

ECORD/ICDP/DCO/JAMSTEC/J-DESC MagellanPlus Workshop Series Program

Advancing Subsurface Biosphere and Paleoclimate Research

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The workshop entitled: “Advancing Subsurface Biosphere and Paleoclimate Research” took place in Seoul, S-Korea August 21-23, 2014, directly before the International Society for Microbial Ecology (ISME) meeting, also in Seoul. Twenty-eight junior and senior scientists with experience in the geomicrobiological components of the IODP, ICDP, DCO and IMPRESS (the successor of IMAGES) programs representative of the global community of subsurface microbiology, participated in this workshop and, for the first time, were able to speak with one solid voice. The idea for this workshop was developed during the Chikyu+10 workshop in April 2013 but has roots in many workshops, meetings and discussions over the last several years. Since the Chikyu+10 workshop, the idea to have a community discussion on standard protocols for microbiological drilling, sample handling and long-term sample storage developed and broadened rapidly with the interest and support of ICDP and DCO. Timing was important for these discussions since IODP, ICDP and DCO are at the beginning of new 10 and 5 years science plans with large geomicrobiological and paleoclimate components.

The overall aim of our workshop was to develop shared sampling and long-term storage strategies partly based on already existing white and scientific papers and to implement these strategies through standardized protocols for all drilling platforms, i.e. “traditional drilling” with the JOIDES Resolution, Chikyu and MSP/ICDP platforms. A decision was made during the workshop planning to expand the goal for standardization to much less expensive seabed drilling and long piston core operations from additional research vessels.

Initial workshop discussions were mainly dedicated to providing background information on the current state of deep life components and organic proxy-based paleoclimatology within long-term scientific plans for IODP, ICDP, DCO and IMPRESS. In addition, presentations on subsurface microbiology and organic proxy-based paleoclimatology highlighted the benefits of conducting geomicrobiological and paleoclimate research by acquiring high quality microbiological samples, even when the expedition may focus on other scientific disciplines. At the end of the first day and the start of day two, virtually all participants gave short 10-15 minute talks to present their research activities with an emphasis on the requirements for drilling and handling of samples for their specific research. The presentations emphasized the key aspects of pre-drilling, drilling, on-board sample handling, in-repository sample handling and long-term

storage. Topics included sample frequency, contamination checks, core flow, geochemical measurements, cell enumeration, sample archives, data submission, staffing needs, education and communication with other scientific disciplines. By the end of day 2 it became clear that a communication gap between the scientific drilling community and biosphere researchers is inhibiting progress. Therefore, to help develop and implement a feasible set of standardized protocols for microbiological drilling, sample handling and long-term storage, the workshop participants first suggested a three level approach to improve the expectation of biological research for upcoming expeditions. Where possible, we took into account the diversity of drilling operations, i.e. “traditional” drilling, seabed drilling and long piston coring. The levels suggested are as follows:

Level 1 - expeditions with little to no geomicrobiological components.

Expectation: microbiologist on board, low frequency core sampling, no on board contamination checks. Proposals listed at this level will not receive support from biosphere community to improve rank when evaluated.

Level 2 - expeditions with a modest geomicrobiological component.

Expectation: microbiologist on board, more frequent core sampling on board, on-board contamination checks, limited geochemistry. Proposals listed at this level will receive some support from biosphere community to improve rank when evaluated.

Level 3 - expeditions with a significant geomicrobiological component.

Expectation: microbiologist(s) on board, frequent core sampling, full on board contamination checks, on-board cell counting, extended geochemistry, on board CAS freezing facilities. Proposals listed at this level will receive full support from biosphere community to improve rank when evaluated.

These levels are meant to promote proper communication of scientific expectations and requirements between expedition leaders and participants, an area that is currently plagued with misconceptions from both sides. This system will help clarifying the role and capacity of subsurface biosphere exploration on the expedition for everyone involved. Early communication during the proposal-writing phase will help guide the sample requests and expectations. The level approach was further refined through three subgroups organized based on an expedition planning and operation timeline. The groups were focused on predrilling and drilling, on-board sample processing and post-cruise legacy samples and data.

By the end of the workshop, we concluded that the recommendations and protocols defined by the three subgroups were highly complementary, providing the opportunity to write a full handbook for microbiological and organic proxy-based paleoclimate drilling, sample processing and long-term storage. Workshop participants and experts within each discipline will assist in

writing the handbook. Once completed, the handbook should be tested at sea to determine feasibility. Additional protocols and procedures specific for different ocean and terrestrial drilling platforms, as well as within the repositories, will be included.

The workshop successfully brought together an energetic and knowledgeable group that worked efficiently toward our goal of improving subsurface biosphere exploration. A clear path has now been set. We look forward to seeing our suggestions implemented in the near future.