TEM study of CalNex aerosol particles

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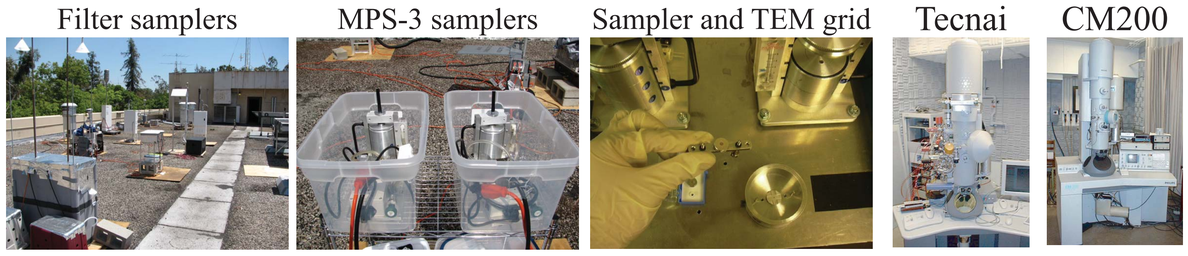
Abstract: Using transmission electron microscopes (TEMs) and energy dispersive X-ray spectroscopy (EDS), we determined the shapes, mixing states, and compositions of aerosol particles having aerodynamic diameters between 50 and 300 nm collected at the Pasadena ground site (CalNex-LA). An average of 15 samples per day (465 samples in total) was collected. Most particles consist of soot, organic aerosol (OA), sulfate, sea salt, or combinations thereof. This study indicates that compositions and shapes of mixed aerosol particles change significantly over 24 hours.

1. Sampling and TEM

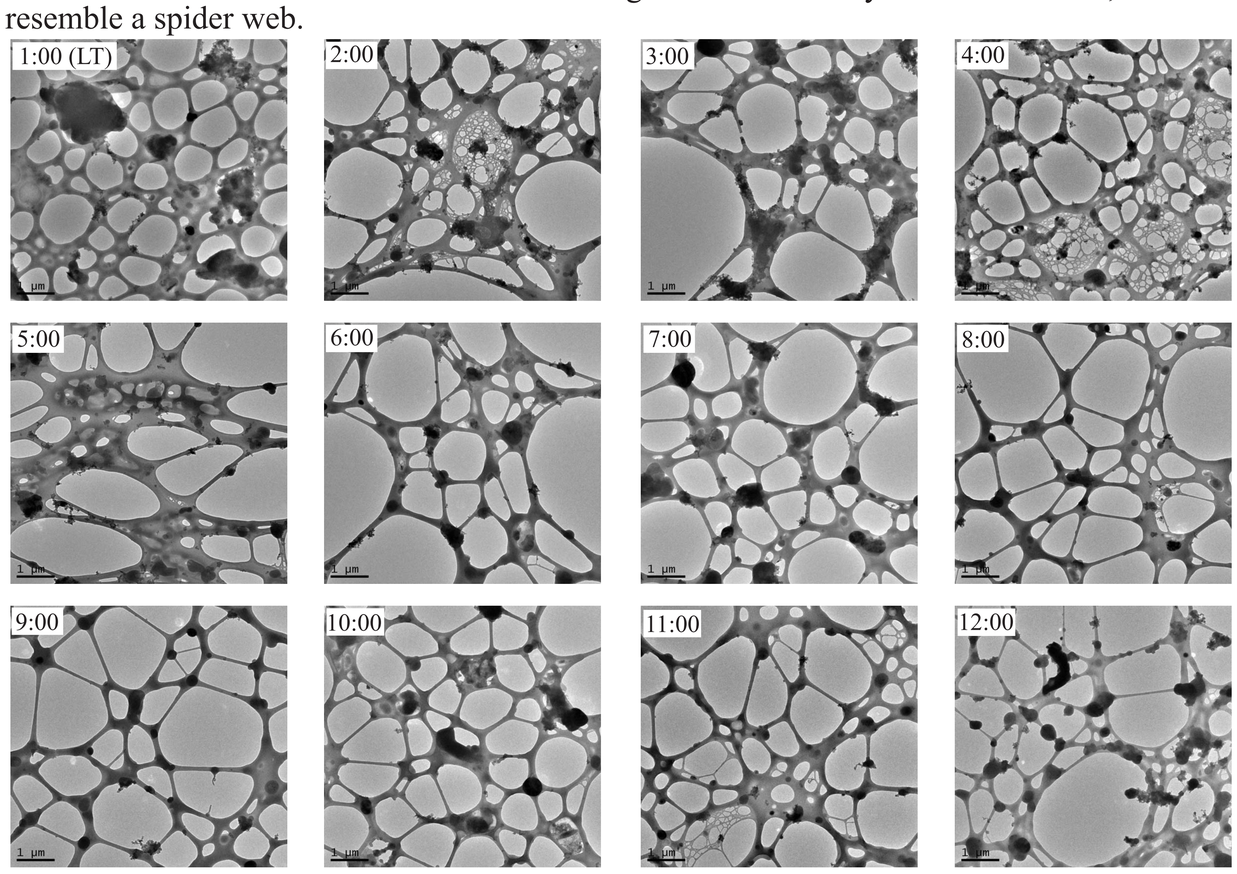
Filter samplers | MPS-3 samplers | Sampler and TEM grid | Tecnai | CM200

