35 Minutes — October 16-18, 2001

U.S. JGOFS Scientific Steering Committee Meeting
Woods Hole Oceanographic Institution, Woods Hole, MA

Attendees

Scientific Steering Committee Members: M. Abbott (chairman), R. Anderson, W. Berelson, M.E. Carr, M. Follows, G. Jackson, C. Lee, M. Lewis, D. McGillicuddy, J. Sarmiento, R. Wanninkhof

Time-series programs: A. Knap, M. Lomas, BATS; J. Dore, D. Karl, HOT

U.S. JGOFS Planning office: M. Bowles, K. Buesseler, C. Chandler, D. Glover, G. Heimerdinger, D. Schneider, M. Zawoysky

JGOFS International Project Office: R. Hanson

National Science Foundation: P. Taylor, J. Yoder

Guests: Christine Hammond, WHOI; Joan Kleypas, National Center for Atmospheric Research; Raymond Najjar, Pennsylvania State University; Deborah Steinberg, Virginia Institute of Marine Science; Daniela Turk, CLIVAR International Program Office

35.1 Introduction

Chairman Mark Abbott welcomed members of the U.S. JGOFS Scientific Steering Committee (SSC), planning office staff and guests to the meeting and announced that data management and future ocean biogeochemistry programs would be the major topics of this session. Before getting started on the scheduled agenda, the SSC held an informal discussion about future prospects for large-scale, coordinated ocean carbon programs. Cindy Lee reported on the composition and activities of the National Science Foundation (NSF) Ocean Carbon Cycle Research committee that she heads. Roger Hanson from the JGOFS office in Bergen mentioned a planning meeting for future ocean biogeochemical research that is to be held in Spain in early December under the auspices of the International Geosphere-Biosphere Programme (IGBP) and the Scientific Committee on Oceanic Research (SCOR). He noted the difficulties of attracting the funding agencies to the programs emerging from international planning efforts.

35.2 Time-Series: HOT Report

David Karl presented a report on the status of the Hawaii Ocean Time-series (HOT) program. Funding for HOT is currently provided through a two-year "creativity award" that runs from 9/01 to 8/03. Support for the HALE ALOHA mooring ran out in 2000. The plan for the future is to submit a five-year (or longer) proposal to NSF or some other sponsor in August 2002.

All monthly cruises in 2001 have been carried out aboard R/V *Kaimiki-0-Kanaloa* (KOK), as will be the first six cruises of 2002. In the latter part of the year, two cruises are scheduled on R/V *Wecoma* and two on the new AGOR 26 SWATH vessel, R/V *Kilo Moana*, which is to be launched in November 2001 and to go into service in July 2002. Two are as yet unscheduled.

Dave listed new HOT projects for 2001-03. They included fast repetition-rate fluorometer and P vs E experiments, nitrogen-15 abundance measurements and tracer experiments, oxygen balance measurements, hydrogen peroxide production and consumption measurements, and vitamin ecology (prokaryotes make vitamins; eukaryotes need them). He also reviewed the set of assumptions with which HOT began in 1988 and the new biogeochemical and ecological paradigms that are emerging. These include new ideas about the role of eukaryotic photoautotrophs, nitrogen production and limitation and multiple element limitation among others.

Dave noted the emergence of genetic information on many organisms and pointed out that a large percentage of the genome is used for regulation and that direct exchange of new genetic information among unrelated prokaryotes is commonplace in nature. He also discussed the links between microbial activity and changes in such climate variables as wind, temperature and patterns of dust distribution. Finally, he offered a "carbon sequestration forecast" for Station ALOHA: "Light trade winds with a diel SST change of 2-3°C and a 50% probability of significant N_2 fixation, increasing to 90% during periods of aperiodic dust (Fe) deposition."

Several future scenarios are possible for HOT. "Business as usual" would continue to entail 10 to 12 four-day cruises a year. Transformation into a true "ocean observatory" would entail emphasis on high-frequency remote instrumentation and sensing. If HOT becomes an open-ocean long-term ecological research (LTER) site, the emphasis would shift somewhat toward testing of biogeochemical and ecological hypotheses. The future could include elements of each of these models, Dave said.

Dave noted a variety of collaborations with other projects at the University of Hawaii as well as with investigators elsewhere. He also described plans for the ANZCAN ALOHA observatory, which will take advantage of an existing undersea coaxial telephone cable from Canada to Hawaii, Australia and New Zealand that is no longer in use. HOT hopes to use this cable, which passes near the research site, for continuous real-time power and data transmission.

35.3 Time-Series: BATS Report

Before presenting his report on the Bermuda Atlantic Time-series Study (BATS), Mike Lomas mentioned that the canceled time-series workshop has been rescheduled to early April 2002. The workshop will include a review of how knowledge of the oligotrophic gyres has changed since HOT and BATS began and assessment of plans for the future.

