

Meeting Summary
Submarine Arctic Science Program (SCICEX)
Science Advisory Committee (SAC) Meeting
April 24, 2008
Arlington, VA

Attendees

SAC members attending:

Jackie Richter-Menge (Chair) – Cold Regions Research and Engineering Laboratory

Tim Boyd – Scottish Association of Marine Science

Ray Sambrotto – Lamont-Doherty Earth Observatory

Terry Tucker – Terry Tucker Research

Mark Wensnahan – Polar Science Center, University of Washington

Jeff Gossett – Arctic Submarine Laboratory

CAPT Paul Stewart – Office of Naval Research

CAPT Doug Marble – Office of Naval Research

Simon Stephenson – National Science Foundation

SAC members not attending:

Margo Edwards – University of Hawaii

Bill Smethie – Lamont-Doherty Earth Observatory

Interagency Committee (IAC) members attending:

John Farrell – US Arctic Research Commission

CAPT Paul Stewart, CAPT Doug Marble, Simon Stephenson, and Jeff Gossett are also members of the SAC

Also attending were George Newton, Advisor to the US Arctic Research Commission and Kathy Farrow, US Arctic Research Commission

Introduction

CAPT Paul Stewart opened the meeting by welcoming the attendees. CAPT Stewart announced that he will be leaving ONR on 3 July to take command of the Naval Research Laboratory. He introduced CAPT Doug Marble who will take over his position at ONR and will be his replacement on the SAC and IAC. Doug and Paul have discussed the recent proposals submitted by SAC members (see below). They have also been discussing SCICEX with other ONR personnel, and appear to have support. Paul mentioned that the goal is to carve out a fixed amount of funding to help support SCICEX, sharing funding responsibilities with NSF. Doug mentioned that the Navy's primary interest in climate change at present regards sea level rise. Some interest in the Arctic is being shown by the Navy, however.

Chair Jackie Richter-Menge reiterated that the primary purpose of this meeting is to make major progress on the science plan for SCICEX accommodation cruises.

Simon Stephenson noted that he expects proposals focusing on SCICEX data to be submitted to NSF once the science plan is published. Simon indicated that a cost/benefit estimate should be included as part of the SCICEX science plan, to help prioritize activities related to accommodation cruises. He expects that Martin Jeffries, Program Director for the Arctic Observing Network would replace him at future SCICEX SAC meetings when the proposals begin to be submitted.

John Farrell explained that the role of the USARC is to support this effort. He noted that more interest in the Arctic is being shown by the DoD and other agencies.

Accommodation Cruise Opportunities and Constraints

Jeff Gossett reviewed cruise opportunities as presented at the Dec 07 SAC meeting (ASL 24 Apr 08.ppt). He noted that he had received confirmation of a Navy ice camp in the Beaufort Sea in the spring of 2009. He acknowledged that there is some possibility of SCICEX accommodation on cruises traveling to and from ice camps. He anticipates ice camps every two years, normally in the odd years (2009, 2011...).

Jeff explained that ASL's current focus in Arctic operations is on transits, submarines traveling from the Atlantic to Pacific (or vice versa) to save time vice transiting the Panama Canal. There are currently 1 to 3 of these transits per year and ASL is made aware of the cruises about a year in advance. Most SCICEX accommodation opportunities will be associated with these transits.

Jeff reviewed the types of submarines in the fleet and baseline instrumentation associated with each. These were spelled out in detail in the Dec 07 meeting and are included in the minutes of that meeting. The science will be focused on baseline data collection – single beam bathymetry, ice topsounder, and expendable sound velocity probes. The science will not be focused on individual experiments, therefore should be aimed at monitoring. XCTDs, if the failure rate can be significantly decreased can be taken along and utilized if they are provided to ASL. Other ASL instrumentation includes the submarine remote video system (SVRS) – a low light upward looking camera, the upward-looking side-scan sonar, and the hull-mounted CTD. Discrete water samples could also be collected and prepared for storage for the later analysis of chemistry, tracers and biology.

If additional scientific instrumentation on the submarine is desired, an installation package must be developed in conjunction with ASL and the submarine force. Development would require at least 9 months and cost \$75K to \$100K. Annual installation costs are about \$15k/year/instrument.

A discussion of the accuracy of the navigation ensued. Jeff explained that the Ship's Inertial Navigation System (SINS) is the only navigation available for the submerged submarine. The accuracy of SINS is affected by maneuvering and by gravity anomalies. Bathymetry, in particular, requires very accurate navigation and there has been some problem from past SCICEX cruises resulting in data offsets due to inaccurate navigation. Unfortunately, the lawn mowing survey pattern increases the navigation error due to

much required maneuvering. SINS accuracy is greatly increased by surfacing and recalibrating with a GPS fix. However, surfacing to calibrate is a 4 to 6 hour evolution which would be time lost to science data collection.

Development the Science Matrix

The committee then began work on filling in the matrix. Members had provided input on when and where data would be desired. The following is a rough outline of the priorities.

Bathymetry ([bathy.sum.SAC.04.24.08.ppt](#)):

1. Continuous collection wherever the submarine traverses in the SCICEX box.
2. Begin a closely spaced (9nm spacing) survey of the Alpha ridge (230 nm legs).

