28 Minutes -- June 18-20, 1997

U.S. JGOFS Scientific Steering Committee Meeting

College of William and Mary, Williamsburg, VA

Attendees

SSC members: M. Abbott, R. Anderson*, D. Archer, R. Barber, P. Brewer (emeritus), A. Dickson, S. Doney*, H. Ducklow (chairman), S. Emerson, D. Hansell, M. Landry, C. Lee, M. Lewis, J. McCarthy, D. McGillicuddy, A. Michaels, J. Murray*, P. Quay, J. Sarmiento*, D. Siegel, S. Smith*, W. Smith*, T. Takahashi, D. Wallace, R. Wanninkhof, B. Ward

Time-Series programs: C. Carlson, BBSR; D. Karl*, U. Hawaii; A. Knap*, BBSR

* - (Implementation Committee - non-voting members)

Planning Office: M. Bowles, C. Hammond, H. Livingston, M. Zawoysky

NSF: D. Rice

NASA: J. Yoder

Guests: J. Alberts, Antarctic Support Associates; Marjy Friedrichs, Old Dominion University

28.1 Introduction

Hugh Ducklow welcomed the participants, noting the remarkable and first time 100% turnout of the whole committee and ExecPlus committee. After some local introductory comments, the committee took up the first agenda item.

28.2 NSF/NASA Budget Projections

Don Rice presented his vision of how U.S. JGOFS budgets might look over the rest of the program. He started with a spendout scenario projection for the period FY97-99 (Appendix 1). The SC appreciated hearing the good news that FY97 now becomes the first year without a deficit. He gave a large share of the credit for this to the way the ASA AESOPS management and OPP had worked on their costs to come in below budget. He noted that this meant that there is now some reserve resources available for emergencies and contingencies. The Arabian Sea funding ends in FY97 and the AESOPS in FY2000, except for management wrap up. He showed the SMP budget projections, with NASA components, and

with up to three Announcements of Opportunity. Subsequently Jim Yoder noted that he hoped that the NASA SMP support might be up to 50% higher than the figures Don showed. Support for the Time-Series stations, planning office and data management, standards (to FY98), miscellaneous (to FY98) and GAIM/SCOR continues at roughly the same level from year to year.

He then showed a very preliminary projection of potential funding out to FY2003, noting that this was very much an exercise for planning purposes and subject to all the usual uncertainties. The projections showed SMP support continuing through FY2002, but with declining levels as the program drew close to its end. No SMP funds other than management close-out were expected after FY2002. He mentioned that the funds released by the wind-down could be viewed as being available for emerging major ocean programs in the large scale/global change area - not necessarily with these labels. The projection also showed support for the Time-Series stations, planning and data management and GAIM/SCOR continuing at the same level until FY 2003. NASA is the only other agency that is talking with NSF about JGOFS activities at present. Don expressed his hope that DOE would provide funds for the rest of the CO2 Survey and for data management. He said that he would speak up for this view.

Hugh Ducklow asked if the support for SCOR could justify pressing for some international meetings which were proving difficult to arrange because of resource competition. Don answered that he believed that this was reasonable.

28.3 Time-Series

BATS

Tony Knap presented a brief account on what was new at the BATS site since the last report, mentioning personnel changes, cruise and data updates, etc. Current personnel include Craig Carlson, core measurements; Debbie Steinberg, biology; Nick Bates, carbon measurements; and Rod Johnson, physical measurements. He made particular mention of the testbed mooring, its funding status and instrumentation. He also noted the other programs that conduct ongoing research around BATS, e.g., Station S, AEROCE, sediment trap mooring, satellite programs and the optics mooring. A new activity which he noted was in the educational area. A proposal has been submitted to NSF for a distance learning project involving high school teachers with the ongoing science at BATS. Another proposal to NSF/SMP was a data mining proposal aimed at recovering and making available all the data from the large number of ancillary science projects staged out of Bermuda over the last decade.

Following Tony's report, Craig Carlson gave the SC a very nice talk on work he has been doing on the carbon dynamics of the spring bloom in the Ross Sea Polyna and in the Sargasso Sea around Bermuda. He compared and contrasted the distributions and fluxes of DOC and POC at these two very different locations. In general, most primary productivity near BATS ends up as accumulated DOC or passes through the microbial loop. In contrast, in the Ross Sea, most of the bloom stays in particles, and either sinks or decomposes.

HOT

Dave Karl followed with his regular update on what was new from the HOT site. Noting that the HOT cruises had just reached the 100 mark, he went on to describe the success of the new physical, biogeochemical mooring HALE ALOHA. First deployed earlier this year, this instrument is collecting excellent continuous data on meteorology, temperature, conductivity, optics, gas tension, nitrate, trace elements and nutrients, respiration, current, fluorometry and ADCP. Data are transferred daily via a cell phone link and will eventually be available on a real time basis. He noted other news on methods improvements, personnel changes and the current status of data release - including the hard copy version of report 7 (1995). He showed several illustrations showing how there was strong evidence of a regional shift over the last two decades from the earlier years in respect of higher levels of primary production, chlorophyll, etc. He reviewed the six meetings on Time-Series science which were to take place in the 12 months starting November 1996.

Dave finished up his report with his traditional science mini-talk - this year called "The Science Second". Two separate but related topics were presented: the role of N2 fixation as a source for new N to the system and the role of periodic upwelling as a source of nitrate. The first will also appear as an article in Nature and so will be discussed only briefly here (the article appeared in the 7 August 1997 issue). The latter, the aperiodic injection of nitrate into the euphotic zone had been suspected for a long time to be important in the N budget of the subtropical gyre but direct evidence has only recently been obtained at Station ALOHA. New data from the HALE ALOHA record nicely recorded this phenomenon through the observation of doming in the temperature isolines in the continuous record - bringing a supply of nitrate into the euphotic zone. The 0-25m pigment levels in the record tracked this influx also. Mark Abbott showed some fluorescence data which followed the same pattern.