BATS is in the midst of updating its server, Mike reported. The first five data reports are online, and the others are available on request. Mike is bringing his interest in changes in planktonic community structure to BATS, adding an ecological dimension to the biogeochemical mixture. He listed ancillary

users who take advantage of the monthly time-series cruises, including former BATS principal investigators Debbie Steinberg and Craig Carlson.

BATS investigators want to head in the direction of process-oriented research as HOT investigators are doing, Mike said, noting that these studies have amassed a wonderful record of the biogeochemical pools. The goal is to understand the links and processes that connect them. He went on to present data on the changes in dissolved organic pools over time, addressing the question of where the primary production is going. He linked an observed decrease in the accumulation of dissolved organic carbon (DOC) with an increase in the basal flux rate over the last decade and a decrease in chlorophyll b during the late 1990s. He is just starting to look at the link between these changes and potential changes in grazing rates and community structure.

Bob Anderson congratulated the time-series representatives on HOT and BATS accomplishments in addressing JGOFS goals and asked what their message would be to modelers. Chlorophyll should not be treated as a bulk pool, Mike said. Organisms matter; they have different responses to external forcing. He recommended digging more deeply into the chlorophyll box. Dave Karl pointed out the importance of looking more closely at the structure of the bulk DOC to see what individual compounds are accumulating. Cindy Lee observed that the wealth of data emerging from the time-series programs is allowing investigators to test new hypotheses.

The time-series programs of the future may have fewer, longer cruises than is currently the case. Phil Taylor said that the scientific balance is shifting toward experimentation and manipulation, which is likely to depend on continuous observations over longer periods of time, whether from ships or from remotely controlled instruments.

George Jackson noted the importance of midwater processes such as remineralization and asked whether time-series work was planned on the mesopelagic region. Dave said that lots of data was available and agreed that remineralization was as important as export.

Mark Abbott asked whether the ancillary investigators were coming to the time-series workshop and were providing access to their data. Both Dave and Mike said that the time-series programs were getting good access to their data.

35.4 Data Management Office Report

Dave Glover introduced members of the data management office (DMO) as "the folks in the trenches with your data" and turned the presentation on DMO activities over to Cyndy Chandler. Priorities for the DMO are the data inventory, merged data products, software development, SMP data products and the final media set. Dave Schneider and George Heimerdinger are responsible for the data inventory for the process studies. Some 18% of NABE data sets are still missing, 11% for EqPac, less than 1% for Arabian Sea, and 18% for AESOPS. A closer look at the missing NABE data sets shows that some do not actually exist and that some are buried in other files.

Several SSC members objected to the "all hands" approach to requests for data, noting that some putative delinquents thought that they had sent in their data and some thought that a given data set was not wanted. They suggested that lists of data sets be reviewed because not everything mentioned in early cruise plans and other documents was actually collected. A detailed discussion of particular data sets followed, addressing such questions as what constitutes a data set, what should and should not be included in the U.S. JGOFS database, and what metadata should be included with the data sets.

After some discussion of whose responsibility it was to pressure investigators for their data and which data sets were critical to the JGOFS mission, Mark Abbott said that the SSC should look at lists of data sets and let the DMO know which ones were critical. He will then talk to the agencies. After final letters from the DMO, copied to the SSC, a list of delinquents will be posted at the U.S. JGOFS web site.

Cyndy continued with an update on the task of producing merged data products. She was pleased to learn from the BATS and HOT presentations that all the DMO work on renaming parameters and the careful separation of organisms into appropriate categories was of great value. She asked whether merged products should include standard deviations and errors; the answer was no.

The sixth version of the Live Access Server (LAS) at the NOAA Pacific Marine Environmental Laboratory (PMEL) is scheduled to be released in December. It will have a richer metadata interface, a greater ability to select subsets of data, and multivariable support for both viewing and downloading. Cyndy explained that these developments will allow comparison of disparate data sets. A JGOFS LAS tutorial is available at the U.S. JGOFS web site; Cyndy updates it regularly.

After a break for lunch, Mark made a presentation on behalf of the SSC and the planning office to former DMO manager Chris Hammond in recognition of her many accomplishments. Noting that it now takes two people to do what Chris once did, Mark observed that U.S. JGOFS has a very good data system, thanks in good part to the groundwork carried out by Chris.

Cyndy continued her presentation with a discussion of data management for the Synthesis and Modeling Project (SMP). Acknowledging a rocky start, she explained that no one had been fully prepared for the complexity of the data sets. DMO staff members are working with the team at PMEL on procedures for assessing each SMP data set as it comes in to see whether JLAS can cope with it. A web page with instructions on preparing gridded data sets can be found at **http://usjgofs.whoi.edu/mzweb/las_guidelines.html**. Also under development is an electronic mail citation format for publications.

