

## **MoHole proposal meeting**

**Minutes compiled by Katsuyoshi Michibayashi and Benoit Ildefonse**

**DATE:** Saturday 4 and Sunday 5, February

**PLACE:** JAMSTEC Office, Tokyo

**Participants:** Natsue Abe, Norikatsu Akizawa, Ryo Anma, Toshiya Fujiwara, Takeshi Hanyu, Yumiko Harigane, Benoit Ildefonse, Peter Kelemen, Jun-Ichi Kimura, Shuichi Kodaira, Hidenori Kumagai, Katsuyoshi Michibayashi, Makoto Miura, Tomoaki Morishita, Toshio Nozaka, Yasuhiko Ohara, Tetsuya Sakuyama, Takeshi Sato, Nobukazu Seama, Eiichi Takazawa, Damon Teagle, Susumu Umino

### 1 Introduction

Natsue Abe and Benoit Ildefonse briefly introduced the meeting by summarizing the context for the submission of a new MoHole proposal to IODP on April 1<sup>st</sup>, 2012. A draft was produced last September, but it was decided to postpone the submission, to allow more time to revise the scientific objectives. A meeting was organized last December in San Francisco to allow co-proponents and interested scientists who attended AGU to discuss this, and the need to submit a MoHole proposal at this stage, following the Kanazawa and Washington workshops in 2010. This meeting in Tokyo was organized to discuss in details the contents of the proposal, and organize its revision.

### 2 Proposal leadership

Before revising the scientific objectives of the proposal, the meeting participants discussed the composition of the lead proponent team for the MoHole proposal, who will coordinate the proposal writing, and also serve as representatives for the larger proponent group. They agreed that this team would be composed of Susumu Umino (Kanazawa University, Japan), Benoit Ildefonse (CNRS & Montpellier University, France), Peter Kelemen (Columbia University, USA), and Damon Teagle (NOC Southampton & Southampton University).

After the meeting, these lead proponents proposed, after additional communication by email, to add Shuichi Kodaira (JAMSTEC, Japan), Katsuyoshi Michibayashi (Shizuoka University, Japan), and Tomoaki Morishita (Kanazawa university), to the lead proponent team.

### 3 Update on Site Survey (Kodaira)

Shuichi Kodaira presented a brief update on the site survey plans by JAMSTEC. A 4 Legs cruise (1 month each) was originally scheduled to start in December 2011, to conduct seismic survey of the region offshore Baja California + 1 week on the Cocos plate. This cruise has been postponed following the Tohoku Great Earthquake in March 2011, as the Japanese oceanographic fleet schedule was reorganized to implement a series of fast-response scientific cruises. Kodaira explained that MoHole-dedicated site survey will be back on the schedule in fiscal year 2013, but the ship time will be less (~2 months) than originally planned. The revised plan is now to conduct site survey in the region North of Hawaii. Kodaira-San will coordinate this with the seismic survey proposal submitted to NSF by Greg Moore (University of Hawaii).

It is clear that additional site survey activity in the Eastern Pacific will require international collaboration and funding (ship time in particular).

### 4 Discussion on proposal contents.

Using the latest version of the proposal produced by Ildefonse et al. in September 2010, the meeting attendees discussed in details its contents section by section, and agreed on a revised version, which is summarized below:

- The executive summary at the beginning of the proposal is useful and should be retained. It will be revised to better outline the revised scientific objectives.
- The 1<sup>st</sup> section (primary motivation for the MoHole) needs to focus on the primary objective (see below), which is to attain and sample fresh, in-situ mantle.
- Section 2 (Road to the MoHo) is useful to place this proposal into its

historical context. However, it could be shortened or deleted if additional space is needed to best develop the scientific objectives.

- Section 3 (Scientific Objectives) needs to be reorganized to better emphasize the priority target (i.e., sampling the fresh convective mantle) and related science goals. This section will contain (in that order) subsections on 1) sampling fresh Earth's residual mantle (composition, heterogeneity, missing component of the carbon and other geochemical global cycles), 2) understanding the geological meaning of the seismic layering of oceanic lithosphere, and of the Moho in particular, 3) testing crustal accretion models/processes and documenting the (primary) composition of the igneous crust (i.e. the link between MORB and mantle chemistry), and 4) documenting hydrothermal cooling and alteration of the lithosphere (how deep, how vigorous?), and probing the limits and controlling factors of life.
- Section 4 (Technology requirements and operations) will be revised to account for detailed comments on the compared merits and disadvantages of the three regions of interest (as defined at the 2010 Kanazawa workshop). The bottom line is that the proposal must be equally fair to the three possible site areas, and primarily emphasize the need for additional site survey (see also the minutes of the Dec 2010 San Francisco meeting). The choice of the appropriate site, and subsequent start of MoHole operations are likely still several years ahead; some site characteristics that are now perceived as major drawbacks may become less problematic in the near future, as drilling technology improves. For instance, the current perceived water depth limitation (~4000 to 4500 meters) could become obsolete in the future (use of lighter pipe/riser, seafloor recirculation system?). The proposal at this stage must remain opened to other possible areas of interest, possibly in deeper water (i.e., in colder lithosphere) pending on technological development.
- Section 5 summarizes the technology and engineering development for the MoHole. The urgent need for scoping (with close collaboration between engineers, drilling/coring/logging/casing/mud specialists, and scientists involved in the project) will be reiterated. This implementation

information should be shortened to a table.

- The short, last section (Keys for success) is important to remain that, based on scientific grounds only, continuous coring is the preferred solution to fully address the MoHole scientific objectives. However, spot coring can be considered, with coring on targeted key intervals. Significant length (100's of meters) of continuous cores across major lithologic and geophysical transitions is critical.

## 5 Proposal title

We briefly discussed again the title of the proposal, and the use of "MoHole", as an explicit reference to the pioneer project initiated by Walter Munk, Harry Hess, and other members of the AMSOC in the late 1950's. It is felt that "MoHole" has now a momentum, as the proponents have consistently used it since the Mission Moho workshop in 2006 (see workshop and subsequent articles and proposal). "MoHole" is also appealing to Japanese colleagues as phonetically it can be translated as "digging to the MoHo". The term "mantle" should also be used in the title.

## 6 Proposal writing

Following the meeting, Benoit Ildefonse is coordinating the writing stage. A first draft of the first version will be edited and completed by a limited number of co-proponents (Teagle, Kelemen, Umino, Kodaira, Abe, Michibayashi, Morishita, Seama, Hauri, Schrenk, Nakamura). We anticipate circulating a complete draft version to all co-proponents in March, to finalize the proposal in time for the April 1<sup>st</sup> deadline.