Following this presentation, a discussion on the status and future of the TS activities was held, noting the proposal currently at NSF for a three year continuation and a possible future under new labeling, perhaps as LTER sites or as part of the GOOS system (although there was some pessimism in respect of the latter). The trend to move towards more automated, continuously sensed measurement was viewed as a key component of the evolution of the TS programs. Also, it was recommended that Time-Series measurements be recognized as a critical component of the scoping of future ocean programs by the various committees now engaged in forward planning. In response to a question for some perspectives on how NSF viewed future Time-Series support, Don Rice made some remarks. He noted that an award for the current proposal could not be made before FY 98 because of NSF funding commitment policies but indicated that an award soon after 1 October was rather likely. He offered some very strong words of support for the Time-Series stations by NSF. He said it was ludicrous to think that NSF would NOT continue to fund these Time-Series sites. Regardless of whatever names or associations might emerge in the future, he noted that there is tremendous support in the community to maintain and continue their efforts. Although support is being handled on a year to year basis at present, shiptime has already been secured for the near future and there is a commitment to keep these observatories going. He ended his remarks with a very strong ringing phrase, "They WILL continue!"

28.4 Carbon Dioxide Program

Taro Takahashi made the first of three presentations on this. He began by discussing the recent carbon dioxide data collected on seven legs of the Palmer cruises in the Ross Sea this past field season. They have permitted collection of full CO2 system data and he showed some results for pCO2 sections during the winter/summer/spring cycle. On N.B. Palmer 96/4, the site survey cruise, a closely spaced in time southbound and northbound cruise track provided an opportunity to demonstrate the high degree of instrument reproducibility by the similarity of the two traces obtained. He also showed the patterns of TCO2 and pCO2 in surface waters between 74 and 78S in the Ross Sea in the summer of 1997 - which made sense in terms of the ongoing seasonal drawdown. He then showed six sections of air and surface water pCO2 along the 76.7S section from Station Minke to Orca. The seasonal drawdown of CO2 was again nicely observed.

He went on to talk about progress in the global CO2 Survey - showing two sections of DIC along two NOAA N/S sections. He noted that most of the WOCE Pacific CO2 data are now available through CDIAC. In the two sections, he showed he wanted to point out deep water features viz. that at the more easterly section, the deep return water was no longer undercut by the Antarctic Bottom water because the circulation of the Western Boundary flow carries the Southern Ocean low total CO2 water to the west side of the Pacific, in the clockwise circulation. This was a major first order effect of the circulation. He also compared data at crossover points conducted on different WOCE cruises and demonstrated a high degree of reproducibility. As far as the availability of the global CO2 dataset, Taro noted that most U.S. data is readily available through CDIAC but the non-U.S. data was not as far along. Jorge was concerned whether there would be support to permit the collection of all the data together.

Doug Wallace gave a brief summary of the status of the CO2 Survey. Field work in the North Atlantic will be completed in August. A slightly more expanded set of measurements is being carried out in the N. Atlantic to allow comparison with the comparable broader datasets collected during TTO. As far as data at CDIAC, he understood that 93% of the U.S. data sets are physically there. The goal is to have a Science team meeting in NH in August to push the intercomparison of the global data sets. The N. Atlantic data will just be recovered but there will be very little opportunity to carry out even the initial stages of synthesis. He finished up with a mention of papers which are in the works at this time, which cover synthesis of the N. Atlantic and S. Atlantic basins (Nick Gruber), similar synthesis of Indian Ocean data (Chris Sabine) and NOAA Indian Ocean data (Tsung-Hung Peng). A further paper on Atlantic meridional transport is underway (Juergen Holfort, Doug Wallace and colleagues). Dave Siegel wondered about data reliability between Survey and Process Study datasets and, in general, it was felt that these should sit well together but every opportunity to compare crossover points, e.g., North Atlantic and Bermuda datasets, needed to be looked at. Dave also asked whether CO2 data from the Process Studies and Time-Series programs were part of the overall CO2 data set. Doug said that they were not as yet.

Rik Wanninkhof followed up the CO2 topic with some brief comments on the total anthropogenic burden of CO2 in the Atlantic from different methods viz. analytical and models. He compared the analysis (by Chen) of actual data in the Atlantic section at 20/25W with model results by the Princeton GCM and by Nick Gruber. Agreement seemed moderately good and the water column carbon

inventories agreed to within 20%. But there were some real differences between the methods with respect to where these inventories were residing.

Towards the end of the meeting, Doug Wallace returned to the CO2 topic with a report on the status of the CO2 Science Team - soliciting SC advice. All university investigators have received notice that they have received their last awards under their current proposals. But realistically the process will continue beyond the award period. He stated two issues - 1. should the CO2 Science Team continue to exist (for data workup and synthesis) and 2. if yes, how? DOE had made it pretty clear to the Science Team that future funding is very uncertain given constraints within the agency. On the other hand, there is an appreciation that a scientific product from the CO2 Survey data is desirable. An encouraging development is that DOE has committed two years of additional funding to CDIAC to allow them to finalize and distribute the global CO2 dataset. Hugh Ducklow offered the opinion that, in the worst case scenario, U.S. JGOFS should be prepared to come up with travel funds to help keep the team alive to round out the program as it was a critical element of JGOFS synthesis. Jorge Sarmiento stated that CO2 synthesis was one of the five major SMP goals and that it needed to be done one way or another. Although remaining DOE funding might be stretched to permit some data synthesis, he felt that the proposal route through the SMP, either to NSF or NOAA, could help make this happen. With proposals written, interagency overtures to DOE could even be made to solicit even modest support. Hugh Ducklow told Doug that U.S. JGOFS was prepared to act in whatever way was necessary to help bring the CO2 program to a satisfactory conclusion.

