Annual Report on GEOTRACES Activities in the U.S.

Principal activities of the U.S. GEOTRACES program include:

1. Implementation of a North Atlantic zonal section,
2. Preparation for a Pacific section between Peru and Tahiti, and
3. Long-range planning for work in the Arctic Ocean

Cruises

North Atlantic: The RV Knorr (KN199-4) sailed from Lisbon Portugal on 15 October 2010 to carry out the first U.S. GEOTRACES section cruise. The planned cruise track (Figure 1) headed south to the Mauritanian upwelling system, and then west-northwest towards Woods Hole. The cruise was terminated prematurely on 4 November due to mechanical problems with the ship. Science personnel disembarked in the Cape Verde Islands to return to their home institutions. One third of the total number of planned stations was completed successfully before the cruise was terminated.

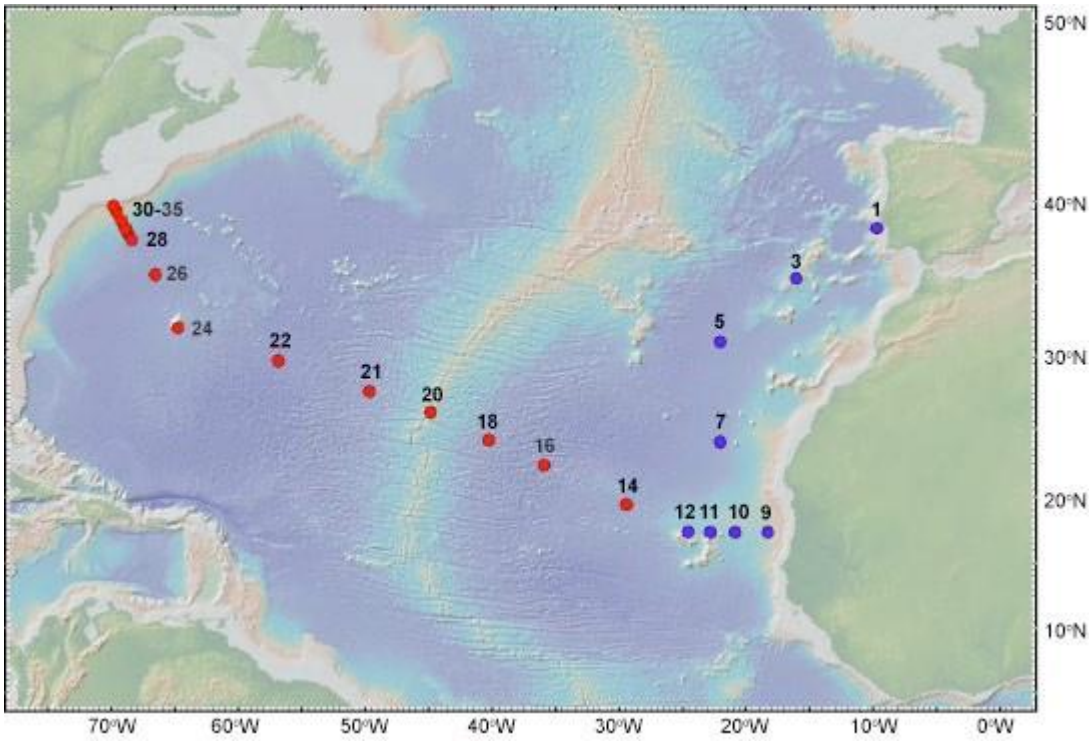

Figure 1. Locations of full depth stations planned for the U.S. North Atlantic zonal section (GA03). Shallow stations to 1000 m are not shown. Sampling was completed at stations in blue. Ship time has been scheduled to complete the remaining stations in November-December 2011. Map courtesy of K. Pahnke.

Scientific objectives of the cruise included:

1. Characterize the trace element and isotope (TEI) distribution in Mediterranean Outflow waters,
2. Provide a measure of interannual variability in the upper water column by reoccupying a portion of the CLIVAR A16 section (20°W) that had been sampled previously for selected TEIs,
3. Define the distributions of micronutrients in the highly productive eastern boundary current upwelling system,
4. Quantify sources of TEIs from Saharan aerosols,
5. Identify TEI sources and sinks associated with the oxygen minimum zone,

6. Compare and contrast TEI distributions in the well ventilated western basin vs. the less well ventilated eastern basin of the North Atlantic,
7. Compare and contrast TEI distributions, sources and sinks on the western (wide continental shelves) and eastern (narrow continental shelves) margins, and
8. Evaluate fluxes of TEIs carried by western boundary currents.

Following the unfortunate termination of the cruise the U.S. NSF authorized ship time in late 2011 to complete the section, as well as funds to cover the added cost of demobilization of the terminated cruise and remobilization for the completion of the section. The U.S. GEOTRACES SSC coordinated the planning and re-budgeting for the completion of the section.

Eastern Tropical Pacific: The second major section planned by U.S. GEOTRACES is a zonal section in the eastern tropical Pacific roughly between Peru and Tahiti (Figure 2).

