SOLAS Open Science Conference 2012

CMOS Student Poster Awards at the SOLAS Open Science Conference

In a new collaboration between two organizations with a natural affinity, the Canadian Meteorological and Oceanographic Society (CMOS) sponsored the student poster prizes at the Surface Ocean-Lower Atmosphere Study (SOLAS) Open Science Conference held in Washington State in early May.

Thanks to a donation from CMOS, Prof. Roberta Hamme (UVic) awarded prizes of US$100 to each of five students whose poster presentations demonstrated outstanding originality, scientific quality and clarity. The SOLAS community thanks CMOS for their support, encouragement, and recognition of these exemplars of the best of future ocean-atmosphere scientists.

These posters can be viewed at http://www.solas-int.org/news/conferencemeetings/OSC2012/posters.html

The local entertainment
Photo: Stefan Kontradowitz

Winner Matthieu Bressac

Impact of Saharan dust deposition on dissolved-colloidal-particulate nutrient distribution in seawater

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In this study, we explored the role of dust deposition on the aggregation process in the surface ocean and its impact on the fate of new atmospheric nutrients. Three experiments were conducted in abiotic conditions at different seasons (bloom, stratified and mixing periods characterised by contrasting dissolved organic matter (DOM) content) by artificially seeding a 300-litre, 0.2µm-filtered seawater tank (clean sampled). Changes in Fe and P concentrations following the seeding were measured for six days.

Results suggest that interactions between lithogenic particles and DOM partially control the evolution of the physical speciation of nutrients. Indeed, the seeding led to a huge input of new dissolved Fe and P with very fast dissolution kinetics. Thereafter, high DOM content promoted the formation of mineral-organic aggregates which, in turn, induced a negative feedback on dissolved nutrient concentrations through scavenging on the particulate phase. This study illustrates the importance of the DOM and associated abiotic processes for the fate of new atmospheric nutrients in seawater.

Winner Kristina Brown

Observations of air-ice-ocean-CO2 cycling during spring melt in Resolute Passage, Nunavut (Arctic-ICE 2010)

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Increasing porosity in spring sea-ice can result in the release of trapped brine and gases to underlying surface waters. This, in combination with ice-melt derived surface freshening, can influence CO_2 transfer between the atmosphere and the ocean, potentially enhancing CO_2 export below the mixed layer as seasonal sea ice recedes. Here we present a five-week time series of discrete carbonate system (DIC, Alk, pCO_2) and isotopic tracer (del^{13}C-DIC and del^{18}O-H_2O) measurements from sea ice, sack hole brine, and the underlying water column during the 2010 winter-spring transition in Resolute Passage, Nunavut. We observed significant changes in bulk sea-ice and sack-hole brine carbonate system parameters associated with increasing sea ice temperatures and high bottom ice chlorophyll a, despite little change in the water column over the same period. Stable isotope composition of sack hole brine samples illustrated carbon-13 enrichment as temperatures increased, possibly indicating the re-dissolution of $CaCO_3$ in the warming, freshening fast ice.

Winner Joëlle Buxmann

"Chlorine explosion" - an autocatalytic release from sea-salt aerosols

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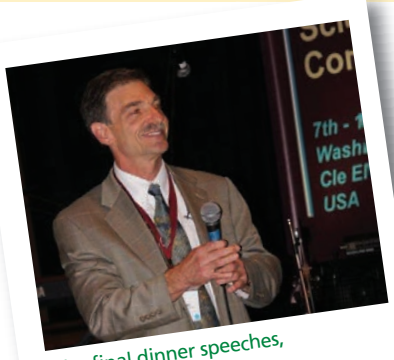
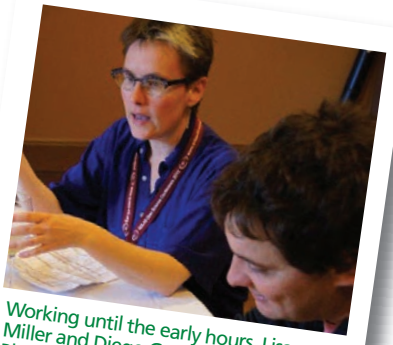
Sea salt aerosol is an important source for Reactive-Halogen-Species (RHS), which affect O_3 and the chemical balance of NO_x(=NO_2 +NO); in particular, the abundance and role of chlorine in the marine boundary layer is still unclear.

We present the first direct and simultaneous detection of ClO and OClO radicals from the "chlorine explosion" and BrO by Differential-Optical-Absorption-Spectroscopy in smog chamber experiments with sea salt aerosol (with and without NO_x,600ppb CH_4).

In the absence of NO_x, the BrO mixing ratio rises up to 430±35ppt and OClO is close to the detection limit of 100ppt. At high NO_x levels, formation of BrO is delayed, while >3ppb ClO and 7ppb OClO are observed. Formation of OClO, $ClNO_2$, and $ClONO_2$ and acidification of the aerosol by HNO_3 or HONO play key roles. The chlorine mechanism might become important in highly polluted marine areas, where high NO_2 and O_3 levels are present.



The final dinner speeches, Eric Saltzman
Photo: Stefan Kontradowitz



Working until the early hours, Lisa Miller and Diego Gaiero
Photo: Stefan Kontradowitz

The conference organisers, Georgia Bayliss-Brown, Stefan Kontradowitz' Roberto Benavides and Kath Mortimer
Photo: Stefan Kontradowitz

Winner Marcela Ewert

Transport of marine microbes and polysaccharides from first-year sea ice into snow and implications for marine-atmospheric exchange

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In high latitude oceans, exchanges between the surface ocean and the lower atmosphere are mediated by sea ice. During freeze up and consolidation, sea ice rejects, to its surface, brines containing high concentrations of salts, bacteria and extracellular polysaccharide substances (EPS) which become available for incorporation in the snow. In this study, we present evidence of the incorporation of sea-ice bacteria and EPS in the snow, based on vertical profiles of temperature, salinity, bacterial abundance and EPS through Arctic snow and first-year sea ice. Samples, collected in two consecutive winters near Barrow, Alaska, indicate a strong influence of snow depth, wind and temperature regimes in bacterial transport and persistence in the snow.

Winner Tianran Zhang

Impacts of Sources and Atmospheric Processing on Fe Solubility in Aerosols over the Yellow Sea, China

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TSP samples collected over the Yellow Sea, China, were divided into north continent source (NCS) and non-NCS samples by air mass back trajectory; in which iron solubility values were 5.6±3.9% and 3.1±5.3%, respectively. In the NCS samples, two sub-regimes were identified by chemical composition difference using the ratio of SMg/SFe. Cloud processing associated with or without biomass burning was found to have a potential effect on solubility of Fe. No correlation between soluble Fe and secondary inorganic ions was observed in NCS samples. However, in non-NCS samples a good correlation between soluble Fe and secondary inorganic ions was observed likely due to acidification reactions. Enrichment factors indicate the existence of abundant anthropogenic Fe in non-NCS samples. Back trajectories and high enrichment factor of V further implied that part of the anthropogenic Fe could be from marine traffic emissions.