DRAFT MINUTES

Meeting of the Shallow Water Systems PPG
San Francisco
December 4-5, 1998

present:	Terry Quinn	*(Co-Chair)*
	Gregory Mountain	*(Co-Chair)*
	Sandy Tudhope	
	Larry Edwards	
	Rick Fairbanks	
	Gregor Eberli	
	Yasufumi Iryu	
	Jeroen Kenter	
	Craig Fulthorpe	
regrets:	Christian Betzler	
	Edouard Bard	
	Michael Gagan	
guests:	Jamie Austin	*(liaison from SSEP - Environment)*
	Jonathan Overpeck	*(watchdog from SciCom)*
	Peter Davies	*(invited guest)*
	Leon Holloway	*(invited guest*
	Kate Moran	*(JOI)*
	John Farrell	*(JOI)*

Introduction

Mountain and Quinn opened the meeting shortly before 9 am and thanked all present for agreeing to serve on this PPG and for making the effort to come to San Francisco. Self introductions by each PPG member showed there is a good amount of shallow water experience, hands-on knowledge of drilling technologies, and prior ODP participation present on this panel. Mountain described the general charge that SciCom has placed on each PPG. Fairbanks asked if other PPGs, like ours, were looking at using alternate drilling platforms; Austin answered yes. Quinn then described the goals and mandate of this particular PPG, noting that we have the opportunity to modify each in ways that we see appropriate.

<u>Phase IV</u> - Austin was asked to describe the status of JOIDES planning for changes in Phase IV, and the ways in which shallow water drilling might be accommodated then or sooner. Ship utilization in Phase IV may be as follows: Schlumberger will likely replace the JOIDES Resolution (JR) with a newer vessel in 2004; construction of the Japanese riser drillship could begin in early '99 pending a favorable and critical threshold decision in Japan next month; funding for a 2-ship program in Phase IV will require at least a tripling of current total support (to 120-150 $M/yr), and a proposed balance for this has been discussed at 44% Japan, 44% US, and 12% all others. This would require very little increase for the "others", roughly doubling the US contribution, and a very sizable increase in the Japanese component. Asked if he thought the ship will be built, Austin said yes. He stressed that for drilling to continue smoothly into Phase IV, the scientific goals and structure of the new drilling program ought to be firmly in place by the beginning of 2001. He noted there is a large area of the oceans unavailable to drilling with the JR (water depths < 100 m or so), that this gap will probably NOT be filled by its replacement vessel, and

that the Japanese riser vessel will be even more restricted, to water depths > 500 m. The scientific issues called for by the Long Range Plan and reiterated in the Compost-II report include drilling in much less than 100 m water depths. Eberli remarked that the 1988 Sea Level workshop in El Paso stressed the need for a platform that could drill in this setting, but there is still no allocation of funds nor mechanism for doing this a full decade later. He stated that a strong message should be carried back to the SSEPs, SciCom and ExCom that the 'new' drilling program must be a triad of operations utilizing a riser vessel, a JR replacement, AND a shallow-water platform(s). There was panel-wide agreement on this point. Discussion followed concerning why there was this gap between scientific need and logistical/financial commitment to shallow water drilling. Fairbanks offered the suggestion that to stimulate reaction from the JOIDES planning structure a feasibility study could be conducted by drilling from a UNOLS vessel. This could be done well before 2003 at minimal cost to the program. Quinn spoke for many by noting this strategy could provide considerable 'bang for the science buck'.

Shallow Water Science Goals

We then began discussing the scientific themes to be addressed by shallow water drilling. We quickly agreed that as defined by SciCom, our PPG objectives include (but are not limited to) advancing ways to: 1) seek sub-millennial records of climate variability in corals, and 2) understand the many processes that shape the composition and distribution of shallow water deposits. Fairbanks offered that scientists pursuing either path will in various places and at various times need identical drilling technologies, and that any effective planning structure, therefore, should provide access to a range of platforms. The upshot - despite the different themes under discussion - is that these objectives should be addressed by a single, unified PPG. Mountain added further that even AFTER drill samples are recovered, an internationally based sample archival and data dissemination structure, such as the ODP, continues to benefit both scientific themes.

