1BA.7
Studies on the Relation of Ice Nuclei from Sea Spray to Ocean Biological Cycles. PAUL DEMOTT, Kimberly Prather, Thomas C. Hill, Taehyoung Lee, Chung Hwang, Yukata Tobo, Douglas Collins, Matthew Ruppel, Jessica Axson, Christopher Lee, Camille Sultana, Bruce Moffett, *Colorado State University*

Far less is known about the emission of ice nucleating aerosols from the oceans than from land, yet the potential influence of marine aerosols on supercooled cloud properties and radiative transfer are great over vast remote oceanic regions. We recently reported on number concentrations of ice nuclei (IN) from laboratory-produced and ambient sea spray aerosols. Here we document new experiments to study variations in the IN activity of sea spray aerosols occurring as the result of marine biological processes that affect the chemical complexity and biological content of aerosols, and on further studies of the relation between IN concentrations and the diversity of biological particles found during marine boundary layer sampling.

Phytoplankton bloom conditions were reproduced in laboratory studies, and nurtured through successional stages dominated by bacteria and then viruses, to examine the impact on aerosols formed by realistic sea spray generation. IN concentrations active in the condensation/immersion freezing regime were measured in real-time below -25C, and filter collections were processed offline to quantify immersion freezing IN concentrations to as warm as -5C. IN increased up to 50 times in accord with chlorophyll-a concentrations during blooms. Aerosol compositions measured simultaneously by single particle aerosol mass spectrometry and IN compositions measured by scanning electron microscopy are under analyses.

Offline analyses of aerosols collected during the July 2012 Korea Polar Research Institute's research vessel cruise over the Pacific basin from approximately 40N to 65N latitude indicate markedly varied IN number concentrations and contributions of labile (presumably biological) IN ranging from 0 to 85%. Initial pyrosequencing results suggest variably diverse communities of aerosol prokaryotes present during the cruise, with terrestrial influence in most cases. These data will be compared to meteorological, aerosol mass spectrometer, and IN data to discern a picture regarding the role of biological aerosols in the marine boundary layer.

1IA.1
Ultrafine Particles Emitted from Scented Markers. Cha-Chen Fung, Shi Shu, YIFANG ZHU, *UCLA*

Recent studies found an increase in ultrafine particles (UFPs diameter < 100 nm) concentration inside classrooms during art activities. Art products (e.g. scented markers) containing ozone reactive terpenes are possible sources. Experiments using scented markers were conducted inside a stainless steel chamber with air sample ports and fans to control air exchange rate and mixing. Ozone was supplied to the chamber from a UV lamp ozone generator. A scented marker was used to color an area of 24 cm by 18 cm on a sheet of A4 paper inside the chamber via a glove port while UFP number concentration, size distribution, and ozone concentrations were measured. Twelve different scents from three brands of markers were tested and only the lemon scent from one brand produced UFPs. Calculated emission rates ranged from $2.4\times10^6 – 5.7\times10^7$ particles/second. Particle size measurements revealed unimodal distributions in the range of 20 – 30 nm. Experiments at decreasing ozone concentrations showed a critical point (50 ppb), below which no UFPs were detected above background. Model simulation revealed that drawing with the lemon-scented marker emitted ozone-reactive VOCs, most likely limonene, in the order of 10 - 100 microgram, which yielded in the same order of magnitude of secondary organic aerosols (SOA). These findings suggest that not all scented markers contain reactive terpenes, and substituting products can reduce children's exposure to UFPs.

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