

DISSOLVED TRACE METAL REFERENCE SAMPLES FOR THE GEOTRACES PROGRAM

Consensus Values for the SAFe and North Atlantic GEOTRACES Reference Samples have been updated and are reported here as of November 2011. During the SAFe (Sampling and Analysis of Fe) program and the North Atlantic and North Pacific GEOTRACES Intercalibration cruises, we (Geoffrey Smith and Ken Bruland) collected large volumes of homogenized surface and deep seawater to provide 0.5 L SAFe reference samples to researchers investigating the marine chemistry of trace metals in both the U.S. and international trace metal communities. Surface seawater was collected using the UCSC designed “GeoFish” towed sampling system, filtered as described below and then homogenized in two 500 L SAFe tanks. Water from 1000 m was collected with multiple four-bottle casts using our Teflon™ coated, 30 L, GO-Flo samplers deployed on Kevlar™ hydroline (Bruland et al. 1979), filtered and then homogenized in one of the SAFe tanks. Our GeoFish/SAFe tank system consists of PFA Teflon™ tubing, an all PFA Teflon™ diaphragm pump, sequential filtration through 0.45 µm then 0.2 µm pore size polycarbonate, track etched (PCTE) pleated filter cartridges and two 500 L fluorinated low density polyethylene tanks connected with all Teflon™ tubing, valves and fittings. All filtrations, acidifications and bottling of the SAFe samples were performed inside of Class-100 clean benches in a portable clean van. We successfully collected and continue to provide to an international trace metal community 650 SAFe S reference samples of surface water, 650 SAFe D1 reference samples of 1000 meter depth water, and 650 SAFe D2 reference samples of 1000 meter depth water. These samples have been stored in rigorously acid cleaned LDPE bottles for over four years and have proven stable for dissolved Fe and other trace metals. These SAFe reference samples are now proving to be valuable for a suite of GEOTRACES key and non-key trace metals.

A variety of GEOTRACES reference samples are also available. We used the SAFe tank system on the North Atlantic GEOTRACES Intercalibration cruise to collect an additional set of North Atlantic GEOTRACES reference samples from the surface and from a depth of 2000 meters. The surface reference sample (GS) was collected with the GeoFish sampling system in the same manner as for SAFe S samples, while the 2000 m deep reference sample (GD) was collected with 5 separate casts of the GEOTRACES rosette to rinse and fill a tank. During the Pacific GEOTRACES Intercalibration cruise, we used the GeoFish/SAFe tank system to collect additional Pacific surface water from the SAFe site to be used as GEOTRACES

surface Pacific (GSP) reference samples (~300 0.5 L bottles). Additionally, we collected a surface tank from the highly productive surface waters of the Santa Barbara Basin coastal site on the Pacific Intercalibration cruise and aliquoted ~600 0.5 L samples of this water as a SAFe/GEOTRACES coastal surface reference sample, “SGC”. To obtain any of these reference samples, contact Geoffrey Smith (geosmit@ucsc.edu). There is no cost for the reference samples, but a Fed Ex, UPS or DHL account number must be provided to cover shipping costs). Results of trace metal concentrations from analyses of all these reference samples and the baseline profiles are being reported to Ken Bruland (bruland@ucsc.edu).

Thus, a range of GEOTRACES reference samples are available with different concentrations and chemistries representative of what one encounters in the real ocean. Current “consensus values” (as of November 2011) of the SAFe reference samples (SAFe S, D2 and D1) and the North Atlantic GEOTRACES reference samples (GS and GD) are now available and reported on the GEOTRACES website. The North Pacific GEOTRACES reference samples, however, are still being treated as "unknown or blind" samples until more data is gathered. Once a researcher reports their data, Bruland then shares what other data he has gathered for the metal of interest on the relevant reference samples with that investigator and they try to further investigate any problems that may exist. This stage is a confidential process and is an important component of the intercalibration exercises and part of the international “learning curve” to help raise the level of expertise of the international trace metal community.