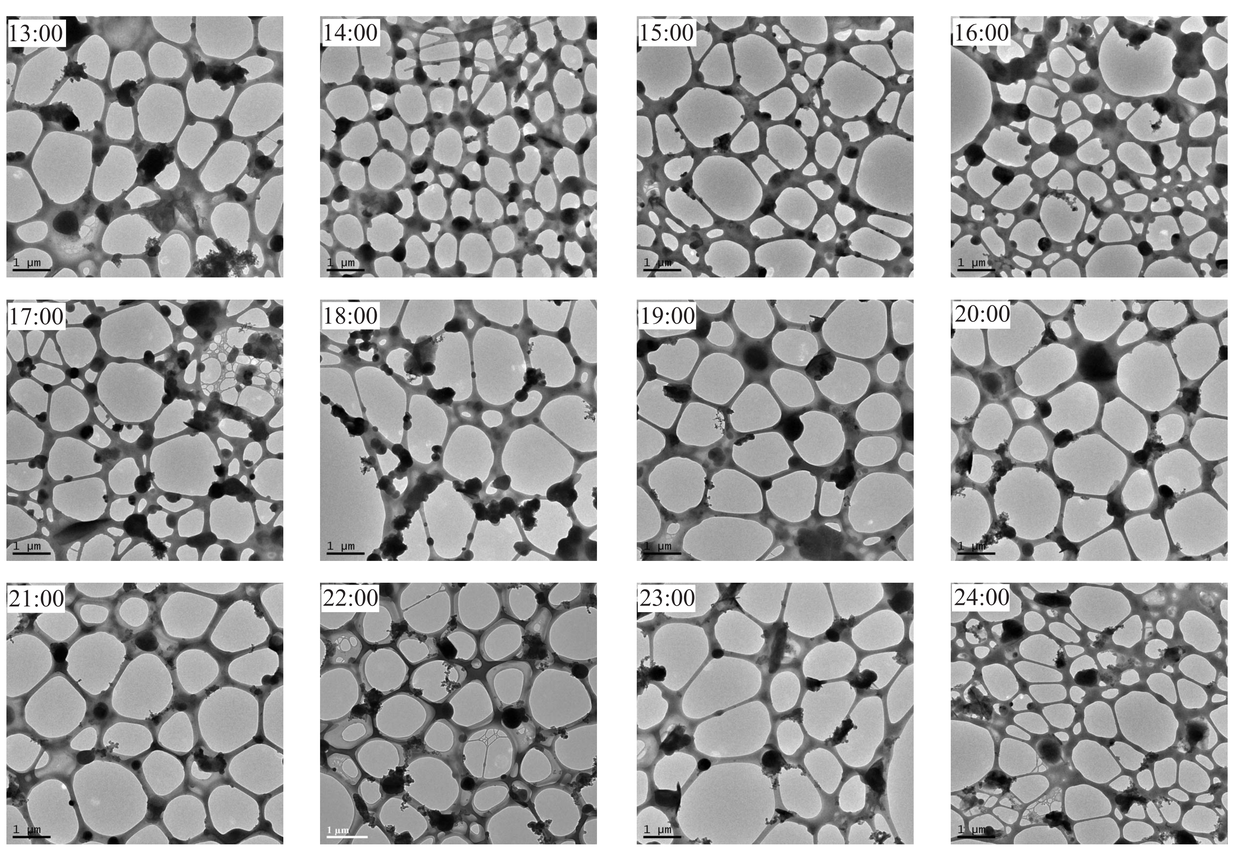


2. Diurnal changes of aerosol particles on May 22

0:00-6:00 Soot particles are relatively abundant and large (~1μm geometric diameter).
7:00-11:00 Sulfate particles are abundant. Soot particles are relatively small (~300nm).
12:00-18:00 Mixed particles of organic aerosol and sulfate dominate and embed soot.
19:00-24:00 Sulfate, soot, and sea salt are aggregated within particles.