Ice ([SCICEX ice draft priorities.v3.ppt](#)):

1. North Pole (50 km on Atlantic and Pacific sides) since this is historically the most sampled area.
2. Across the basin on transit or transect along canonical SCICEX line or the historical 150° W line with 50 km sample sections distributed evenly as densely as time permits
3. Perpendicular line running from Canadian to Eurasian side of the box
4. Along Canadian margin

Ocean ([tboydXCTDsampleScenario2.ppt](#)):

1. ICECAT data collected continuously at depths other than in halocline on transit
2. As many XCTDs as possible at 40 to 60 km spacing on transit or either cross-basin transect
3. XCTDs in Makarov basin
4. XCTDs along perpendicular across box and along Canadian Margin

Chemistry ([Sambrotto chem.ppt](#)):

1. Nutrient samples and minimum treatment samples on a 2 or 3 depth stairstep during transit
2. Maximum sampling available in Amundsen and Makarov Basins
3. Late summer sampling across the western arctic ice edge around 160° E.
4. Cross-track, Canadian margin, East Siberian margin and ice edge sampling

The preliminary matrix spreadsheet ([Matrix.xls](#)) and proposed tracklines ([Track ideas.ppt](#)) show the data collection priorities as a function of science discipline, time available and geographic location. Currently, the plan extends from no time available on a transit to 3 days available on a transect. Jeff was instrumental in helping develop the matrix and track lines with his detailed knowledge of submarine operations and skill using Excel and PowerPoint. Jeff noted that our matrix likely covers the limited cruise time (up to 3 days) that is likely to be available for SCICEX accommodation opportunities for the next several years. Once the matrix is in place (i.e. reviewed and accepted by community-at-large), the SCICEX SAC will consider extending the maximum time frame of availability to 7 days.

It was decided the draft science plan should be ready for public input in September. A one month long window for review and comment is anticipated. The science plan will be discussed at a public meeting to be held in conjunction with the AGU meeting in San Francisco in December.

ACTION: Each SCICEX SAC member to review matrix spreadsheet and provide more detailed commentary on the rationale for the recommendations. This information will be included in the draft SCICEX Science Plan.

ACTION: SCICEX SAC to complete draft science plan by 1 Sept.

ACTION: Richter-Menge and Farrell to coordinate meeting room for SCICEX meeting, to be held in conjunction with 2008 Fall AGU.

Other Equipment Testing

Mark had brought up in his description of ice profiling priorities that equipment testing will be essential and comparison between new topsounder systems coming on line and older systems was necessary. In addition, the question needs to be resolved of whether ice profile data collected from a submarine running fast and deep is usable and what the error bars may be. The committee suggested that at least for the latter issue, perhaps testing could be carried out at an ice camp with a series of short tracks (a rosette) run slow and shallow then fast and deep allowing a comparison of the same profile data.

ACTION: Wensnahan, Tucker and Gossett to develop a plan for comparing topsounder systems for possible support and implementation in during the 2009 ice camp.

SAC Proposals

Several members of the SAC have submitted proposals to ONR based on needs identified in previous committee discussions. These proposals were discussed by the SAC and IAC

1. Tim Boyd has proposed to purchase and test XCTDs. The newer, digital submarine launched probes have a significantly higher failure rate than previous analog probes. Sippican has modified the launch procedure in an effort to improve reliability. Tim proposes to purchase and provide probes to ASL for submarine testing and follow up by processing the data.

ACTION: Boyd, with input from ASL, to submit revised proposal to SCICEX IAC, to include the procurement of 16 XCTDs.

2. Ray Sambrotto along with Dale Chayes of LDEO submitted a proposal to establish a web site for the use of the SCICEX SAC as well as be a front end for the science community to access SCICEX related activities and to interact with the SAC.

3. At the committee's request, Florence Fetter at NSIDC submitted a proposal to provide a data archive for new and historic SCICEX data. Discussion followed which resulted in suggestions for modifications to Florence' proposal.

ACTION: Richter-Menge to work with Fetterer in the revision and resubmission of NSIDC data archive proposal, to include 3-year window of funding.

Agency Support

The issue of financial support for data collection was discussed. For instance, XCTDs will need to be purchased, ice profile data needs extensive processing and chemistry samples require processing prior to archiving the data at NSIDC. Simon advised that proposals will be required to be submitted and approved through standard procedures for NSF to fund these activities although when, where, and how much data will be collected are unknowns. He did note that other mechanisms do exist such as NSF transferring funds to ONR who could possibly fund a proposal in a more timely manner to address a short notice need.

Open Meeting

The meeting was opened to the public at 3:00 pm. Jon Berkson, US Coast Guard Headquarters attended. Jackie briefed Jon on the committee's recent work, particularly regarding the science plan. Jon then described recent Coast Guard interest in the Arctic. Operation Arctic Domain Awareness is to improve Coast Guard knowledge of the Arctic. With the recent large ice retreats, they anticipate increases in shipping, oil exploration and production and need to be prepared to respond to emergencies. They are currently carrying out C-130 reconnaissance missions along the northern Alaskan coast. It was recently announced that they could accommodate science of opportunity on the C-130 flights. Jon also noted that he is searching for any acoustic data of Coast Guard icebreakers that might be available.

Jackie ended the meeting at 4:30 pm