The first volume of the final U.S. JGOFS data set will be available by May 2003 with process-study data and merged products. Software will include a web browser interface, GIS for data selection, data subselection capability and the ability to extract data in a format selected by the user. Future DMO efforts will focus on the merged products, completion of data acquisition, software development, model data and the final data set.

Cyndy asked SSC members what they want to do about flagged bottle data from EqPac, roughly 3-4% of Jim Murray's bottle data set. Cindy Lee suggested that data users have the option of including the

flagged data or not when they request the data set.

George Jackson asked about getting access to international data sets. Roger Hanson noted that the JGOFS Data Management Task Team (DMTT) is dedicated to producing a master set of JGOFS data from all participating countries by the end of the project (2003). Efforts are now underway to collect all national JGOFS datasets and produce a Master Dataset in the World Data Center System; national data sets will remain at the Ocean Data Centers of the participating countries. Roger also mentioned that Germany plans to host and maintain the long term stewardship of the Master Dataset at the recently established World Data Centre for Marine Environmental Sciences (WDC-MARE). With some support from WDC-Oceanography A, WDC- MARE plans to mass-produce the JGOFS Master Dataset on CD-ROMs for distribution.

Noting the difficulties involved in getting access to data, Roger reported that JGOFS data sets in Germany, the U.K., France and the U.S. are almost entirely complete and accessible. The Japanese JGOFS data set is nearly complete but not yet accessible. Bits and pieces of data are available from other national programs. People persist in focusing primarily on availability rather than on long-term storage, he said.

Dave Glover observed that Germany is one of the better servers of data but that it has serious limitations on what may be served legally. The European Union has passed laws that restrict access to data seriously. He urged the SSC to look at this problem carefully before agreeing to put data anywhere.

Mark asked about access to the U.S. JGOFS time-series data sets and interaction with the DMO. Dave Karl acknowledged that naming in the time-series data sets is somewhat different from that of the rest and said that John Dore was working on the problem. Cyndy said that she and John discuss what would be easy and hard to bring from the time-series data sets into the DMO database and into merged products. There is no automatic way for Cyndy's software to query the time-series software; a user has to request information.

Mark then asked Roger about time-series and CO_2 survey data in international planning. Roger said that the DMTT hopes for a large percentage of these data but does not expect to get it all. Some time-series programs are still underway, while others are done.

35.5 Science Minute: Ocean Carbon Cycle Modeling

Mick Follows made a presentation on a modeling study that focuses on the role of the low-latitude oceans and wind-driven gyres in controlling atmospheric pCO_2. This study tests the conclusion emerging from box-model studies in the 1980s that only high-latitude ocean processes can affect atmospheric pCO_2 significantly. More recent studies with general circulation models (GCMs) have shown a much higher atmospheric pCO_2 sensitivity to low-latitude surface perturbations, he noted. Why do different sorts of models give different results?

Atmospheric pCO_2 is significantly influenced by the carbon reservoir in subtropical thermocline waters, formed at low latitudes. The way the wind-driven gyres and the ventilated thermocline are represented affects the relative sensitivities of box models and GCMs, Mick said. The interesting question is whether the ventilated thermocline could be a significant agent of change for atmospheric pCO_2.

35.6 Planning Office Report

Ken Buesseler gave a quick review of U.S. JGOFS Planning Office news. The final PO/DMO proposal covers a four-year period through early 2005, running through the last stretch of the SMP. Planning office activity will decline significantly after the JGOFS Open Science Conference (OSC) in May 2003 and the distribution of final data products in 2004. Funding was awarded at the 85% level, necessitating a decrease in the size and frequency of SSC meetings and some reduction in the U.S. contribution to the OSC.

The office has sent out some 5,000 paper copies of the "Legacy" brochure to date. The brochure is available electronically as well as a pdf file, and high-resolution images of individual photos and figures are available. The U.S. JGOFS special issue of Oceanography is coming out in December 2001; included are 10 papers and eight sidebars or shorter pieces. The Oceanography Society (TOS) membership will take up about 2,000 copies, and the planning office is ordering an extra 1,000 to 2,000. The Legacy brochure will be sent along with the special issue to those who have not already received it.

Dave Karl asked whether the special issue could be downloaded from a web site or whether this would create copyright problems. TOS does not have a web site, Ken said, adding that he would raise the matter with Bob Spinrad at TOS. SSC members agreed that having the special issue on a web site with an index that could be picked up by Google would make its contents available to a vast number of people.

Several meetings have been postponed from dates this fall until 2002. They include the international DMTT meeting, the SMP iron workshop and the time-series "summit." An SMP workshop on mid-water processes will be held March 25-27, 2002. The summer SMP workshop is scheduled for July 22-26 at Asilomar, California (subsequently moved to Woods Hole). The JGOFS OSC will take place May 5-8, 2003, in Washington, D.C.