Austin pointed out that some of the science objectives being aired were all well and good, but to really stand a chance of being heard by other members of the advisory structure we must be very clear that these can be addressed only by drilling in shallow water. A more pointed discussion developed concerning the major scientific issues that can be accomplished by -- and ONLY by -- shallow water drilling.

<u>Corals</u> - We began with the coral system. Much of the world's climate is controlled by heat and moisture patterns in the tropics. Corals throughout these regions contain records of shallow seawater temperature and chemistry; absolute dating can be achieved to 500 Ka, often to decadal, sometimes annual, accuracy. Fairbanks described the ability to recover 95% of drilled sections in reef-front settings, the goal being to sample the isotopic composition of Acropora palmata corals, or their sea-level equivalent, that are the most desirable indicator species. While coral fragments are typically penetrated by a drillhole in a piecemeal fashion, with corals 'floating' in a matrix of less useful carbonate debris, each A. palmata can be absolutely dated and through multiple drill holes at one site, a nearly complete composite climate history section can be assembled. Others asked about the benefits of drilling in more continuous lagoon facies; Tudhope answered that crucial geochemical proxies are very much harder to read from these samples due to bioturbation and physical reworking. Davies volunteered that lagoon samples contribute to studies of reef ecosystems, and provide additional information concerning tropical climate variability. Fairbanks pointed out further that to extend the temporal range of paleoclimate studies, transects of drill sites are needed that will recover coral fragments in sand channels in water depths to roughly 150 m. The rate of local tectonic subsidence and/or uplift as well as the time into the past for which there is absolute age control will determine this water depth limit more exactly. Discussion followed concerning the pros and cons of sub-millennial

climate variability studies in corals vs. ice cores. The latter can claim absolute age control to no more than 11 Ka; beyond this time age models are the product of ice flow modeling studies. Furthermore, ice cores studies are very limited geographically.

<u>Fluids</u> - Austin volunteered that the relationship of fluids to diagenesis was an important issue to the environmental SSEP; to what extent did our PPG consider it a forefront shallow water issue? Eberli offered that there is useful post-depositional climate and paleoceanographic information contained in the cements and fluids of shallow water carbonate systems. Mountain asked about the overlap with fluid interests in the buried biosphere community. Austin answered that indeed, they do have interest in pore fluids (in deep water as well as shallow) but their immediate goal is to solve the problem of recovering uncontaminated fluids, and the climatic imprint on the diagenetic products left behind is a more distant challenge. He mentioned further that fluids are an element of other groups' interests (esp. at mid-ocean ridges re: alteration of ocean crust and the impact on the composition of seawater, plus the relationship of fluids to seismicity in subduction zones) but that few groups have convinced the general community that fluids are central to other front-line topics. Davies said explorationists in the oil industry are right now very interested in improving their understanding of diagenesis and fluid interactions in the upper 400 m of shallow water sediments, because in this zone many seismic interpretations can be misled by post-depositional processes that have altered the reflection character of these sediments. Kenter seconded the point, mentioning that techniques are emerging for shear-wave analysis of near-bottom sediments that can quantify patterns of fluid content in shelf sediments. After much discussion, many agreed that fluids are important and relevant to our shallow water goals, but that extracting a climate story from cements and fluids is an especially difficult challenge. While this is a positive reason for working in diagenetically altered shallow water sections, major advances in understanding climate variability will be difficult to achieve, and Quinn suggested that 'like a 15-pt buck on the first day of deer season', targeting such sections may provide detractors of shallow-water operations an easy target for criticism.

<u>Rapidly Deposited Muds</u> - Discussion turned to climate variability studies that could be done with drilling in rapidly accumulated, mud-dominated shallow water systems. Tudhope pointed out that the temporal resolution of deep sea drift deposits is dwarfed in many such shelf deposits that have accumulated at rates 2 orders of magnitude faster; temporal resolution in some shelf deposits approach centennial scales. Absolute age control is usually good to 60 Ka, and with a variety of proxies can be extended much farther back in time. Fairbanks cautioned, however, that open shelf deposits, even if deposited at apparently fast rates, provide a climate record that is deceptively difficult to extract. Nonetheless, many agreed that studies of such deposits could lead to a better understanding of land-sea interactions in areas such as glacial melt water history and paleobotany. Furthermore, these records provide SST data for a wide range of latitudes.

