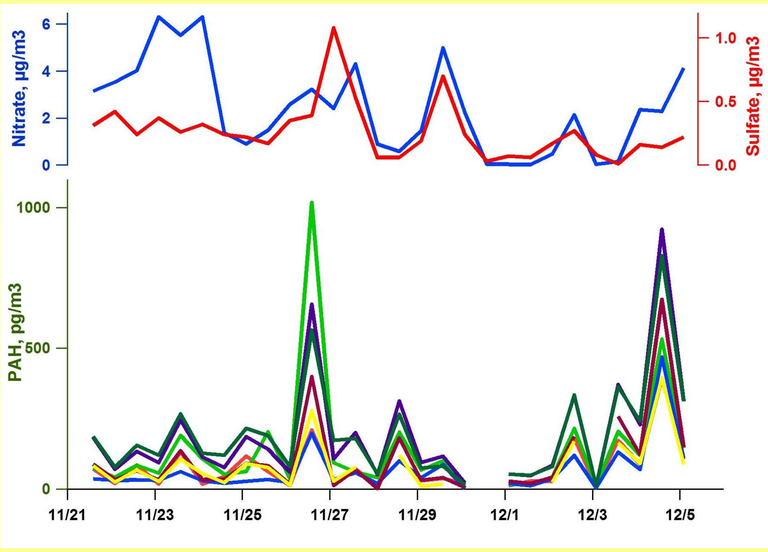


**Figure 6. Temporal variability of PM chemical composition**

## CONCLUSIONS

**The Spot Sampler is a simple, portable and reliable instrument for sequential, time-resolved collection of dry samples of ambient PM down to 6 nm.**

**The sample collection plate can be streamlined with an automated analysis system for ambient PM chemical speciation.**

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