35.7 JGOFS SSC Report

Roger Hanson reported on the JGOFS steering committee meeting in July 2001 in Amsterdam, The Netherlands, and JGOFS participation in "Challenges of a Changing Earth," the international open science conference that took place afterwards. The International Geosphere-Biosphere Programme (IGBP) was one of the sponsors of the conference. Ocean scientists involved in a number of IGBP core projects participated; Roger singled out fine talks by Berrien Moore, Tom Pedersen, Ray Bradley and Dave Karl for mention. He also circulated copies of the Amsterdam Declaration on Global Change, signed by the chairs of the four international sponsors of the conference.

Challenges of the JGOFS global synthesis phase include synthesis of the regional process studies,

global surveys and time-series programs, analysis and modeling, and the collection and archiving of ocean biogeochemical data. Roger listed the various synthetic publications emerging from various components of the program as well as from the open science conferences.

The international program is scheduled to draw to a close in December 2003. The JGOFS SSC currently includes six at-large members and the chairs of the regional and topical planning groups and task teams. Synthesis activities planned for 2002 include meetings of the DMTT in Washington in January, the North Atlantic Synthesis Group in Honolulu in February, the North Pacific Synthesis Group in Sydney, Canada, in October, and the JGOFS SSC in Concepción, Chile, in the fall. Scientific events include a Southern Ocean Synthesis Group session at AGU/ASLO Ocean Sciences meeting in Honolulu in February and a North Atlantic Synthesis Group session in Nice, France. A variety of workshops are planned, and training course will take place in Chile next fall.

Roger then reviewed the work of the DMTT and touched on many of the same issues mentioned during the DMO report. The International Project Office in Bergen continues to maintain a high-quality metadata file on each JGOFS cruise and is developing a metadata catalog

(DIF) for submission to the Global Change Master Directory at NASA. It also assists data managers and national programs with acquiring and submitting data, especially in countries without ocean data centers.

35.8 Synthesis and Modeling Project (SMP)

Speaking on behalf of Scott Doney, who could not attend, Joanie Kleypas began her SMP presentation with a brief review of the 2001 summer workshop, held in Woods Hole July 16-20. Nearly all the SMP projects were represented with 80 attendees. Joanie cited an excellent DMO presentation and tutorial and invited talks by Jim Bishop and Taro Takahashi as highlights of the event. Participants gave 50 15-minute talks and presented 20 posters. The current list of SMP working groups includes large-scale data sets, continental margins, community synthesis and modeling, regional testbeds, midwater processes, and calcification.

Turning to SMP funding, Joanie noted that NSF funded 10 new projects in the FY 2001 round. The next round will be the last for NSF. Some of the final projects will continue through 2004. A total of 65 projects involving 130 principal and co-principal investigators have been funded since the SMP was launched in 1997; sources of support include NOAA, DOE and NASA in addition to the more sizeable contribution of the NSF. Mark pointed out that NASA selected carbon cycle science projects this summer and that five or six were chosen as SMP projects. Mary-Elena Carr said that NASA sees these projects as ocean carbon cycle research but not explicitly JGOFS. In answer to a question about NASA support for SMP meetings, Joanie said that none had designated specifically for this purpose, unlike the first round of NASA support for SMP projects.

Three SMP events took place during 2001: the marine calcification workshop, the international WOCE/JGOFS transport workshop, and the summer investigators' meeting. An iron workshop scheduled for late September was postponed until 2002. The all-hands investigators' meetings will be held each summer through 2004. Other proposed workshops include one on midwater processes in spring 2002 and

two on regional testbeds, one 2002 and one in 2003.

Will Berelson asked about the number of students who get to SMP workshops. Tight money and space make it hard to include very many students in the summer workshop, Joanie said, asking the SSC to think about how important this matter was.

The first SMP special issue of *Deep-Sea Research II*, to be published in January 2002, will contain 20 papers. Editors are Doney, Falkowski and Sarmiento. The abstracts and most preprints are available temporarily via the SMP web page. Plans are underway for a second special issue, which has a March 2002 deadline for submission, December 2002 deadline for final manuscripts, and a January 2003 deadline for submission to the publishers. This issue should be out in spring or summer 2003, Joanie said. Eight papers are proposed at the moment for this issue, probably plus a CD-ROM.

Joanie next gave an update on SMP data management. Experts at PMEL and the University of Washington are working on making U.S. JGOFS process study data more useful and accessible to SMP investigators and on improving their ability to merge and display data products. The SMP management grant is supporting this effort. The web site for the JGOFS Live Access Server **(JLAS) is http://ferret.wrc.noaa.gov/jgofs/main.pl**. Recent improvements include a new user interface design for US JGOFS data, ability to select data for particular cruises and other constraints, a richer metadata interface, gridding to user-defined grids and differencing between gridded and ins-situ fields, the ability to select multiple variables for both downloading and plotting, enhanced plotting capabilities, and ease-of-use improvements.