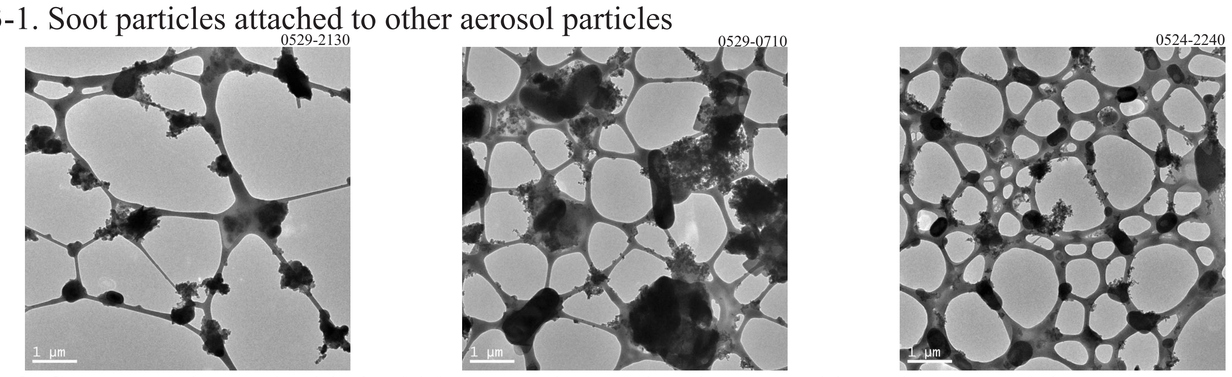
The substrates for these and the other TEM images consist of lacey carbon filaments, which resemble a spider web.



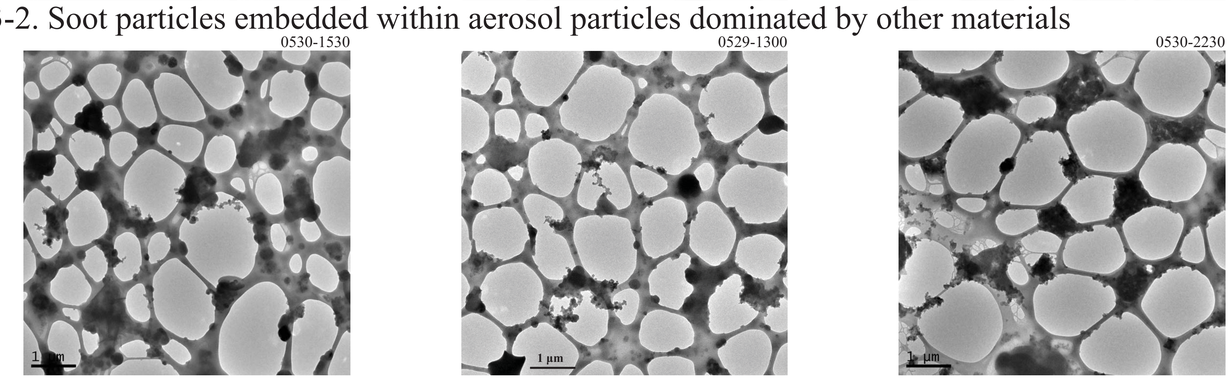


3. Examples of mixing states and shapes of soot particles

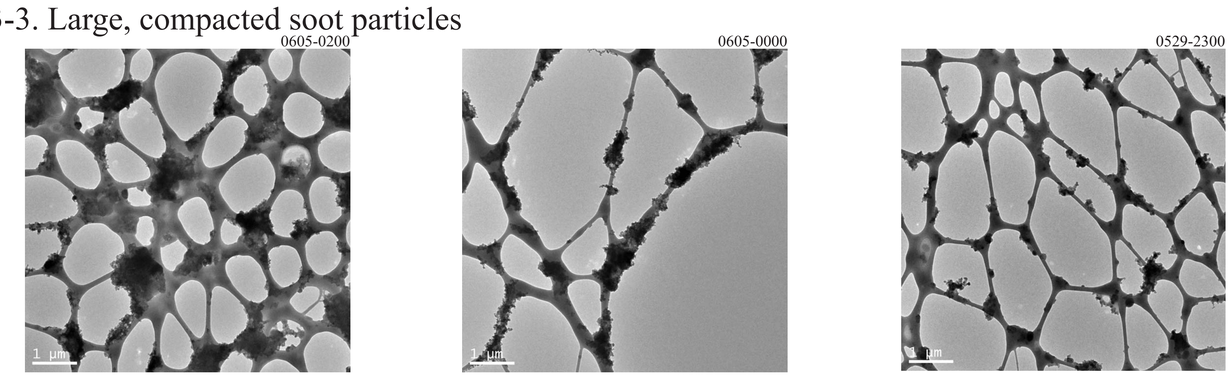
3-1. Soot particles attached to other aerosol particles



3-2. Soot particles embedded within aerosol particles dominated by other materials