28.5 EqPac Process Study

Jim Murray reviewed some recent news of this mature study in its synthesis phase. There have been some recent field programs, since the major U.S. earlier effort, notably:1. A French zonal flux cruise (FLUPAC) in 1994 along 165E and 150E, and OLIPAC along the meridian at 150W, in El Niño conditions.

2. A U.S./French cruise on the Thompson in April/May 1996 along the same line, but in La Niña conditions.

3. A further French meridional cruise, EBENE, at the dateline in October 1996, with a focus on grazing.

4. A number of Japanese cruises but details are less clear due to poorer communication.

He also reviewed progress in EqPac Synthesis in the form of Deep-Sea Research Special Issues. Two are now out, and a third, containing many synthesis papers arising from the Scottsdale workshop, is due out by year's end. It should contain 25 papers and he presented the table of contents list.

Following Jim's update, Marjy Friedrichs, Old Dominion University, presented a science talk on EqPac - recently presented at the International JGOFS Synthesis/Modeling meeting in Oban, Scotland. Focusing on the biological response to many scales of environmental variability, it was entitled: "Physical Control

of Phytoplankton Biomass and Primary Production in the Central Equatorial Pacific". Through the use of a numerical model she illustrated that both the specific El Niño phase (interannual time scales) and mesoscale events such as tropical instability waves (monthly time scales) play an important role in explaining the varying levels of phytoplankton biomass and primary production observed during the EqPac cruises. Modeling results also reveal that equatorially trapped internal gravity waves (weekly time scales) may potentially provide a significant source of iron to the oceanic surface layer. In conclusion, Marjy observed that high-frequency physical variability must be included in model-making, since it may be critical to understanding phytoplankton levels.

28.6 Arabian Sea

Sharon Smith followed with her report on current activities in the Arabian Sea Process Study. She reviewed the whole program from objectives, through the field program, to the first data workshop in summer 1996. She gave particular emphasis to a) the importance of the physical forcing and b) of the placement of moorings. After restating the Implementation elements and goals of the program, she reviewed some of the meetings over the last year which featured Arabian Sea science results (AGU/ Ocean Science, ASLO and TOS) and those scheduled in the next few years, national and international (the draft agenda for this year's New Hampshire Data workshop was shown). Both Sharon and Duck pointed out that the ONR-supported participants in the Arabian Sea Expedition are participating in the U. S. JGOFS workshops and working closely with the NSF-supported scientists. They are good about getting their data out and sharing it, Duck added. Miscellaneous news included work on an atlas, translations of historical Arabian Sea work by the Sevastopol, Ukraine laboratory and the news that there are no longer plans for a Royal Society meeting and for one in Amsterdam. Jim McCarthy suggested that U.S. JGOFS might ask I-JGOFS to convene a suitable meeting in an international context to bring together the various national studies in the Arabian Sea. Some discussion was held on data availability issues, national and international, but it did not appear that this was presenting any serious problems. Indian data had historically been rather difficult to access but Sharon painted a rosier picture for data collected outside the EEZ - especially on a one on one basis.

There followed a discussion of the proposed production of a CD-ROM containing all international CTD data collected during the recent field programs. The German Data Management Office had offered to carry out this activity as a contribution to international data management. Sharon voiced a concern that there was no mechanism planned for standardized quality control. It was recognized that after the two year limit on data release that this would remain a problem anyway and other solutions needed to be found for this. Andrew Dickson made the plea for working collaboratively to archive the data with appropriate information on data quality, methodology and all metadata that would be helpful to users. In conclusion, Hugh Ducklow noted that we should observe the two year restriction on data release - not a problem in this case - and that we should collaborate with the international program on their initiative. He proposed that he, Sharon and Christine Hammond work together to ensure that the data include all necessary additional information.

Following this, Sharon presented a science talk reviewing the key scientific findings which had come to light as a result of the preliminary analyses of the Process Study data. She noted the veritable tsunami of

data flowing into the Data Management Office ahead of the upcoming New Hampshire workshop and expected that there would be a quantum leap in understanding when all the new data and ideas are exchanged.

28.7 Southern Ocean

Jon Alberts started the Southern Ocean (AESOPS) report with an operational review of completed and upcoming cruises in the Ross Sea on the Palmer and at the Polar Front zone on the Revelle during the next field season. He gave an impressive account on the professional way in which all the scientists, ships people, ASA personnel and NSF OCE/OPP had worked together to complete a highly successful field program so far. The difficult conditions of working in the extreme and remote environment of the Antarctic Seas was a real challenge but he was able to report that most of these problems had been faced and solved.

He went over the details of the ship and procurement schedules, the logistical differences between cruises on R/V Palmer and those on R/V Revelle, and some of the difficulties to be resolved, such as the disposal of isotope wastes from the Revelle cruises. AESOPS cruises will come to an end in March and April 1998.

Dick Barber asked about the ultimate disposition of equipment purchased by NSF through ASA for AESOPS. Don Rice said that equipment would most likely remain with the last scientist to use it for the time being and that the SSC and OCE would work together to decide its eventual ownership.