Joanie asked for feedback on the above improvements from the SSC and from SMP investigators. She then reviewed mechanisms for serving data on the SMP data system, differentiating between gridded data, non-gridded data and model code. She also mentioned some lessons learned about getting data into the system and reviewed the status of each SMP data set.

Ken asked about getting access to SMP data located elsewhere other than the DMO after investigators stop serving their data sets. The problem is under discussion, Joanie said. Cindy asked for clarification of the meaning of "data" in the SMP context; model output was the answer. The day concluded with a general discussion about length, style and structure in the development of an effective meeting. SSC members expressed a preference for getting away from many short presentations. Cindy emphasized the importance of talking about what we don't know as well as what we do.

35.9 SMP Update Continued

Joanie Kleypas resumed her presentation with a review of proposed changes in style and organization of the SMP workshops. One option for the summer all-investigator meetings is to continue as before with presentations by each investigator and discussions and other activities as time permits. The other option is to define specific goals and design the meeting around them. This approach would entail just a few key speakers and many poster presentations. It would require more pre-meeting planning, Joanie said. Mark urged a move toward the second option.

Mick Follows said a few words about a proposed NATO Advanced Study Institute of the ocean carbon

cycle and climate, to be held at the Middle East Technical University in Ankara, Turkey, August 5-16, 2002. Mick is among the organizers. The plan is to invite 40 to 50 students from NATO, partner and other Mediterranean countries and 10 to 12 lecturers, each participating for a week. Funds are being sought from NATO and from agencies such as IOC and SCOR and U.S. JGOFS.
The SMP presentation continued with a discussion about potential outreach and educational activities. Tony Knap described the BATS online program for teachers, which was funded by NSF for two years. Because the NSF education section is not interested in providing continued funding, Tony is now trying for NASA funds.

Marlon mentioned his concerns about the reliance of JGOFS on publishing in *Deep-Sea Research II*. He is under the impression that DSR II has a low Institute of Scientific Information (ISI) ranking in terms of frequency of citations of papers published there. Although there are some excellent papers published in DSR II, he said, there are some that are not so hot as well. He argued that library choices of journals and departmental tenure decisions both take note of ISI citation ratings.

Jorge drew a distinction between journals of record and more competitive journals. He described DSR II as a journal of record that one would cite if one were using data from someone else. Joanie noted that turn-around time was an important consideration in deciding where to publish a special issue. Bob said that Elsevier does not use ISI ratings because they consider them to be full of bugs. Cindy noted the tremendous teaching value of special issues that one can hand to students.

Joanie continued with a report on the SMP calcification workshop, which took place in late May-early June at WHOI. She also circulated a synopsis of the workshop put together by Debora Iglesias-Rodriguez and others and gave an overview of results and recommendations. A brief report will appear in the next U. S. JGOFS newsletter (11,3).

George Jackson discussed plans for a midwater processes workshop March 23-25, 2002, in San Antonio. Its aim is to get people together who can tell us about mechanisms and inferred rates, he said. About 25 participants are expected. The steering committee comprises George, Adrian Burd, Richard Lampitt and Mick Follows.

35.10 Planning for Future Research: NSF Update

Phil Taylor gave a brief presentation on planning in the NSF Directorate of Geosciences for the future support of carbon-cycle research. All Geosciences divisions (OCE, ATM and EAR) are participating in a new FY 2002 competition to support integrated carbon-cycle science, he said, and an announcement will be released later in the year. This announcement, which is expected to total $10 million, will be the first of a set of announcements over the next several years. Future announcements may not necessarily be combined across all of Geosciences, he noted.

Phil stated NSF's commitment to increasing scientific understanding of the processes that regulate the transport and transformation of carbon within and among the terrestrial, oceanic and atmospheric spheres of the earth. The agency intends to continue to support and coordinate basic research on the carbon cycle

and to work with other federal agencies seeking to develop a coordinated national scientific effort in this area.

The Carbon Cycle Science Plan (CCSP) clearly shows the need to focus resources on understanding the carbon balance in the Northern Hemisphere, particularly the North American region and adjacent ocean basins, Phil said. The NSF agrees with this recommendation, although it will not be the exclusive focus of the upcoming announcement. The CCSP provided only a general blueprint in some areas of an overall scientific effort, leaving many details concerning processes and mechanisms to be articulated, he added.

Phil listed a set of activities with community input that have been supported by the NSF and other agencies. Included were: the North American Carbon Program (NACP), The Changing Carbon Cycle: A Terrestrial Focus, Large-Scale CO_2 Observing Plan: Oceans and Atmosphere (LSCOP), Transport, Transformation and Fate of Organic Carbon in River-Dominated Ecosystems (RIOMAR), Ocean Carbon Transport, Exchanges and Transformations (OCTET), Ecological Determinants of Ocean Carbon Cycling (EDOCC), and Ocean Carbon Cycle Research Planning (OCCR). In answer to a question about SOLAS, Rik Wanninkhof pointed out that it is not purely a carbon program and thus not on this list, but that the major carbon goals of SOLAS are contained in the OCCR document.