3-3. Large, compacted soot particles

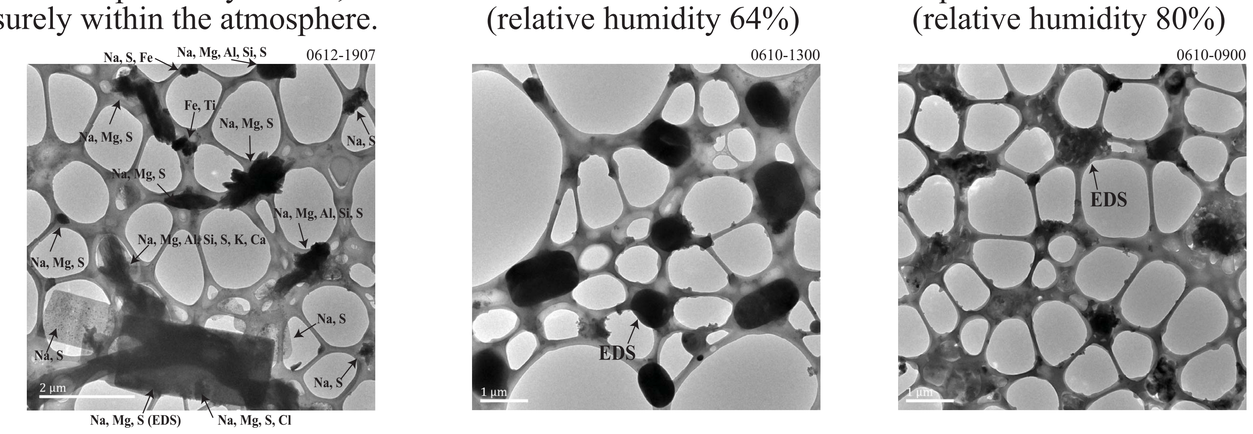


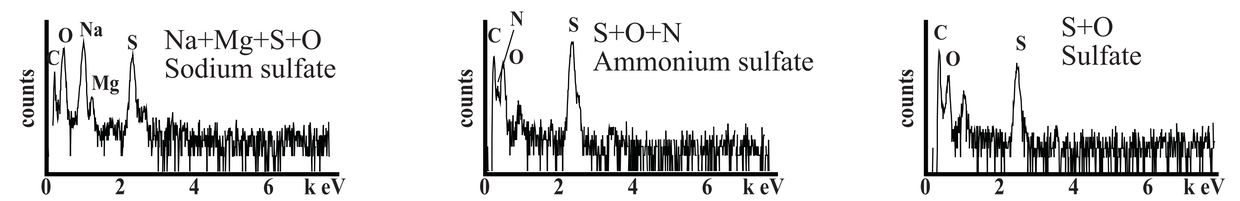
4. Sea salt and sulfate particles

Various sea salt particles. Most Cl was replaced by sulfate, almost surely within the atmosphere.

Sulfate was presumably solid when collected (relative humidity 64%)

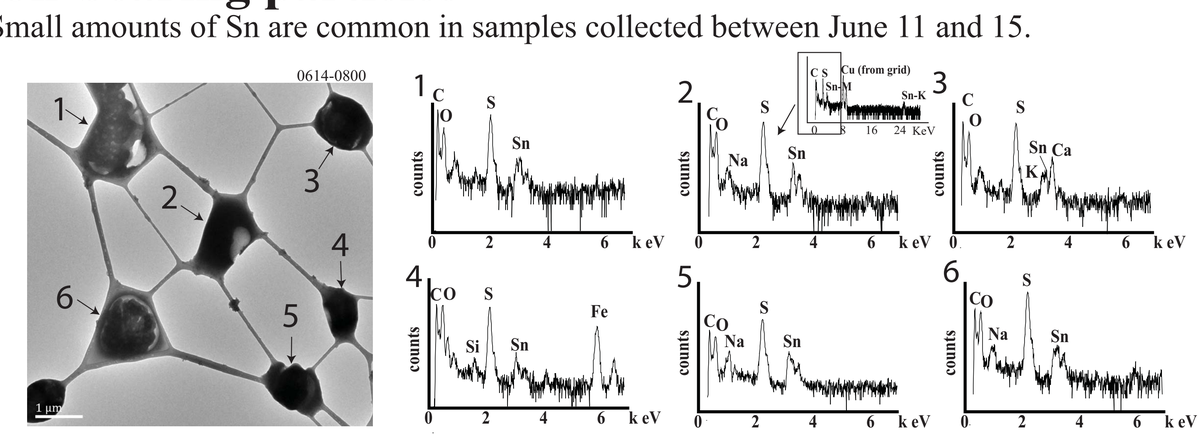
Sulfate was presumably liquid when collected (relative humidity 80%)





5. Sn-bearing particles

Small amounts of Sn are common in samples collected between June 11 and 15.



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