Walker Smith followed Jon with a science summary presentation touching on some of the highlights of the four Palmer cruises completed so far - Site Survey and Process I, II and III. He noted that the purpose of the shelf study is to investigate the temporal dynamics of carbon within the Antarctic's most productive coastal region. He showed several overheads which charted the progression from winter to spring/summer and back to winter in terms of the development of all the parameters of the regional bloom and associated changes in nutrients and parameters of productivity. He noted in conclusion that the timing of the cruises worked well in catching the conditions of the pre-bloom, bloom initiation and end of season heterotrophic consumption of organic production. The essential role of iron to autotrophic processes was also confirmed during Process II. And he expected that the data sets obtained would be the most complete assessment of carbon dynamics of a hyperproductive location anywhere in the Antarctic.

Bob Anderson followed Walker with an update of the plans for the polar front cruises. He showed an impressive multi-beam survey of the proposed site for the study and described the siting and structure of the sediment trap arrays. He summarized the intended strategy for the cruises and noted the differences in definition of survey and process cruises from the definition which applied during EqPac. He showed some SST profiles along several crossings of the survey area in the Palmer cruise which revealed consistency of the major features but variability at the mesoscale level. These would be the object of intense study during the Revelle cruises. Similarly he showed some surface nutrient profiles along

several transits through the study area which provided an indication of what to expect on the Revelle cruises. Tony Michaels asked about data availability from AESOPS as there would be strong overlap between the data being released and the operation of the Synthesis phase. Bob said that the Arabian Sea data policy would be maintained. But, in any case, any U.S. JGOFS P.I. could get access to the data on a timely basis - and others by arrangement with P.I.'s.

The next item on the Southern Ocean was a presentation by Dennis Hansell on some early observations from Process-II in the Ross Sea in January 1997. The main thrust of the presentation was the demonstration of how the region could be characterized by the biogeochemical regimes defined by dominant organisms, i.e., diatoms -> phaeocystis -> diatoms. The talk stimulated a number of questions and preliminary discussion of the kind of scientific advances of knowledge in the regional biogeochemistry which can be expected when all the results come together.

Finally, Bob Anderson gave a report of the recent meeting of the International Southern Ocean Planning Group (in Oban, Scotland, 26/27 May). Basically, there were two new studies which were being planned and funded. The first was an initiative from New Zealand to carry out some iron enrichment experiments. The second was a European Community project (CARUSO) which was similar to Iron-X-II. These two plans lead to extended discussion of the critical need for intercalibration needed to resolve the serious differences in existing iron observations. These were between the Dutch results (high) and the French results (low). SOPG members agreed unanimously that the JGOFS CPO should press for an intercalibration exercise before cruises go to sea. Hugh Ducklow proposed that the Chairman of JGOFS be asked to write a letter to the MAST (European funding agency) Directorate urging that such measures be started. Dick Barber said that the Europeans saw it more as a conflict between the Dutch and MLML results - which differ by a factor of ten. But two French studies in the Indian Ocean are apparently providing support for both positions. One is getting results similar to the Moss Landing ones, and the other is getting results like those reported by Hein de Baar.

The French Time-Series work at Kerguelen south of the Indian Ocean has been terminated and there is little optimism that it will restart.

Regeneration was one of the topics addressed at the meeting - scales of regeneration especially. Regeneration in the Southern Ocean was believed to be less efficient than at lower latitudes. This was seen as an area of overlap with GLOBEC and Bob recommended that a linkage to GLOBEC in this respect be established during the SMP phase of U.S. JGOFS.

Bob noted plans by the Bergen International Planning Office to produce a data catalog of JGOFS results.

Bob reported on a series of planned meetings over the next few years on Southern Ocean Science. These included: Ocean Science meeting, February 1998 (less likely, due to the absence of the Germans); Liege (Sea-Ice), May 1998; AESOPS data workshop-I, 17-24 June 1998; Marseilles (Australia/France), June 1999; AESOPS data workshop-II, August 1999; Brest, 2001. Bob hoped that there will be effective linkages between these meetings and the SMP activity.

Discussion of biogeochemical provinces in the Southern Ocean came next. Bob pointed out that provinces needed to be redefined in the light of new biogeochemical data: differences in species assemblages and biogeochemical parameters did not necessarily coincide with differences in physical characteristics. He therefore proposed that the AESOPS cruises in the APFZ have flexible rather than fixed stations in order to target biological features. He also discussed concerns about the comparability of APFZ data from the Pacific, where the front is located around 60S, to data from the Indian and Atlantic oceans, where the front is nearer 50S. He and Walker feel that this is not a problem.

Bob made some comments on the European EPOS program but as it did not have any synthesis component planned, he was unsure that it would contribute to the overall Southern Ocean Synthesis.

28.8 Standards and References

Cindy Lee asked the committee to consider the issue of these for U.S. JGOFS. She argued that it was not reasonable to try to compare different datasets within the program when they had not been obtained using identical methods tied to appropriate standards and reference materials. She noted that this can be a problem even between groups, some as HOT and BATS where considerable efforts had been made to tie their datasets together. She believed that the TS stations should be charged with taking on this task and get funds to do so properly. She noted that the situation was particularly bad for POC and PON.

There followed a full discussion of standards issues, ranging across the measurements where there were clear standard needs and to the broader international arena where, in general, the potential for serious discrepancies was even greater.

Bob Anderson pointed out that standards are not much help when there is considerable variation in the way people handle samples. Standards are also costly to create and implement. And researchers resist using them unless they have serious incentives to do so.

A common problem is agreeing upon what is meant by the term "standards." In this context, it refers to an agreed-upon protocol or set of methods, rather than the development of a calibration standard or a certified reference material. Differences in methodology often lead to discrepancies between data sets. An intercalibration exercise for sediment sampling that was run by Margaret Leinen, for example, showed that failure to agree on standard measurement approaches resulted in significant variation in results.

Cindy pointed out that all of the recent improvements in DOC measurements were in methods. Although no calibration standard or reference material exists, samples can be compared with greater confidence because a carefully articulated protocol has been developed. True certified reference materials are available now for certain components of the ocean CO2 system, on the other hand.