Returning to the proposed NSF announcement, Phil said that it is expected to come out in December, with an early March 2002 deadline and anticipated starts in the summer or fall of 2002. He reiterated NSF's interest in encouraging interagency and international cooperation and noted that the agencies are in a transition period in terms of research focus. Discussion followed on the goals and criteria for evaluation of proposals to be submitted in response to the upcoming announcement.

35.11 Planning for Future Research: OCCR Update

Cindy Lee, chair of the OCCR committee, gave a brief report on its activities. She showed a list of members and commented that the committee is now truly diverse in its representation of ocean sciences. This committee is charged with bringing together ideas and making recommendations for priorities, not organizing programs, she said. It has combined ideas from EDOCC, OCTET and SOLAS as well as from investigators interested specifically in the continental margins. The group was unable to meet as planned as a result of Sept. 11 and thus was unable to interact with the NOAA and CLIVAR representatives who were scheduled to attend. Discussion ensued on the importance of interaction with CLIVAR and of taking advantage of the ARGO floats that are to be deployed in the North Atlantic.

Phil indicated that OCCR input into the development of the upcoming NSF announcement of opportunity was the best and most comprehensive that the agency received. Cindy expressed concern that the AO would attract a diverse and unfocused set of proposals. Unlike JGOFS, it invites proposals at all scales and has no mechanism for organizing and starting a big program, she said. No structure for planning a big, integrated program is taking shape at the moment, a matter that concerns her committee, she added. She also expressed concern about the lack of protection for the process of organizing a framework for a big program.

Will Berelson asked whether RIOMAR was the only group following the JGOFS model. It has an infrastructure in place, Cindy said. Will expressed concern about the risk of recycling with the sort of broad approach adopted in the forthcoming AO.

35.12 Science Minute: Shallow Remineralization at BATS

Ray Najjar gave a short talk on a modeling study of the remineralization of organic matter in the Sargasso Sea. He and his colleagues used a diagnostic model of the annual cycles of oxygen, dissolved inorganic carbon and nitrate below the mixed layer at the BATS site to estimate organic matter remineralization in the seasonal thermocline. The model includes advection and diffusion, which are significant components of the seasonal patterns of O_2, DIC and NO_3, Ray said. The investigators looked at the individual patterns of production and consumption of these compounds and their implications for element ratios in remineralization. This approach may help solve the conundrum of non-Redfield ratios in surface waters and Redfield ratios in deep waters, Ray said, noting the midwater cycling of dissolved organic matter with high C to N ratios that does not get into the deep sea for the most part.

35.13 AESOPS Update and Science Minute

Bob Anderson took the floor after lunch to present an AESOPS "science minute" and review a number of developments. Two AESOPS volumes have been published in *Deep-Sea Research II*, and a third is coming along. He noted a number of AESOPS articles in other journals as well.

Bob gave an overview of AESOPS highlights, showing figures from various research projects. AESOPS was the first study to capture the complete seasonal cycle in the Ross Sea and the polar frontal zone along 170°W, a region with tremendous variability, he said. The use of two different ships offered opportunities for intercalibration. A broader issue is how representative the southwest Pacific is of the entire Southern Ocean. Half of the Southern Ocean is "brighter" (higher productivity) than the other half, Bob said, but the transect along 170°W is pretty close to average.

Summary points were:

A. High export from low production. Primary production was around 80-100 $gC/m^2/yr$; export at 100 meters was around 30 ±10 $gC/m^2/yr$, and POC flux at 1,000 meters was about two times the global average.

B. Satellite-based models underestimate both primary and export production.

C. The Southern Ocean provides roughly one-third of global export production.

Bob hypothesized that light, iron and silica are each limiting factors at some time and place in the Southern Ocean. A shallow mixed layer plus at least 0.2 nM Fe yields large diatoms and an export flux that is moderate to large in the absolute sense, but very high in terms of f-ratio. Cindy observed that pteropod populations in the Southern Ocean were incredible and that they were responsible for most of the

carbonate flux.

35.14 U.S. SOLAS Report

Rik Wanninkhof serves as co-chair of U.S. SOLAS, along with Russ Dickerson. U.S. SOLAS held a workshop in May that has yielded reports from four working groups: boundary-layer physics, long-lived CRC's, short-lived CRC's and atmospheric impacts on the marine nitrogen cycle. SOLAS has formed a steering committee, which will meet this winter. Both Canada and Germany have organized SOLAS programs, Rik said.

