

GEOTRACES REFERENCE SAMPLES

Consensus Values for the SAFe Reference Samples – as of August 10th, 2009

During the SAFe (Sampling and Analysis of Fe) program, we collected large volumes of homogenized surface and 1000 meter depth seawater to provide 0.5 L SAFe reference samples to researchers investigating the marine chemistry of iron in both the U.S. and international trace metal communities. Surface seawater was collected from ~5 meters depth using the UCSC designed “GeoFish” towed sampling system, filtered as described below and then homogenized in the 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 with dissolved Fe close to 0.094 nM, 650 SAFe D1 reference samples of 1000 meter depth water with dissolved Fe concentrations ~ 0.65 nM, and 650 SAFe D2 reference samples of 1000 meter depth water with dissolved Fe close to 0.92 nM. 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 variety of GEOTRACES key and non-key trace metals. The [GEOTRACES Web site](#) and Bruland’s laboratory website (<http://es.ucsc.edu/~kbruland/>) provide current consensus values for the concentrations of a suite of dissolved trace metals for the SAFe reference samples. The consensus values are also compared with historical data sets in the general area. We have included results that have been reported to Bruland (bruland@ucsc.edu) as of August 10th, 2009. It is our hope that posting this data will provide an incentive for more scientists to both analyze these SAFe reference samples and report their data to Ken Bruland to allow for updated consensus values to emerge.

A variety of GEOTRACES reference samples are also available. Bruland and Smith used the SAFe tank system on the Atlantic GEOTRACES Intercalibration cruise to collect an additional set of 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 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, Bruland and Smith 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, Bruland and Smith 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. As previously mentioned, results and "consensus values" of the SAFE reference samples are now available and reported on the GEOTRACES website and on Bruland's web site (<http://es.ucsc.edu/~kbruland/>).

The 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.