Considerable discussion was devoted to the problem of standardizing protocols for iron measurements. Dick Barber noted that there was a perfectly good standard for iron analyses, but that there were serious

problems with protocols. Methodology differences also make it difficult to measure the distribution of inorganic and organic carbon in sediment trap material. The only way to get reliable results is by measuring differences between two direct gasification techniques.

SSC members agreed that the minimum response to the need to develop standards and references for oceanic measurements was to document fully the methods currently in use. One reason to do so is to alert modelers and others not familiar with disagreements over methods about the various methodological pitfalls. Jim McCarthy pointed out that protocol manuals should be used to provide documentation of standard measurements and that methods testing at the Time-Series stations continues to be a good idea. He added that the Time-Series Oversight Committee had recommended a combined protocols manual for HOT and BATS. Dave Karl agreed that this was a high priority and would be attended to as soon as possible.

In answer to a question about the commitment of NSF to support for the development of standards and references, Don Rice said that NSF believes strongly in the development of community standards. The agency is supporting the development of standards for POC, DOC and DON. He added, however, that NSF is not willing to support the development of an iron standard right now, since protocols were too far apart still. Bob Anderson cited examples of NSF support for the development of protocols and went on to argue the case for conducting shipboard intercalibrations to sort out the real disagreements over iron measurements. He urged the SSC to support the effort to sort out disagreements and establish a common protocol.

Subsequent comments stressed the idea of writing letters to funding and international groups urging that these matters receive attention as a high priority. Hugh Ducklow stated that he was ready to sign and send any such letter as was brought forward. Tony Knap agreed to draft such a letter.

Finally, recognizing the high costs of these exercises, Steve Emerson suggested that they should be prioritized to maximize the benefit to the scientific community.

28.9 Synthesis and Modeling Project

To set the stage for this discussion, Jorge Sarmiento started with a Science talk which updated his views on Global Warming and Ocean Biogeochemistry. He showed model predictions of the oceanic effects of rises in atmospheric CO2, based on the observations from 1765-1990 and the IPLCIS92a scenario to 2065, with and without biology included. Observing that the impact of biology on the ocean's ability to take up CO2 was strongest between 40S and 60S, Jorge stressed the importance of finding out what is happening biologically in the marginal ice zone.

Don Rice then presented an overview of the proposal response to the recent SMP Announcement of Opportunity. A total of 46 proposals (NSF focus) were received, spanning over the five elements as, element 1 (14), 2 (14), 3 (7), 4 (1), 5 (6) and one management proposal. In addition, 14 satellite/remote sensing proposals responded to the NASA part of the Announcement. Seven proposals in non-JGOFS

geographic areas were received. Total funds requested were $25M over three years with $8.4M in Year 1. 65% of the requested funds were for element 1. 35-40% had a mix of observationalists and modelers.

He discussed planned interactions between NSF and the SMP/SSC during the funding process. The SMP will hear of abstracts when the awards are made. They may be published on the U.S. JGOFS Web page. Feedback from the SMP/SSC will be invited on proposals likely to receive funding. This feedback is taken very seriously. In the Southern Ocean funding process, it led to the inclusion of the iron limitation component. He welcomed such feedback as a priority listing of proposed topics - as had been provided in previous Process Studies. Cindy Lee observed that, while the giving of advice was fine, it was also necessary to leave room for good ideas. Don estimated that ~75% of the proposers had prior JGOFS experience and ~25% were new.

Peter Brewer started some discussion of WOCE/JGOFS interaction during the SMP - recalling that he and Carl Wunsch had once made a pact to come up with the ocean transport of heat and carbon on the same observational basis. He raised the question of how the necessary communications links would be established to make this happen. Don Rice said that some links are made at NSF. Others come from joint service by some on the two SSC's and others might need some proactive action such as invitation of appropriate WOCE people to future meetings of the SSC or SMP, or soliciting the right kind of proposals to address these topics if they have not been proposed, or funded in the first round. Doug Wallace noted the need for WOCE and JGOFS oceanographers to write joint proposals to work in this area which straddles the line between WOCE and JGOFS. Don Rice said that if there were multiple opportunities for proposal submission, this would permit, for the first time, joint review of proposals between WOCE and JGOFS. Walker Smith asked about the interfacing of the Southern Ocean Modeling initiative with the SMP. Don said this was up to the SSC to decide but it was a small initiative with a rather substantial GLOBEC component.

Hugh Ducklow asked whether people would be wise to await the third announcement or submit proposals sooner. Don's advice was to respond to the second call, and request a later start date if early timing was inconvenient. This could be a problem for AESOPS P.I.'s and Don thought that a target date for submissions might be a way around this - if it turns out to be a problem.

Jorge Sarmiento expressed concerns that the three announcement scenario (small/big/small) was a different approach to that discussed in the start of the SMP - but he was reassured that he need not worry as the proposal request can be matched to the program needs as it goes along. There would indeed be flexibility to spread the funding as required - always remembering that chances of funding in 2002 are near zero.

Dave Siegel asked Don to comment on how NSF saw the need for a product. In response, noting that NSF will have spent $170M by the end of JGOFS, said that the NSF leadership wanted to see its support of this program in the news. The bottom line was; WE WANT A PRODUCT! It was up to the program to decide what this would be in respect of paper sets, models sets and grand synthesis results. Dick Barber reflected on the difficulties of rewarding such group efforts in a system which encourages and

rewards individual achievements.

