

# **Biogenic Aerosols- Effects on Clouds and Climate (BAECC)**

Report to ASR fall working group  
meeting

Nov 2013

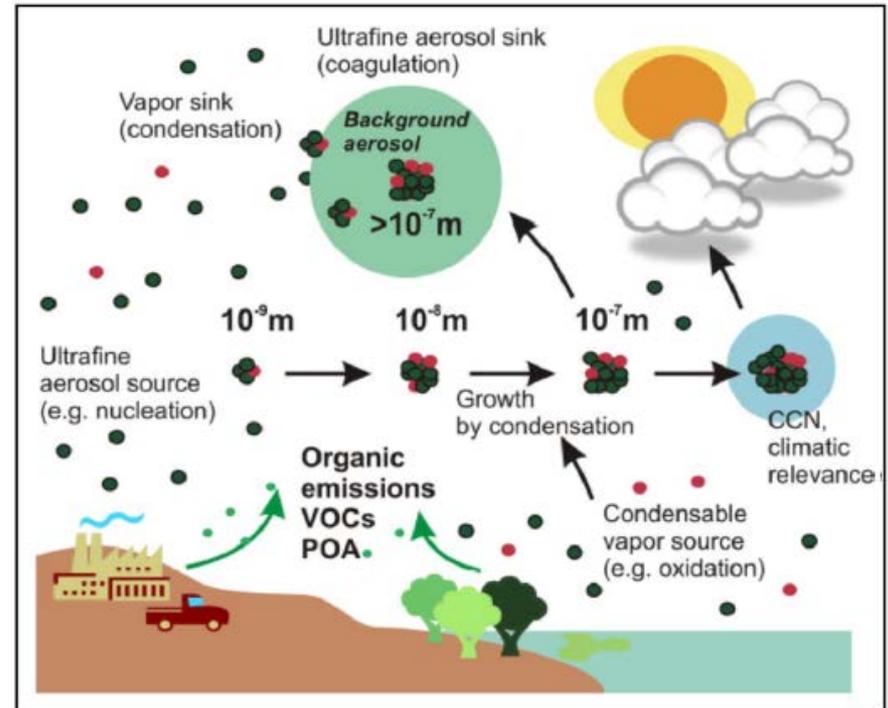
# BAECC: Summary

Dates: February through October 2014

Site: SMEAR II Station, Hyytiälä, Finland

Goals: The main goal of the activity is to understand the impact of biogenic aerosol formation on cloud properties and ultimately on global climate. The specific aims are:

- to resolve the role of biogenic secondary aerosol formation in cloud processes for warm liquid, mixed-phase and ice clouds over the boreal environment,
- by utilizing ARMs state-of-the-art active remote sensing together with process-scale modeling, to complete the link between our comprehensive 18-year observational record of aerosol and biosphere-atmosphere interactions to cloud processes,
- to expand our local observations over larger spatial scales up to the Earth System via a hierarchy of models (emission, aerosol dynamics, atmospheric chemistry, cloud process, radiative transfer, global climate model) and satellite observations.



# ARM Observations

**Table 3.** AMF2 instrumentation during BAECC experiment

<p><b>Aerosol Observing System (AOS)</b> - a duplication of certain aerosol instruments already installed by University of Helsinki providing a resource for benchmarking, repeatability and representativeness, including:</p>
<ul style="list-style-type: none"> <li>• Cloud Condensation Nuclei Counter CCN100, single column</li> <li>• Ambient nephelometer and variable RH nephelometer for <math>f(\text{RH})</math></li> <li>• Condensation Particle Counter (CPC)</li> <li>• Hygroscopic Tandem Differential Mobility Analyzer (HTDMA)</li> <li>• Particle Soot Absorption Photometer (PSAP)</li> <li>• Ozone concentration</li> <li>• Cimel sun photometer</li> </ul>
<p><b>Atmospheric sounding system</b></p>
<ul style="list-style-type: none"> <li>• Balloon-Borne Sounding System (4 ascents a day to provide sufficient temporal coverage)</li> </ul>
<p><b>Vertical structure and radiation</b></p>
<ul style="list-style-type: none"> <li>• Laser Disdrometer (LDIS)</li> <li>• Micropulse Lidar (MPL)</li> <li>• Microwave Radiometer, 3-channel (MWR3C), liquid water path for mixed-phase clouds.</li> <li>• High Spectral Resolution Lidar (HSRL) extinction profile for aerosol and cloud, together with unambiguous detection of liquid layers.</li> <li>• Total Sky Imager (TSI)</li> <li>• Radiometers (ASSIST, MFRSR, GNDRAD and SKYRAD) – for radiation and water vapor profiles.</li> <li>• Beam Steerable Radar Wind Profiler (BSRWP) at 1290 MHz.</li> </ul>
<p><b>Cloud observations</b></p>
<ul style="list-style-type: none"> <li>• X &amp; KA-SACR – for 3D mapping of clouds and precipitation plus dual-frequency retrievals</li> <li>• KAZR and SWACR – for dual (triple)-frequency retrievals of liquid, ice and mixed-phase layers.</li> </ul>
<p><b>Surface observations</b></p>
<ul style="list-style-type: none"> <li>• Local meteorology (Vaisala WXT520 weather station)</li> <li>• Snow observations, Video Disdrometer (VDIS), 2-Dimensional</li> <li>• Rain Gauges</li> </ul>

# BAEC

number size distribution (1-4.5 nm)	ACSM; MARGA	Manninen
in-situ aerosol chemical characterization		Tuukka Petäjä; Mikko Äijälä MARGA: Hannele Hakola
aerosol optical properties	3λ nephelometer, AE-31 aethalometer, MAAP, CAPS, PSAP	Tuukka Petäjä; John Backman
in-situ cloud condensation nuclei concentration (total and size segregated CCN)	CCN counter	Tuukka Petäjä; Mikhail Paramonov
aerosol hygroscopicity and volatility, mixing state of aerosol population	VDMPS, VHTDMA	Tuukka Petäjä; Pasi Aalto
trace gases (O3, NO, NO2, NOx, SO2, CO, CO2)	trace gas sensors, vertical gradient	Tuukka Petäjä; Petri Keronen
trace gases (VOC, VOC fluxes, inorganic gases)	PTR-Q-MS, CIMS, MARGA	PTRQMS: Jaana Bäck PTRTOFMS: Taina Ruuskanen MARGA: Hannele Hakola, FMI
trace gases (OCS)	Aerodyne instrument	Timo Vesala
Greenhouse gas concentrations, GHG fluxes, micrometeorological fluxes	CO2, OCS, CH4, H2O, momentum	Timo Vesala
ion chemistry	API-ToF	Tuukka Petäjä; Mikko Sipilä
solar radiation	spectroradiometer (Bruker), UVA, UVB, PAR, Global, IR, albedo)	Tuukka Petäjä; Erkki Siivola
Radon, environmental radioactivity	geiger counter	Jussi Paatero, FMI
Ecophysiological measurements; forest growth from cell level to canopy level	various instruments	Jaana Bäck, UHEL
column aerosol burden	sun photometer (Cimel CE-318, part of AERONET	Veijo Aaltonen, FMI
cloud base height	Vaisala ceilometer	Tuukka Petäjä; Pasi Aalto
aerosol vertical profile, boundary layer height, horizontal wind profile	Halo photonics Lidar	Ewan O'Connor, FMI

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