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25. Iron-plankton interactions (incl. trace element distributions)

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Distributions of dissolved and particulate trace metals

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{Trace.Met} METALS.XLS

{Nom.Depth, Diss.Met., Part.Met., Si, NO3, PO4} METALS.XLS

Seawater samples were taken with precleaned GoFlo samplers (12 L) mounted either on a 10 mm kevlar hydrowire (40 - 400 m), or on an all-Teflon coated CTD/Rosette frame (> 400 m). At each full degree, six samples were collected with kevlar wire at standard depths (40-60-100-150-200-400 m), corrected afterwards for wire angle, using an SIS pressure sensor at the deepest (400 m) sampler. Water deeper than 400 m was collected with the CTD/Rosette frame. Surface water samples (~10 m; unfiltered) were taken from a walking bridge extending 10 metres beyond the bow of the slowly upwind steaming ship, using a 2 l GoFlo sampler on a small winch with 6 mm kevlar wire. Upon recovery, the sampler was wrapped in plastic bags, transferred into a Class-100 clean air laboratory van, and drained into a precleaned storage bottle. Particulate matter was collected by filtering 30 to 60 l of seawater through 142 mm NUCLEPORE filters with a pore size of 0.2 µm. The seawater had been taken with a suite of 3-6 12L GoFlo samplers on the CTD/Rosette frame.

Immediately upon recovery, the large 12 L GoFlo samplers were attached to the outside of the clean air laboratory van. Teflon tubes were connected to lead the seawater into the clean laboratory. Pressure lines, with high purity nitrogen gas passing over fine particle arrestance filters, were attached to the top of the samplers, to allow for filtration by an overpressure of < 1 bar. Inside the clean laboratory, seawater was filtered over acid-cleaned NUCLEPORE or PORETICS membrane filters (47 mm, 0.4 µm), mounted in all-Teflon (PTFE) filter holders. In addition, seawater samples were taken without filtering. The filtered or unfiltered seawater was collected into 1 or 2 l hot-acid-cleaned PE bottles, acidified to pH 2 with quartz distilled HNO_3 and stored. ZHUANG et al. (1990) reported an increasing dissolution of Fe in marine aerosols with decreasing pH of seawater. Hence, for the unfiltered samples it is assumed that the approximately one year storage at pH 2 would allow dissolution of at least some, if not most biogenic fractions and surface oxyhydroxides coatings. Only the most refractory component of land-derived minerals (clays, sand, etc.) would still be excluded from the analysis.

At the ice stations, surface snow, ice and brine samples were collected using acid-cleaned plastic ware. The samples were placed in a laminar flow clean air bench for melting, then acidified, and transferred into PE bottles and stored.

In the clean laboratory onshore, the samples were pre-concentrated (167x) by an APDC/DDDC chloroform extraction in Teflon separatory funnels, according to BRULAND and FRANKS (1979). The back extraction step was omitted. The extract was evaporated to dryness and the residue dissolved in diluted HNO_3. The reagents used were cleaned by four-fold subboiling distillation in quartz stills. The final analyte was measured using a Perkin Elmer 5100 PC Graphite Furnace Atomic Absorption Spectrophotometer with Zeeman background correction.

In the home laboratory the trace metals Fe, Cd, Cu, Ni, Zn, (Co), (Pb), (Ag) have been analyzed. The first step is a twohundredfold preconcentration and purification by selective complexation with APDC/DDDC followed by solvent extraction into chloroform. The extract is then evaporated to dryness and the residue dissolved in dilute HNO_3. The final analyte was measured using a Perkin Elmer 5100PC Graphite Furnace Atomic Absorption Spectrophotometer (GFAAS) with Zeeman background correction.