Scott Doney followed with an account of the management proposal which had been submitted to NSF for the management of the SMP. The key theme towards the achievement of the SMP objectives was the "fostering of strong interactions between the observationalists and modelers". He reviewed the SMP structure in respect of P.I.'s, teams, working groups, oversight and coordination. He spelled out his and Jorge's vision on their coordination role. They expected to provide the organization and support of the annual and working group meetings, the SMP infrastructure, leadership on the grand JGOFS synthesis discussion, communication of SMP results to the community and interaction between the U.S. JGOFS synthesis activity with other major U.S. program synthesis and the parallel international synthesis.

Scott went on to introduce the idea of the SMP "Grand Synthesis" (the integrating and overarching synthesis product) recognizing that it would evolve as the P.I. profile emerged. One of the major products will be a set of process/conceptual models that can be inserted into a global model. Examples of relevant processes include remineralization, grazing and export. Integration of diverse elements into a large framework would be a challenge. He identified some ways in which the synthesis would be reached and a proposal that would create a structure for collaboration - based on P.I. collaboration with a central framework. Discussion of how this would work in practice drew the caveat that human interaction was key and that aspect needed to be kept well in mind. The final scope of the synthesis blueprint was not yet set and would evolve through the input of the SSC, P.I.'s and the biannual SMP working group leaders. Several examples of how modeler/observationalist interaction had worked in the past and the lessons learned from these would be used in the SMP case. Cindy Lee wondered if some funding mechanism could be helpful to bring in individual experts as consultants for one or two weeks. There was extended discussion on the nature of models and how they could be interrelated and combined with each other and with accumulated datasets. Jorge urged the critical approach taken at the New Hampshire workshop be continued where models were being tested against real data and not simply being adjusted as required to produce some desired result.

Scott then showed a timeline of SMP activities starting with the 1996 summer meeting running through the July 1998 first P.I. meeting. Bringing the funded P.I.'s together was an early priority. Steve Emerson said he thought the Grand Synthesis idea was really critical and the planning should be directed towards defining and promoting this. On the other hand he argued that there needed to be equal emphasis on global and regional models. Jim Murray said that when the groups got together they could review progress on, say, the regional models (he saw nothing on the North Pacific, for example). Finally Hugh Ducklow reminded the group that all would not be solved that day and frequent returns to this debate were to be expected. Jim McCarthy summed up by noting how different the SMP was from Process Studies or Time-Series studies. Tuning along the way would be required and there would be constant iteration and dialog in shaping the project.

Scott went on to describe plans for the summer SMP meeting in Snowbird, Utah. He reviewed the key topic (Time-Series), the objectives for the meeting, key topics or processes which need emphasis for adequate model representation and how the meeting would be structured to attain the objectives (participants balanced by area/age and a mix of invited, informal talks, posters and working groups).

Speaker invitations and the meeting agenda were due to be sent out in the following few days. People felt that the list of participants was good but that the meeting was broader than just Time-Series - as it included some Process components. So processes of relevance to SMP concerns were contained within the framework of the HOT and BATS and also time-series aspects of the Process Studies.

Dave Karl noted the proposed merge of HOT and BATS in LTER-JGOFS. He recommended that some of these P.I.'s be invited to SMP meetings.

Reports from the meeting could include an EOS article and Working Group reports from successful groups.

28.10 Ocean Modeling and Data Assimilation

Scott Doney had attended two meetings on these topics (see briefing book for details). This came from a dialog between the U.S. WOCE Office and various federal agencies on where we are and are going in these areas. The meeting was to broaden the focus beyond WOCE. Scott observed that these meetings were extremely broad and communication was not easy. And very different scales were involved. Although global synthesis was discussed at the data assimilation meeting it was more in terms of hind-casts for the 1990's and now-casts. Physics was the main thrust and the complexities were beyond the individual P.I. The global Ocean Data Assimilation effort was also closely linked to forward modeling development. The purpose of the Ocean GCM meeting was to leverage resources through increased community collaboration. A suggested approach was through a "Community Ocean Modeling Consortium". Scott felt that forward progress from these meetings was longer term and would not be particularly helpful to JGOFS as it comes to a close. Scott accepted that the GCM meeting was primarily emphasizing large-scales.

28.11 SeaWiFS

Jim Yoder had the latest on this. Currently it is scheduled for launch on July 18. It is likely to go sometime in latter July. If everything works data should be collected starting about 30 days after launch and available after about 90 days. On this schedule the fall AESOPS cruise would get coverage. Failing SeaWiFS there are other options. He mentioned two instruments on the Japanese satellite ADEOS-1 (OCTS and POLDER). Unfortunately, since the meeting has come the devastating news that ADEOS apparently suffered failure in the solar panel assembly and that it is to all intents and purposes dead. One other option is a German instrument MOS (Modular Optical Scanner) on an Indian satellite. It is primarily useful for coastal waters but has no storage capability and data must be downlinked directly. Failing a successful launch, NASA would likely take out the funding base for ocean color. This would precipitate a substantial struggle in all probability.

28.12 Rotation

Steve Emerson chaired the meeting to begin discussion of this matter. The first item was the question of

the intersessional outcome of the search for a Chair-Elect. Hugh Livingston reviewed the chronology. Six people had agreed to be considered for this position. At this point Hugh Ducklow agreed that he was also willing to serve a second term. In addition, he had also indicated that the need for a Vice-Chair was no longer a concern as he considered that the present Exec. Comm. could give him all the necessary support that he might require. Several people withdrew and a summary message was sent around on the 7th March noting that final decision on this would be taken at this SC meeting. Following this, both Jim Yoder and Mark Abbott also asked to withdraw from consideration as they had not been fully aware of the situation. The topic was opened for comment. Jim McCarthy took it as a sense of program strength that six people had been willing to be nominated as Chair. Steve Emerson explained the Exec. Comm. reasons for making the recommendation to re-elect Hugh Ducklow for a second term. Jim McCarthy explained that Hugh Ducklow had previously not planned on considering a second term and was under pressure to become Chair of the International JGOFS Committee. But as he became more involved with the U.S. JGOFS Committee, when the question of which committee should take precedence came up, he concluded that his contribution would be of much greater value to the U.S. committee and he was willing to be considered for nomination for a second term. Steve Emerson added that, when this happened, that the Exec. Comm. (minus Hugh Ducklow) felt that it was appropriate to make a recommendation to the SC that Hugh's name be placed in nomination. A move to adopt this was made, seconded, and approved unanimously by a show of hands.

