WOODS HOLE OCEANOGRAPHIC INSTITUTION

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Drs. N.O. Eguchi & J.D. Schuffert
iSAS Office
2-15 Natsushima-cho,
Yokosuka, 237-0061,
JAPAN

Re: Proposal No. 631-Pre - Global siting plan for borehole geophysical observatories in the International Ocean Network

Dear Drs. Eguchi/Schuffert,

This is a second Response Letter to bring you up to date on our progress with Pre-Proposal No. 631. We are not submitting a full proposal for the April 1, 2004 deadline. The ION community has been active over the past year in planning and pursuing funding for installing broadband seismometers in existing holes and in coordinating long-term planning and standards with the new permanent seafloor observatory initiatives (DEOS/OOI/ORION, GEO, etc). See the figure below for a summary of the recommended ION sites for global seismic coverage and their relationship to other potential observatory sites.

At and since the ORION meeting in San Juan in January two things have become clear: 1) that it will be many years before even a small number of ION sites are occupied by ORION style permanent real-time observatories and 2) because of cost and the multi-disciplinary requirements for ORION installations, many ION sites may never be serviced with real-time observatories. In the interests of keeping the ION dream alive, I think that there continues to be a requirement for autonomously recording, seafloor borehole seismic stations similar to the system that was deployed on the OSN Pilot Experiment (ie wireline deployed and serviced).

Although some of the ION objectives could be met by deploying arrays of seafloor or shallow buried OBS's in "big foot" style experiments (leap frogging across the ocean basins with arrays that record for two or three years at a time), there will continue to be the issue of the quality of the seafloor or shallow buried data at short periods as we learned on the OSNPE [*Collins et al.*, 2001; *Stephen et al.*, 2003; *Sutherland et al.*, submitted]. It does not make sense to have a hiatus in broadband borehole seismic work while we wait for ORION sites.

As a practical matter it seems reasonable to pursue a staged implementation plan for ORION sites. At the ORION sites that are targeted for meeting ION objectives, autonomous borehole seismic stations should be deployed for a year or so, prior to installing the ORION infrastructure. As we know there are many logistical reasons as well as just plain bad luck that

lead to sub-optimal seafloor seismic installations. It makes sense that we should be able to demonstrate that a seismic installation is providing valuable, high quality data before committing to a high cost real-time acquisition system. (This is the plan that is being followed with the four broadband borehole seismic installations in the Western Pacific and Japan Trench [*Araki et al.*, in press; *Suyehiro et al.*, 2002]. The systems are installed in an autonomous recording fashion while their data quality is being evaluated. The option of linking these sites to cables for real-time acquisition is left open for a second stage.)

As part of the second phase of the OSN we already have some borehole sites that were drilled specifically for seismic stations. The Ninety-East Ridge site is planned for a joint Japanese/French installation that would most likely be autonomous recording, but could be targeted for a real-time system. At the Equatorial Pacific site, an autonomous recording system would be an excellent idea for the intermediate term to evaluate the data prior to considering it as an ORION site. There might even be arguments for deploying an autonomous recording station at H2O, while the cabled aspects of the observatory get sorted out. The mid-Atlantic site could also use an installation.

At the ION Steering Committee meeting at Mt Fuji in January 2001 [*Kawakatsu*, 2001] it was recommended that the highest priority for ION sites was in the Southern Ocean (say between 30ºS and 60ºS). Since this is a region of notoriously bad weather we hope that the ability to maintain drilling operations in high sea states will be an important specification for the new riserless drilling vessel. In addition to weather concerns other factors that will go into ION site selection are: 1) ray density for tomographic coverage [*Wysession*, 1996], 2) the chances of ships of opportunity for servicing sites in the long term, 3) ancillary science goals, and 4) site survey and prior drilling data.

It is worth noting that this pre-proposal focused specifically on sites to complete "uniform global seismic" coverage. Although supported by the ION community boreholes for test facilities, for non-seismic objectives, and for regional and local seismic objectives were not addressed.