35.15 WOCE/JGOFS Transport Workshop

Rik reported next on the WOCE/JGOFS Transport Workshop held in Southampton, U.K., in June. The focus was on estimation of the transport of carbon, nutrients and oxygen in the ocean. He regards it as a great success; the workshop attracted 90 scientists from 11 nations. Sponsors were WOCE, JGOFS, U.S. JGOFS, U.S. WOCE and NOAA (OGP). A report on both parts of the workshop (WOCE and JGOFS) will be forthcoming.

35.16 U.S. CLIVAR/CO_2 Repeat Hydrography Program

Next on the agenda was a report on the proposed repeat hydrography program, also given by Rik. The U. S. CLIVAR Steering Committee and the U.S. Carbon Cycle Scientific Steering Group have established a committee in consultation with OCE at NSF and OGP at NOAA. Co-chairs are Rana Fine and Rik. The proposal is for an observational program to monitor the changing patterns of CO_2 in the ocean and to provide the necessary data to support continuing model development that will lead to improvements in forecasting changes in the ocean and in global climate.

If funded, this program will give as much weight to measuring CO_2 as to carrying out repeat hydrography as part of U.S. CLIVAR, Rik said. The aim is to mount one and a half cruises a year, or 70 days of ship time, with an expected cost around $3 million. Objectives of the repeat hydrography effort are carbon system studies, heat and freshwater storage and flux studies, deep and shallow water mass and ventilation studies, calibration of autonomous sensors and accumulation of data for model calibration and validation.

Cindy noted that one of the OCCR recommendations was to allocate resources for links with programs such as this one. Rik emphasized the need for community outreach and input. The web site for the program is: **http://www.aoml.noaa.gov/ocd/repeathydro.** An announcement will go out when the detailed plans are posted on the web site.

35.17 CLIVAR Report

Daniela Turk, who has recently joined the international CLIVAR office, gave a brief report on the

program. Intended to last for 15 years, CLIVAR began in 1995 under the aegis of WCRP. Its objectives are to describe and understand physical processes responsible for climate variability and predictability, to extend the record of climate variability by assembling paleoclimatic and instrumental data sets, to extend the range and accuracy of seasonal to interannual climate prediction through the development of predictive models, and to understand and predict the response of the climate system to increases in gases and aerosols and to compare these predictions with the climate record to detect anthropogenic modification of natural climate signals.

Although CLIVAR is a physical program, there is considerable interest in interacting with carbon researchers, Daniela said. She described plans for repeat sections with both hydrological and carbon measurements and a joint carbon project sponsored by WCRP, IGBP and IHDP.

35.18 The Incompleat POGO (with apologies to Walt Kelly)

Tony Knap brought the SSC up to date on the international Partnership for Ocean Global Observations (POGO). A goal of this partnership is to address the lack of ocean laboratories and long-term time-series measurements in the Southern Hemisphere.

The partnership has held several workshops recently, including one in Woods Hole in May on oceanographic time series. Objectives include locating suitable sites, developing rationales for establishing and maintaining instrument arrays, identifying gaps in existing programs, coordinating implementation and data transmission, creating links to complementary programs and looking for funding mechanisms for sustained observations.

Tony showed a map and list of selected time-series sites, existing and planned, in the Atlantic, Pacific, Indian and Southern oceans and answered questions about the choices they represent. He also listed the variables selected for measurement. The observatory system proposed is intended to be multidisciplinary, and the data are to be available to the public as soon as they are received and pass through quality control. An international science team will provide guidance, coordination, outreach and oversight for implementation, data management and capacity building.

POGO is intended to focus on building capacity, Tony said, not on "high-end science." The aim is to give developing nations some tools.

35.19 Review of U.S. JGOFS

Bob Anderson and Mark Abbott led a discussion about how the SSC might organize a final review of U.S. JGOFS, somewhat like the mid-course review conducted under Cindy's leadership some 6 or 7 years ago. The goal is to review what JGOFS has done as a large-scale ocean research program over the 17 years since it began. What did we learn from JGOFS that we can apply to policymaking and human concerns as well as to future research programs?

Bob posted a list of general review questions for the SSC to consider:

Does U.S. JGOFS have clearly stated and reasonably attainable goals?

Has U.S. JGOFS evolved a successful strategy to attain its goals?

Has U.S JGOFS been successful in implementing its strategy?

Are its goals being achieved?

Was the leadership appropriate for the stated goals?

Were the available resources appropriate for the stated goals?

What has been the overall impact of U.S. JGOFS on ocean science?

Are there other lessons to be learned?

He also listed the U.S. JGOFS overall goal, a set of specific objectives and a set of specific operational goals.

The SSC then discussed various approaches toward conducting such a review and considered the relevant audiences. All agreed that U.S. JGOFS needed to make a cogent and compelling case for the value of large-scale, multidisciplinary programs and to show what was learned in JGOFS that could not be done in any other way.