Hugh Livingston then informed the committee of the needs for filling the seven slots on the committee which were due for rotation this year. He noted the summary in the briefing books and requested nominations during the next three weeks to establish a list of nominees. These would be culled by the Exec. Comm. to a short list of 15 names, selected such that discipline, region and gender were all balanced, would be sent on e-mail to the SC asking for their ranking to be returned in confidence to Hugh Livingston. Prior to this message being sent, all proposed nominees would be contacted to determine their willingness to serve if nominated and selected by the SC. The seven top ranked names would be sent to the Exec. (unranked) for review on discipline/region/gender balance criteria prior to being sent to the SC for an electronic request for endorsement of the Exec.'s recommendation. The Exec. could select from names below this initial list to resolve any balance issues.

28.13 Forward Planning

Jim Murray started off this topic with an account of the NRC Major Oceanographic Program (MOP) Committee, chaired by Rana Fine, on which he serves. This committee was set up at the request of the Ocean Studies Board to assess the functions of large ocean programs for NSF - past, present and future. Jim reviewed the make-up of the committee and its charge and pointed to the questionnaire which was being used to gather information on all the programs. A background questionnaire had already been sent from U.S. JGOFS to the NRC committee but another more substantial one was due in August. A draft of this was in the briefing books and the final version was due to be sent out imminently. Steve Emerson asked if the purpose was to assess the efficiency of Major Oceanographic Program Science and whether it required a more coordinated format. Jim felt that Worth Nowlin leaned more towards the latter but that the committee role was more to gather a historical perspective of the MOP's. Progress with the committee seemed rather slow to Jim and this was a concern to some. Don Rice was asked for NSF's

view of this committee. He said that NSF was concerned to find out what was the perceived MOP contribution to ocean science and whether the expense was in step with the achievements. Also, they were interested in the design of the MOP's and finding a mechanism for identifying future MOP's. He added that the input from this committee would go to Mike Purdy and that it was solely a NSF initiative. Peter Brewer and Jim McCarthy reviewed the previous OSB activities which lead to JGOFS and WOCE. Jim Murray said that the plan was to be finished by next summer but was concerned that the progress so far was minimal. Cindy Lee noted the need for small groups or individuals to do the groundwork necessary to start up a program. Other models to start up programs were mentioned viz. CLIVAR. Questions were asked about the impact and usefulness of the questionnaire. Pete Brewer saw it as an informational appendix to a good report which could make a substantial impact if well done. Finally it was agreed that the committee would work on the JGOFS input and the Exec took on the responsibility of finding the best way to accumulate and synthesize JGOFS wide input. Don Rice was interested on how fast the input would become available and if early draft could be seen on a Web page, for example. Jim McCarthy said there was no reason why NSF as sponsor, could not call the NRC and request an update. Finally it was suggested that it might be helpful to invite Rana Fine to the next steering committee meeting and this was deemed a constructive suggestion and would be acted upon.

Jim Murray went on to describe another newly formed forward looking committee - the ad hoc Future of Ocean Biogeochemistry Committee started by Gus Paffenhofer at the winter ASLO meeting. Jim described the make-up and reason for formation - the latter resulting from Don Rice's prior comments about the need to define future plans for the money which is now supporting JGOFS and which could be diverted to other uses unless new global biogeochemical initiatives emerged. It was important that the various committees recently formed to develop recommendations for long term ocean science plans keep aware of each groups activities to avoid overlap.

Don Rice described another committee formed through NSF to look at the future of chemical oceanography. (The Physical Oceanography and Biological Oceanography programs will also be funding their communities to carry out similar studies). This could be seen as a balance to the MOP emphasis. He described its membership and expected that a workshop would be convened of about 40 invitees late this year. General input to this meeting would be solicited. One objective would be to assess the present and future of ocean chemistry as a science and profession.

A further committee on Carbon and Climate has been formed and is headed by Jorge Sarmiento. This is part of an inter-agency planning effort to be supported by some of the USGCRP agencies. It comes at a time when resources for carbon research seem to be in decline while at the same time research is providing some exciting results. Also there is strong centralized support overseas and a new framework for international control on CO2 emissions. Peter Brewer remarked that, despite many books and reports, the terrestrial community continue to consider they are right in terms of the dominant terrestrial role. He wondered how this new initiative could improve on the existing situation. Jorge thought that 1. previous reports were rather old and out of date and 2. there is now a clear international consensus on the need to stabilize future CO2 levels and the issue needed to be attended to so as to control emissions. Jim McCarthy felt that the agencies had begun to realize the need to act in a coordinated way. They don't have a coherent plan which deals with the terrestrial and the marine components. Further, the key point

is whether the agencies will heed the proffered advice. Peter Brewer noted that there was no legislation requiring agencies like NOAA to take responsibility for, say, greenhouse gases. Perhaps some high level coordination might work towards some legislation. Jorge said that mostly people favored scientific invitees but that he was concerned that the political groundwork was in place.