Yours sincerely,

Ralph Stephen

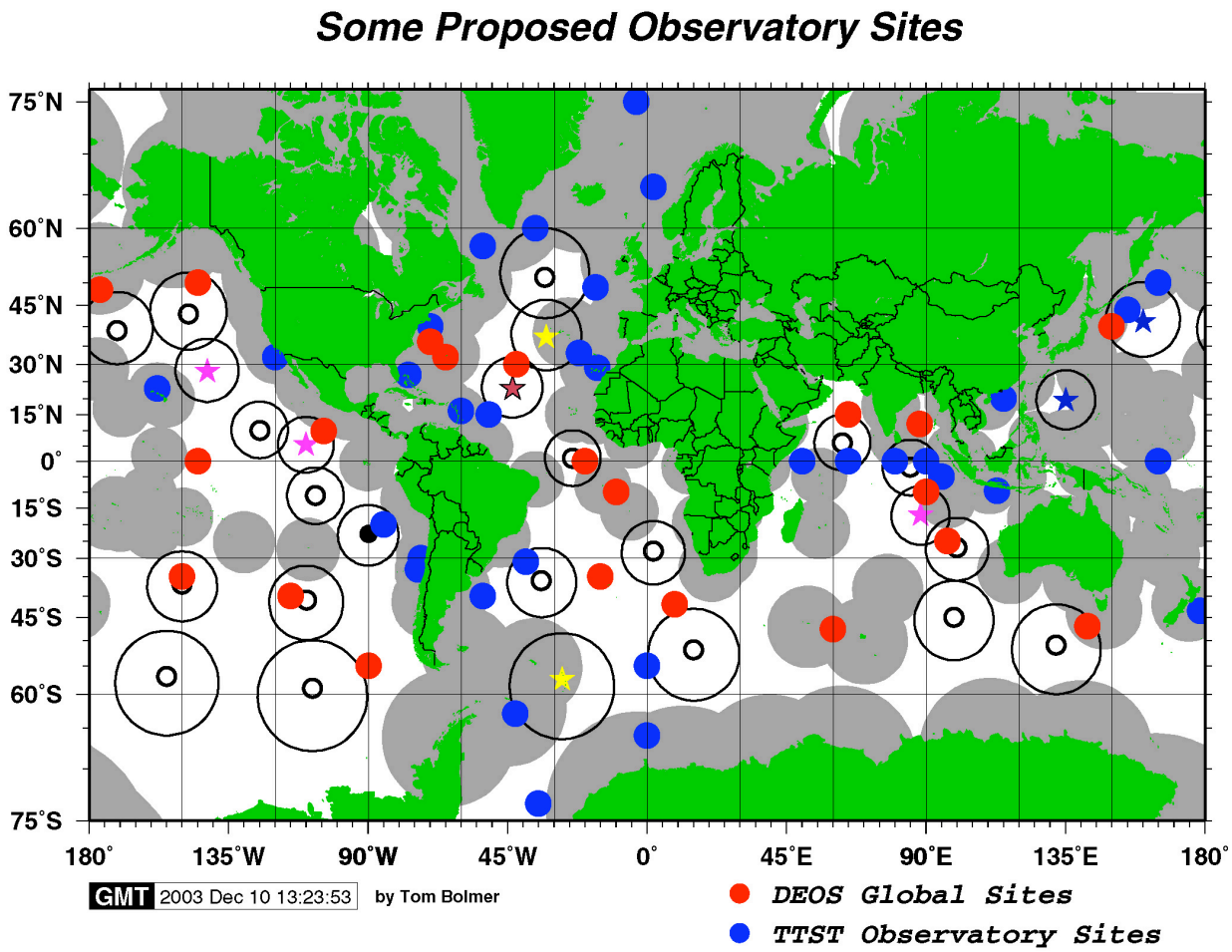

Figure 1: This figure summarizes the role of ocean borehole sites in global seismic coverage. The grey shaded regions indicate the surface coverage out to 1000km from continent and island stations. (These are distorted in the projection.) White spaces are gaps in the land based coverage. Existing and proposed ocean stations for global coverage are indicated by symbols surrounded by black circles at approximately 1000km radius. The different symbols show different levels of progress at the ocean sites: red star - the Mid-Atlantic Ridge test site (the OSNPE and Japan Sea regional test sites are not shown), blue stars - presently operating borehole observatories (the Japan Trench regional sites are not shown), maroon stars - sites at which boreholes have been drilled but have not yet been instrumented, solid and open black circles - high priority ION sites proposed in 1996 but not yet drilled and yellow stars - other proposed sites which have not yet been drilled [*Butler*, 1995; *Purdy and Dziewonski*, 1988; *Stephen et al.*, 2003]. The blue and red dots are observatory sites taken from Appendix E (TTST Observatory Sites) and Table 3-1 (DEOS Global Sites) in the Ocean Studies Board Report, "Enabling Ocean Research in the 21st Century: Implementation of a Network of Ocean Observatories" (2003, Chaired by Bob Detrick). (Some of the DEOS Sites are also TTST Sites.)

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