35.20 NSF Update II

Former SSC member Jim Yoder, now director of the NSF Ocean Sciences Division, gave the committee more information about the upcoming carbon announcement and other NSF events and activities. Although all three divisions of Geosciences are putting in money, oceans money will go to oceanographic projects. Some projects, such as a watershed study, might be jointly funded, he said.

Jim said that the amount available for ocean research for FY 2002 will be on the order of $5 to $6 million; it could go up. The budget has not cleared the congressional conference committee yet. NSF administrators are hoping to see a 9% to 10% increase this year.

Jim pointed out that growth in the budget is often the result of congressional direction of money into new initiatives, such as biocomplexity. Information technology is coming. Even with large increases, core programs do not grow much, he said. Ship operations ate up much of last year's rise, he added.

Last summer saw lots of attention to carbon and climate change in Washington. Geosciences director Margaret Leinen worked on a climate change initiative for the White House. Other agencies are interested in carbon cycle research as well as NSF. NASA has significant plans, starting in FY 2003, that Chuck McClain will be coordinating. NOAA is also planning significant work.

Looking forward to FY 2003, Jim said that he could not predict the effects of 9/11. Ship operations are certain to be affected, for example, by insurance restrictions.

Mark expressed the SSC feeling that the scientific community continues to be interested in large-scale, multidisciplinary studies, recognizing that they require more structure and organization than individual research projects. Jim noted the directorate-wide initiative in Geosciences, which is broader than oceans. Other divisions in Geosciences are less used to big projects like JGOFS, he said, and they are likely to look to OCE for guidance. The announcement of opportunity for this initiative does not preclude funds for a planning office.

Jim went on to observe that NSF funds formerly allocated to JGOFS will be used for interdisciplinary work, integrated across land, atmosphere and ocean rather than just within ocean research. He recognized SSC concerns about confusion over overlapping responsibilities of various committees and said that this would be sorted out.

Ken asked about the role of the Ocean Commission, headed by Admiral Watkins. Scientists and their deans should go to the regional meetings that are taking place all around the country, Jim said. The problem is that people tend to talk about fisheries, not ocean research, at these meetings.

In answer to questions about the foci of the new carbon initiative, Jim recommended focusing on what was learned in JGOFS and what areas are ripe for new discoveries. The problem of degree of focus on usable results versus the advancement of basic knowledge is always present in any interagency undertaking, he acknowledged.

With regard to the problem of future support for ongoing large-scale carbon-cycle research, Jim said that the next big source of information would be the President's science plan. It will give the agencies a chance to respond and plan for the future, although it will not provide direction for this year. Jim also reminded the SSC that the U.S. JGOFS time-series stations are already funded and that they are not coming out of the forthcoming AO.

35.21 Final Open Science Conference

Debbie Steinberg led a discussion of the final JGOFS open science conference, scheduled to convene in Washington, D.C., May 5-8, 2003. She asked SSC members to think about what they would like to see and how the conference should be structured. The organizing committee wants to get started advertising the event.

Planning so far calls for avoiding parallel sessions and many short talks. A select number of invited speakers will give talks in the morning, and poster sessions will take place in the afternoon. Evening sessions will include educational events and a talk for a broad audience to which the public will be invited.

Ideas for the title of the conference included borrowing the "Sea of Change" concept from Dave Karl. The

audience for the conference will include international as well as U.S. scientists, government representatives, IGBP and other multinational organizations, and representatives of new programs such as CLIVAR. Representatives of private foundations and industry should be invited as well. Cindy urged bringing in people from other NSF Geosciences divisions.

A number of names of potential speakers were suggested. They will be expected to give synthetic talks that put a number of pieces together and to submit their talks ahead of time, Debbie said. Nominations will be sought from other national JGOFS programs as well.

Themes proposed include the response of ocean biogeochemistry to big climate systems, biocomplexity and the food web, the anthropogenic impact on the ocean, global synthesis modeling, and ocean alchemy, including carbon sequestration and iron fertilization. Another issue mentioned was technological development, the advances in methods and standards. "Old-timers" should be invited to give talks focusing on the evolution from what we knew at the beginning of JGOFS to what we know now. The conference should demonstrate that the sum of JGOFS is more than its parts.

Conference products should include a briefing book with the talks and good illustrations to hand out. Conference organizers should make data CDs available and have workstations set up; the point to emphasize will be that anyone can look at and use JGOFS data.

Poster sessions will be organized by both themes and regions. Bob suggested that Roger Hanson ask the chair of each regional synthesis group to provide a synthesis poster for the OSC. Roger suggested that the request for abstracts be linked to the list of themes that finally emerges. Debbie pointed out that some topics could be addressed in a panel format rather than in talks or posters.

35.21 SSC Wrap-up

The SSC concluded its meeting with a brief discussion of its own role in presenting science community views to the agencies. Ken showed a final overhead of a plan for organizing a set of mid-size ocean projects under the umbrella of ocean biogeochemistry and climate.