<u>Stratal Architecture</u> - Mountain began discussion of drilling objectives designed to understand processes that build the observed geologic record. The sedimentary record from shallow water settings, regardless of age, is replete with unconformities at all scales. We know that events from tides to storms to tsunamis to eustatic changes cause breaks in the record from the bedding scale to basin-wide dimensions. We do not know with great precision, however, how each of these is expressed in the geologic record with fluctuations in sediment supply rate or tectonic disturbance, to name just two complications. Mountain pointed out there is a growing awareness that paleocurrents are greatly underappreciated as agents of sediment transport, both along and across continental shelves. Davies concurred, saying that while there is widespread application of the systems tract model to inferring sediment facies from seismic profiles, he knows of many examples where its predictions have proven invalid, possibly because margin-parallel sediment transport was not taken

into account. He pointed out further that a large portion of the rock record known to geologists accumulated in shallow water, yet there are large gaps in our understanding of the processes that produced this record. Mountain emphasized that one very important way that shallow water drilling could contribute is to validate numerical models or provide reliable scaling factors for physical (i.e., flume) models, both of which attempt to duplicate stratal patterns observed in profiles from shallow water. There was general agreement that the many factors that directly affect the geologic record -- among them sea level, river discharge/precipitation history, currents, tectonism -- are inadequately understood, and furthermore, that inferences concerning these processes based solely on existing seismic profiles cannot advance our knowledge without careful sampling.

Demonstration Projects

We diverged into a discussion of hitting our desired target by: a) developing broadly based, fundamental objectives that few could deny are important (the 'motherhood and apple pie' model), vs. b) seizing upon focused scientific goals that could be achieved quickly with a demonstration drilling effort (the 'laser beam demo' model). Fairbanks advocated the latter, saying that if our PPG proposed a pilot program of shallow water drilling we could strongly influence the set-up of the Phase IV drilling program. Austin agreed that action, not just a management plan, was needed in the next 24-36 months, if not sooner, for there to be a reasonable hope that shallow water drilling would be promoted to a full-fledged third element of post-2003 drilling (along side riser and JR-style drilling). There was panel-wide agreement that one of our major tasks is to show the shallow water science community that ODP can provide opportunities for them to meet their scientific goals. It was agreed that the case for exciting and important science in shallow water was not hard to make, and that the necessary technology for shallow water drilling exists; the most daunting task is to develop strategies that utilize these resources. We left it that we'd each think about pilot projects and discuss these on Day 2.

Tudhope asked what time scales were important for processes of shallow water deposition. Mountain offered that it depended on the process under investigation, but that at least two cycles of change need to be explored. For example, if the question concerns the influence of glacioeustatic forcing, then drill records back to at least 250 Ka were needed in order to capture two full 100 KY cycles. Austin stressed the importance of the finest quality seismic imaging possible. The theme that we have been developing is to understand the relationship between process and stratal architecture, and the best seismic data possible are required to frame a proper sampling program, and to interpret the cores that are recovered. Like the above answer to the question of what time interval must be acquired, the spatial scale of the seismic data and the drill the process under investigation must determine core locations. Austin advocated that we should not shy away from the fact that high-resolution 3-D seismic data must be part of this future.

Day 1 Summary

Quinn led the remainder of day 1 pulling together the prior discussions of what science could be achieved exclusively by shallow water drilling. The title "The Role Of Tropics In Global Climate" was considered a good summary of theme 1. Corals from the tropics provide SST and salinity data that are used to measure global climate variability on the decadal to even interannual scale. Such 'snapshots' provide insights into the response of the whole ocean-atmosphere system to dramatically changing boundary conditions. The links to other types of high-resolution climate records (ice cores, tree rings) are particularly important, and yield data on pre- and post-anthropogenic influences. Overpeck mentioned that scientists in the CLIVAR program are very anxious to see coral-based climate data covering the last millennia. Fairbanks agreed these are important data to gather, but he felt that ODP's potential could be better utilized if it focused on longer time scales, dealing with histories of sea level, ENSO, SST, etc.

