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**Cruise Report: Trace gases in seawater/air and atmospheric aerosol composition**

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Objectives:

Our primary goal was to quantify the levels and air/sea fluxes of gases and particles that may be involved in new particle formation and growth to cloud condensation nuclei (CCN) in the remote ocean. A secondary goal was to quantify the direct flux of dimethylsulfide (DMS) from the ocean to the atmosphere.

To achieve the goals above we quantified DMS levels in the atmosphere and ocean. Atmospheric measurements were made continuously at high frequency throughout the cruise. High frequency concentration data coupled with three-dimensional winds facilitates the calculation of vertical fluxes by eddy covariance. Seawater DMS and acetone levels were also measured continuously during the cruise. These data will be used to estimate the air/sea concentration gradient (∆C) and air-sea fluxes using Flux = *k*∆C. We will also work with data collected by other NAAMES participants to assess the biological controls on seawater DMS and acetone.

Seawater and atmospheric DMS/acetone measurements were made using Atmospheric Pressure-Chemical Ionization Mass Spectrometry (API-CIMS). Atmospheric measurements were made at 10 Hz and will be coupled with measurements of 3-dimensional wind speeds (corrected for ship's motion) to make direct air/sea flux estimates. Seawater was equilibrated with clean air and analyzed by API-CIMS for DMS and acetone.

2,000 aerosol samples were collected for composition analysis at a later date. Aerosol samples were collected continuously from ambient air as well as during PMEL SeaSweep deployment periods.

Aerosol was collected in ultrapure water using a particle into liquid sampler (PILS). The composition of organic compounds that are released into the atmosphere as primary aerosol via bubble bursting will be analyzed at UCI using ion chromatography with electrospray mass spectrometric detection.

Table 1: Summary of measurements made during the AT34 cruise

|  |  |  |  |
| --- | --- | --- | --- |
| *Instrument* | *Parameter* | *Mode* | *No. of samples* |
| API-CIMS (mesoCIMS) | Atmospheric DMS conc. and flux | Continuous | n/a |
| API-CIMS (miniCIMS) | Seawater DMS and acetone | Continuous | n/a |
| Particle In Liquid Sampler (PILS) | Aerosol | Continuous collection into discrete vials | Ambient air (~1,300 vials)  Sea Sweep (~700 vials) |

All instruments were run continuously unless problems required them to be serviced. Atmospheric data will only be analyzed during periods when the relative winds came over the bow (± 90°). Internal isotope standards (deuterated (d3) DMS and carbon-13 labeled acetone) were used with all mass spectrometers to characterize instrument drift and changes in the atmospheric inlet and/or seawater equilibrator.

In the next 3-6 months, efforts will primarily be focused on finalizing and quality controlling the data.