Tony Michaels and Tony Knap mentioned that several ad hoc meetings on the future of the time series stations had taken place. This led Cindy Lee to ask whether each element of JGOFS should provide Jim Murray with a list of important issues which need funding. Jim thought that this was really appropriate and that now that the committee was formed, that there was no reason for U.S. JGOFS not to make recommendations to the committee. He also said that he had been persuaded of the merit of adding a Time-Series person to the committee but needed to negotiate with Gus Paffenhofer on this. Bob Anderson asked whether keeping biogeochemistry as the focus of forward planning was advisable. He wondered whether the consideration of other directions might not be appropriate - paleo-oceanography, for example. Other points of view might need to be heard by the ad hoc committee. Steve Emerson felt that more time needed to be spent on this topic and suggested that it be discussed more fully at the next SC meeting. Don Rice reminded the group that whatever way forward was decided, it needed to happen in an extremely open way. Even if the decision was to create new initiative building on the U.S. JGOFS achievements, this would be all right as long as it was decided in a totally open manner. Tony Knap felt that the Time-Series planners felt pressure to determine a way forward on a faster track. He planned to include Jim in their meetings, or keep him informed. Jim had originally thought that the ad hoc committee might be relatively shortlived, but he now believed that it might be necessary for it to come up with a straw proposal for a future program or programs that could be held up for community review. This could be either as an evolution of JGOFS or something framed in a new way. The CLIVAR mode was recognized as being very successful but it was also characterized as distinctly operational, i.e., leading to improved predictive capabilities.

Jim next presented some examples of possible program themes for debate. They included: a) the oceanic CO2 response to climatic atmospheric CO2 changes b) regime shifts under nutrient limitation and c) the proposition that the "steady state ocean" is not a valid picture. Possible approaches to new programs could include high resolution time-series studies (with chemical moorings), ocean manipulation/ perturbation experiments and interdisciplinary (physical/chemical/biological). Peter Brewer argued that no new initiative would get going without individual effort and leadership taken together with new ideas, tools, papers, etc. Doug Wallace suggested it might be useful to look at other parts of the community, e.g., biodiversity, atmospheric chemistry, and ask where these areas were going - to avoid conflict or overlap. Jim Murray agreed, noting that the SOLAS program included the ocean/atmosphere sulfur cycle. Bob Anderson said that he liked seeing some straw ideas being put forward as Jim was doing. He felt that it could have the effect of provoking others to respond if they have alternate ideas to put forward.

Jim Yoder pointed out that NASA was putting on order of $1B into the upper ocean/atmosphere area. He thought if good links were made to this it would attract a lot of interest, leveraging them beyond purely satellite sensing programs. The session closed on the topic of how to communicate ideas to the ad hoc committee. Messages to the entire JGOFS community were mentioned, including the use of Web

pages. Hugh Ducklow closed the discussion by noting that the U.S. JGOFS SC was still a group which could say something of weight and substance by way of input to the ad hoc committee and promised to make this topic a more comprehensive item on the agenda for the next SC meeting.

28.14 International JGOFS Activities

Jim Murray reported on the activities at the International JGOFS SSC meeting held a few weeks ago at Oban, Scotland. He summarized news from the Bergen office, membership of the JGOFS SSC and noted that Mike Fasham had been nominated to take over the committee Chair spot from John Fields. He described the JGOFS Synthesis plans, making the existing task teams as sub-committees of the Synthesis planning group and with a timetable to be complete by 2004 - the sunset date for the JGOFS program, one year later than for U.S. JGOFS. He reviewed recent and upcoming meetings and gave an update on the activities of the various task teams. Specifically, from the North Pacific task team came the news that the Japanese have a new field program which is planned to continue until 2000. A forward planning report, Andrew Watson's SOLAS report, is complete and has been forwarded to IGBP for their consideration.

Andrew Watson, U.K., was to report the activities of the IOC-CO2 Panel. Since he could not attend the meeting, his presentation was replaced by an oral report by Takahashi on the ocean CO2 research activities in the United States. The latest results of ocean CO2 measurements made by the Southern Ocean JGOFS program (NSF), the OACES program (NOAA) and WOCE CO2 program (DOE) were summarized in a 45-minute presentation.

Tony Knap gave some details on some other international meetings. A Health of the Oceans meeting will be held in Singapore in December and there will be JGOFS representation there. Quite soon there was to be meeting in Brest which would address instrumentation and chemical measurements. It was not clear if Fe measurements were to be addressed there in any substantial way. One advance topic to be covered apparently, was on a neutrally buoyant float which was rumored to work well.

28.15 Other Business

The date and place of the next SC meeting was set. It will be from 21-23 January 1998 in Santa Barbara. Tony Michaels requested that attention be paid there to issues of standards and model output policies. It was agreed that these would be addressed in a substantive way and accordingly placed on the agenda.

Hugh Ducklow closed the meeting with a series of thank you's - to the SC members finishing their term of office, to Jim McCarthy for his term of service on the Exec. Comm., to the attendees and speakers and to the Planning Office for the meeting arrangements.

Appendix 1

U.S. JGOFS BUDGET PROJECTIONS

Spendout Scenario

Thousands of Dollars

	FY97	FY 98	FY 99
ASPS	1,830		
AESOPS/OCE	4,994	5,660	1,600
AESOPS/OPP	4,499	1,433	744
AESOPS/NASA	300	300	
SMP1	1,000	1,000	
SMP1 NASA	1,500	1,500	
SMP2	4,000		
SMP3			
BATS/HOT	1,700	1,700	1,700
PCO/DMO	740	800	800
Standards	200	210	
Miscellaneous	500	500	
GAIM/SCOR	90	90	90
TOTAL	14,853	13,193	11,434
OCE Total	10,054	9,960	9,190
OPP Total	4,499	1,433	744

NASA Total 300 1,800 1,500