The title of the second theme for drilling in shallow water systems emerged as "Linking Process to Architecture". The concept is that a range of physical, chemical, and biological processes shape the composition and distribution of strata in shallow water environments. Great strides have been made in imaging the 'architecture' of these deposits with acoustic profiling of the seabed. A large range of studies address the delivery and reworking of sediments to shallow marine settings, but few have been able to link these processes to the architecture of the preserved record in much beyond a descriptive manner. A major impediment has been the lack of samples from within shallow water systems deeper than a few meters below the seafloor. One of the first challenges of this PPG is to frame the first-order questions that cannot be answered until such samples are acquired. It was pointed out that there are few proposals in the JOIDES review system that address this process to architecture link; Eberli stressed this is NOT due to the lack of community interest. He said potential proponents are simply waiting for strong indication from within the JOIDES structure that money and technology are available to drill in shallow water.

Technologies

The morning of Day 2 was devoted to presentations of drilling technologies relevant to shallow water science.

PROD - We began at 8:45 am on Day 2 with Peter Davies presenting an overview of the emerging Portable Remotely Operated Drill (PROD) that he is helping to develop. He described Benthic GeoTech, a consortium of partners comprising the U. of Sydney, Williamson & Assoc., Warmer, NGK, and Protech. He assembled this team in response to his interests in sampling rocks and sediments in settings that have been shown to be especially hard to recover (e.g., reef carbonates on Leg 133). His premise was then and continues to be that precise control of weight on bit is a critical aspect of achieving high recovery in unstable formations. Specific design and operational criteria were identified at the beginning of development where it was decided the tool must: be affordable and driven by science objectives, easily transportable, and deployable from a ship of opportunity; operate from 0-2000 m water depths; be able to achieve nearly complete recovery of hard rocks and soft sediments to 100 mbsf, and this calls for powerful system with rotary and a variety of push coring capabilities. After several years and $5M dollars of investment, building on similar designs that have not been entirely successful or were lost at sea (most notably by Williamson & Assoc.), these criteria have resulted in a drilling device that rests on the seafloor. This 'bottom lander' obviously eliminates ship motion, the most significant contributor to unwanted fluctuations of weight on bit. Just as obviously, this remote operation introduces unique and challenging operational features, but sophisticated robotics and elaborate monitoring systems have been designed. Basic features of the tool include: weight in air = 6 tons; footprint on deck = 2.4 m x 2.4 m; height = 5.8 m; main drill fits in one 20 ft container, and its winch + cable (currently 300 m in length; a 2 km fiber-optic umbilical weighing roughly 2 tons is on order) comprise a second 20 ft container and another 10 tons; an optional operator's control room can be shipped in a third container; the device is self-leveling to 20°, resting on 3 legs; any of various feet can be selected to match seafloor characteristics, and when push coring is needed, active suction anchors providing 10 tons of upward resistance can be installed; 3000 V is supplied from the ship to a seafloor hydraulic power pack that through a diaphragm system is not compromised by ambient hydrostatic pressures. A robotic arm is used to select pipes or drill rods stored in 2 vertically oriented carousels. Current plans call for carousels that carry enough material to drill to 154 mbsf; this could be adjusted in the future. Seawater is pumped to the bit face to cool and clear the bit in rotary mode; pan and tilt video plus still cameras will be used to monitor performance at the seafloor, and water turbidity will be minimized by piping the circulating fluids to a foot on one of the legs. The drill pipe is rotated with a Longyear topdrive at speeds up to 2000 rpm and producing roughly 100 hp; push coring can be expected at 1 m/sec. Core recovery will be measured by pressure differential at the top and bottom of each core barrel as it is placed in the carousel, though this can't be verified until the entire carousel is unloaded at the sea surface. Other 'on-board' sensors will monitor bit torque, drill inclination, hydraulic pressure, voltage, amperage, and motor winding temperatures. Core positioning could be aided by transponder navigation, though that is not yet part of the system; three independently controlled thruster propellers are at the top of the device. Future modifications may include: N- and H-size drill pipe (yields unlinered cores with diameters of 1.875 and 2.5 inches, respectively; current design is B-size with core diameter of 1.432 in), 6000 m water depth operation, Core Penetrometer technology (CPT), logging; pressurized core barrel sealed at the seafloor, and wireline core retrieval enabling faster coring (current design requires complete trip of drill rods to bit face with each core) and deeper penetration (to 150+ mbsf). Shop tests show that to make, break, and store a core pipe takes the robotic system about 30 seconds. Current estimates are that rotary drilling to 100 mbsf will take 30 hrs of bottom time; piston coring to that depth might be 1/2 to 1/3 that time. Deployment and retrieval times must be added, as well as turn-around time of emptying a carousel and readying the next deployment. A second, empty carousel of core pipe, if constructed, could be swapped in with about 1 hours' time.