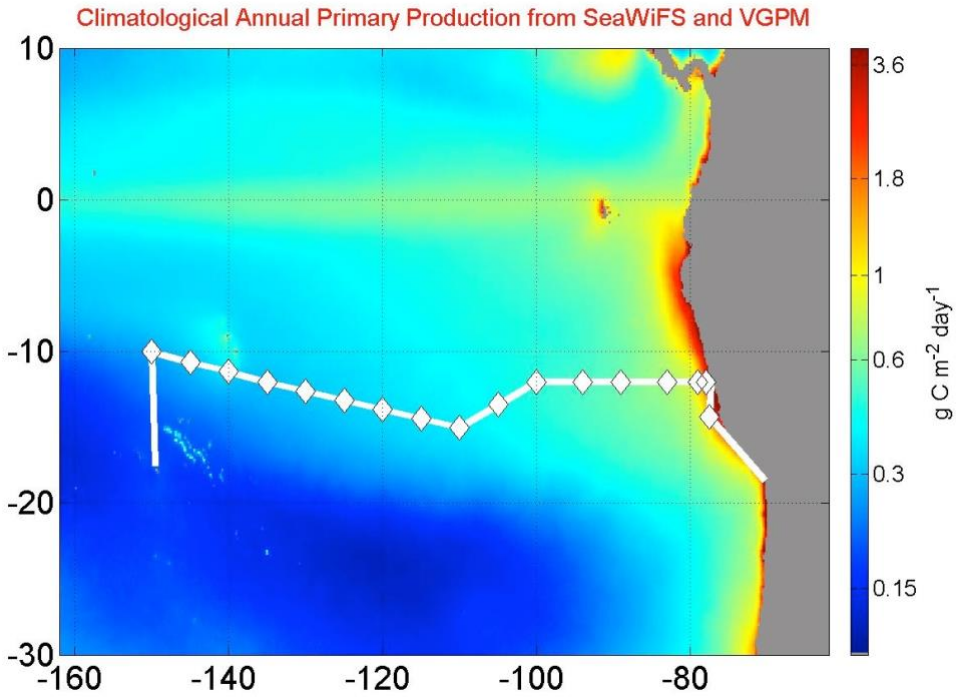

Figure 2. Tentative locations of full depth stations planned for the U.S. eastern tropical south Pacific zonal section. Shallow stations to 1000 m are not shown. The cruise is planned for late 2013. Map and productivity calculations courtesy of M-E Carr.

The principal scientific objectives of this section are:

1. Characterize the distributions of micronutrients in the highly productive eastern boundary current upwelling system,
2. Compare and contrast TEI distributions between the biologically productive eastern end of the section and the oligotrophic western portion of the section,
3. Quantify sources and sinks of TEIs associated with hydrothermal systems of the East Pacific Rise,
4. Quantify TEI sources and sinks associated with the oxygen minimum zone.

Implementation of the Pacific cruise has been delayed by approximately one year by the disruption and delay in completion of the North Atlantic section. Target dates for the Pacific section are now late 2013.

New funding

Two proposals were submitted to the U.S. NSF in February 2011: 1) a management proposal for the Pacific section described above, which will secure ship time and support the cost of operating the clean sampling system and other cruise logistics, and 2) a proposal for three years of continuing support of the US GEOTRACES project office. A formal decision on funding of these proposals is anticipated soon.

New results

Preliminary results from the North Atlantic cruise were presented and discussed at a workshop in March (see below). Investigators are making good progress in analyzing samples and interpreting results, but none of the preliminary results are in yet in a state to present here.

Meetings

U.S. GEOTRACES sponsored two large workshops during the past year.

An Arctic planning workshop held at the U.S. NSF (29 September - 1 October, 2010) was attended by approximately 40 US investigators as well as by several key international partners. The workshop defined the rationale for a US GEOTRACES Arctic research program and identified options for international collaboration to secure access to this remote and logistically challenging region. A report from the workshop is posted on the U.S. GEOTRACES website:
<https://usgeotraces.ldeo.columbia.edu/sites/default/files/content/GN01/Arctic_Workshop_2010/ArcticWorkshop_Report_NSF_DC_2010.pdf>.

A follow-up meeting was held at NSF on 1 June that included David Kadko (Chair US GEOTRACES Arctic planning committee), Bob Anderson (Chair US GEOTRACES SSC), Don Rice (representing NSF Ocean Sciences) and Bill Wiseman and Hedy Edmonds (representing NSF Polar Programs). The principal outcome of this meeting was the decision that Kadko and Anderson will approach the U.S. GEOTRACES SSC with a proposal to defer the third planned U.S. GEOTRACES section (Alaska to Tahiti) and insert an Arctic GEOTRACES expedition into the decadal timeline of U.S. GEOTRACES activities. This proposal will be reviewed when the SSC meets on 15 September 2011.

A second workshop was held 7-9 March 2011 (Old Dominion University) to plan the logistics for completion of the U.S. GEOTRACES North Atlantic section. Logistics were particularly complicated because the vessel assigned to complete the section was changed twice before a firm plan was in place. Lessons learned during the first North Atlantic cruise were used to generate a revised station plan and cruise schedule for the remainder of the section. These lessons produced both changes to station schedules to allow for more efficient operation of the sampling systems and changes to the sampling plan to allow certain features in the water column at intermediate depths to be sampled with greater resolution.

This workshop also provided a venue for scientists to see preliminary results from their colleagues and discuss implications for interpretation of the overall data set.

Publications (GEOTRACES and GEOTRACES-related*)

*Crusius, J., Schroth, A.W., Gasso, S., Moy, C.M., Levy, R.C. and Gatica, M., 2011. Glacial flour dust storms in the Gulf of Alaska: Hydrologic and meteorological controls and their importance as a source of bioavailable iron. Geophysical Research Letters, 38: L06602 doi:10.1029/2010GL046573.

John, S.G. and Adkins, J.F., 2010. Analysis of dissolved iron isotopes in seawater. Marine Chemistry, 119(1-4): 65-76.

Website

The website hosted by the U.S. GEOTRACES project office at the Lamont-Doherty Earth Observatory has been revised. Information about international GEOTRACES activities has been removed, and transferred to the web site hosted by the IPO <www.geotraces.org>. The US GEOTRACES website <www.usgeotraces.org> now presents information about U.S. GEOTRACES activities as well as links to the websites managed by the IPO and the DMO.

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