Testing has thus far has been as follows: drilling through the shop floor has shown the system functions on dry land. Several tests in Sydney harbor (up to 15 m water depth; roughly 8 m harbor mud overlying crystalline rock) has achieved nearly 100% recovery after washing through 6 m of mud and drilling several meters into rock. The first open sea test is slated for mid-winter at shelf depths in the Timor Sea on an industry vessel. J. Austin is planning to participate in the test cruise.

Davies then showed a short video of the PROD doing test drilling in the workshop and in Sydney Harbor. He fielded questions. Logging? soon to be incorporated; oil companies are very interested in the standard suite of slim line tools. Monitor core recovery while drilling? feasible, but not in the current design; plans call for measuring amount of material in a barrel using pressure sensors on the seafloor, presumably as a completed core is set back into the carousel and a fresh barrel is made up. Costs? a very approximate estimate of $20K/day (US), not including ship costs. Why hasn't this been done before? Holloway said many companies have tried designs similar to this for 20 yrs; for various reasons none have been entirely successful. The sophistication of the robotics in the PROD may be a large improvement over predecessors. Moran added oil company interests have until recently been in shallow water where ships were (for them) a cost-effective solution. Now moving to deeper water, oil companies are looking to the less expensive strategy of doing this kind of work from 'bottom landers'. Any pending contracts? yes, C. Goldfinger (OSU) is funded to use the PROD rock drill in ~1300 m water depths near vents off the Cascadia margin in summer '99. This will be done from the R/V Sonne. Can testing/development progress be posted on a website? yes, Davies will advise Mountain as soon as this is available.

<u>Fairbanks' Fore-Reef Drilling</u> - Rick Fairbanks was asked to describe his efforts in drilling shallow water systems. He had not been asked to give a formal presentation on drilling technology prior to the meeting, but with a few maps and diagrams pulled from his briefcase was able to provide a very informative overview. He began in 1985 working with Williamson & Assoc. and drillers from eastern Canada exploring ways to enhance recovery from shallow (~100 m) drillholes into Quaternary reefs. Bottom lander designs such as precursors to PROD were evaluated but discarded in favor of a 4-pt anchoring

system that used a standard mobile drill rigged on a ship or barge. A lot of trial-and-error work went into bit selection. He successfully joined advantages of coal mining bits with wireline coring techniques familiar to the oil industry, but continued to be plagued by bit jamming when drilling hard coral fragments within softer formations. The technique that has evolved over the years is a heave-compensated Longyear drill on an anchored vessel. 6-ft swells can be tolerated with little problem; Fairbanks thinks operations could continue with reasonable core recovery to 9-ft swells. Anchoring is feasible to roughly 115-m water depths, using the current 1.5-inch anchor cable, each 3000-m in length. API pipe is used for a riser; the ship's fire control system is used for downhole fluid circulation; mud can be used if needed. The whole system is 'off-the-shelf' wireline technology with heave compensation and coal industry bits. Drilling costs are roughly $10K/day (US), not including ship time. As a rough guide, drilling proceeds at 4-5 m/hr; cores are retrieved with every 3 feet of advance. A 100-m hole can be completed in approximately 2.5 days; roughly half this time is spent deploying and retrieving the anchors. One of the special needs for this type of drilling is an assortment of pre-drilling bathymetric surveys. Ample space for setting anchors is mandatory, and wind and wave directions are important considerations in choosing the proper location. While cantilevered systems with the drill rig over the side can be used, center-well locations are preferred for drill bit stability and ship's maneuvering. A moon pool 1-ft square is adequate. Fairbanks suggested that with appropriate modifications (anchors + winches, instrument well adaptations) the Knorr or Melville could be suitable platforms from which to work.

Commercial Survey - Leon Holloway completed the mornings' technical overview with a thorough summary of the tools used by industry. He had distributed a 160-page technical manual prior to our meeting, and all panelists followed in their copies as he outlined dimensions and capabilities of various drill rigs and sampling tools. Details can be found in that handout; only a brief outline is supplied here. Portable drill rigs range from those intended for 250 to 1200 m total pipe length. Often the weight of the drill pipe is more limiting than is the length; substituting aluminum pipe for steel can increase allowable lengths by 35%, but this kind of pipe is in limited supply. Each type of drill rig under discussion requires 3-4 operators per 12-hr shift. Most are containerized for shipment (with as many as 11 containers!) Most are intended for center well deployment; the smaller ones can be cantilevered. Jack-up platforms are appropriate to as much as 100 m water depths, though there is a dramatic price increase beyond 30 m. The vulnerability of jack-ups to sea state during jack-up and jack-down operations is offset by platform stability, eliminating the need for heave compensation to maintain constant weight on bit. Either passive or active heave compensation is required if drilling from a floating platform. Most of the latter are secured by 4-pt anchoring systems to roughly 100-m water depths. Beyond that, DP-equipped vessels use taught wire or bottom acoustic transponder systems. Sampling is accomplished with a variety of coring and drilling devices and techniques. The former requires a 'reaction mass' or 'seafloor template' that provides a mass to push UP against when coring DOWN into the substrate. Dimensions of these seafloor instruments dictate the size of the platform center well. Continuous coring is the exception, not the rule, in most oil field operations; even then, spot cores of 2-m length are typical. The geotechnical industry has developed sophisticated tools for measuring but not necessarily sampling engineering properties of sediments in the upper 70 or so meters. These data are generally associated with measurements by a cone penetrometer (CPT). Holloway outlined the variety of bits used by ODP in drilling hard formations that could be considered for reef rocks. Kerf ratio (core diameter vs. total drill hole diameter) ranges from roughly 0.24 in rotary core bits (RCB), to 0.55 in diamond coring system (DCS), to 0.60 in the motor-driven core barrel (MDCB). Together with alignment of cutting elements on the bit face, kerf ratio is a major factor in designing the optimum bit for a particular rock type.

Holloway provided detailed estimates of times required to sample in a range of settings. For example, in 10 m of water using a 4-pt anchor system, set up, push/piston coring in 1 m increments with wireline retrieval to 100 mbsf, and rigging down would take a total of 3.3 days. Increasing to 100-m water depths and using a standard Gulf of Mexico mudboat has little effect on the time on site, but imposes fewer choices on the type of platform. For total penetration to 500 mbsf, estimating push/piston coring to 100 mbsf as before but followed by 400 m of drilling to TD with a ROP of 3m/hr yields a total of 11.3 days whether the water depth is 10 m or 100 m.

Discussion

The panel thanked Holloway, Fairbanks, and Davies for their informative presentations. In hopes that information of this type can be available to proponents preparing shallow water drilling proposals, methods were discussed briefly for posting some of this on a web site. Follow-up discussions with managers at JOI will explore ways to do this efficiently.

View from JOI - Kate Moran was asked to say a few words about the JOI position regarding shallow water objectives. She reiterated that the Long Range Plan had always intended that alternate platforms were to be part of the ODP tool kit. She offered that the ice boats accompanying the JR into high latitudes are similar to alternate platforms because they extend drilling into regions with special technical challenge and fundamentally important scientific goals. She noted that there are already some proposals in the system requiring alternate platforms, but that as a PPG we have the opportunity to encourage the submission of more; proposal pressure will surely have a strong effect on the future allocation of resources. She feels that with sufficient scientific need and community support, money could be found during the current Phase III of ODP to drill from alternate platforms.

Action Items - The balance of Day 2 was devoted to discussing a plan of action. Eberli restated that he felt there are many scientists 'out there' who would have submitted shallow water-based drilling proposals if they had thought there was a reasonable chance that ODP would support an alternate platform. This raised the issue of our generating a Request for Proposals (RFP) that would be designed to stimulate new submissions for the March 15 deadline. Fairbanks voiced concern about the likely rate of progress in planning and executing a complex operation. He advocated our spearheading a demonstration project, small and focused, that could return samples well before the end of Phase III. He felt this would be more beneficial in the long run than gathering up a new round of drilling proposals. Davies pointed out that if we did succeed in flushing out some new proposals that we will have helped enfranchise a wider community than now feels part of the drilling partnership.

More discussion led to asking John Farrell for comment on getting an RFP prepared and advertised in time; he said the mechanics of writing one were not difficult (there are many previous RFPs to use as guides) and through EOS (expect 2 weeks between submission and publication) and his own JOI listserver the word could get out in the time needed. This would mean that we would have to write a solid statement framing the objectives of shallow water drilling and we would have to get appropriate technical information on the Web for proponents to consult. More extensive comment on the nature of shallow water issues could be placed on the Web as a PPG white paper. All of this was feasible and panelists were willing to pitch in to the help as needed, but there was not complete agreement that this alone was sufficient action.

More discussion of demonstration projects followed. We struggled with the conflict of interest issue where it may be inappropriate to place on the fast-track for demo purposes a research/drilling project that sprang from the efforts of one of our own panelists. It was finally resolved to write an RFP calling for shallow water drilling proposals of all types, to be guided by technical and white paper information yet to be posted, but with our own panelists free, in fact strongly encouraged, to participate in this enlarged batch of drilling proposals. Innovative strategies by all proponents that could be completed very soon were to be strongly encouraged. Recognizing at this point that we could all help think about these issues but that strategies for the "Role Of Tropics In Global Climate" and the "Linking Process to Architecture" themes could be different, we rearranged into two groups advocating each of these two themes. The former drew up a tentative list of 30 or so scientists who will be invited to a February workshop designed to forge a new proposal. Proposal writing, research and post-research publication will be similar to other group initiatives such as SPECMAP and COHMAP. The actual lead proponent will be selected at that workshop, and the authorship will likely include the entire group of participants. The Linkage group decided that among themselves they would prepare a drilling proposal to drill a transect across a previously well-surveyed region to examine the facies and stratal architecture of an area with little to no glacial rebound and a thick unit of mud-dominated sediment back to at least glacial stage 6. This is a time when the forcing of glacial eustasy is well known, and the impact of total subsidence, changing sediment supply, storms, and current influences could be traced across the buried record. The US shelf along the northern Gulf of Mexico is a strong candidate. Recovering sands and developing firm age control were thought to be significant but not insurmountable technical challenges.

We reassembled to discuss plans for the next few months and to compare calendars for scheduling our next meeting. We plan to post white paper science objectives on the PPG web page (to be managed by the new JOIDES office in Germany) and link to PROD and engineering data web pages pending help from Peter Davies and Leon Holloway, respectively. An RFP for shallow water drilling will be advertised shortly thereafter. Proposals that are submitted to the JOIDES office by March 15 will have a chance to be reviewed by the SSEPs in May. Though these will very likely NOT have the benefit of external mail review two months later, we can nonetheless examine any that are appropriate during a meeting in July, and this will provide sufficient time to pass comments back to the SSEPs so that their recommendations to SciCom could be reasonably complete by the August meeting of the latter. Hence we tentatively targeted early July as the time of our next meeting; Jeroen Kenter agreed to act as host in Amsterdam.

We adjourned shortly after 5 pm.

Appendix I

Many science organizations have interests similar to ours and share our concern for exploiting existing drilling technologies. Hence we agreed that the activities of the following would be tracked by the panelists named for each, and look forward to updates from these individuals at our next meeting. They are:

CLIVAR	Tudhope
CORSAIRE	Bard
ICDP	
IDEAL	
MARGINS	Eberli
MESH	
NAD	Mountain
PAGES/IMAGES	Kenter
ARTS	Quinn
PRESCIENT	Tudhope
SHALDRIL/ANTOSTRAT	Mountain
STRATAFORM	Fulthorpe
COMPLEX	Austin