Report of the IODP-MI QA/QC Task Force

(9/12/07)

Introduction

The Quality Assurance/Quality Control (QA/QC) Task Force has established the framework for IODP shipboard and shore-based QA/QC laboratory procedures, as recommended by the IODP Science Advisory Structure (SAS).

Task Force Vision

The IODP QA/QC Task Force seeks to establish policies to ensure that the highest quality data possible are produced on all IODP platforms and at associated shore-based facilities. These policies will define guidelines for establishing traceability of measurements and observations, documenting procedures, recording results, and determining uncertainty for all data generated by IODP.

Mandate

The QA/QC Task Force establishes the framework for QA/QC procedures for measurements and observations made on all IODP platforms and at shore-based facilities, and the SAS structure and implementing organizations (IOs) monitor the success of the implemented QA/QC framework. The Task Force also defines the QA/QC guidelines to be followed by the IOs for at least the IODP minimum and standard measurements and observations across the full range of disciplines (e.g., geochemistry, petrophysics, microbiology, core description, logging, etc.), including but not limited to the following:

- Establishing general policies for capturing all relevant QA/QC data and metadata;
- Establishing general policies for ensuring quality of data across all IODP platforms and expeditions and including shore-based laboratories (e.g., that all data generated by IODP platforms/laboratories are traceable);
- Establishing a general policy that, where practical/appropriate, reference materials be used and their data captured;
- Establishing general policies for data transfer and integrity protocols to ensure quality control of the IODP databases;
- Recommending that the IOs develop and implement protocols for performing calibration, determining uncertainty, and ensuring traceability in all IODP measurements and observations, and that the IOs report these protocols to the Science Technology Panel (STP) for review; and
- Recommending that the IOs develop digital dictionaries/databases (e.g., micropaleontology, lithologic terminologies, timescales, etc.), along with protocols for maintaining them.

Proposed Implementation Plan for QA/QC in IODP

The Integrated Ocean Drilling Program seeks to ensure that the highest quality data possible are produced on all IODP platforms and at associated shore-based facilities. To achieve this requires traceability of measurements and observations, documentation of procedures, recording of results and all associated metadata, and

estimation of uncertainties and quality for all data generated by IODP. The success of the QA/QC process is a shared responsibility between the IOs and the scientific community.

Here we propose a strategy and means for implementing QA/QC across IODP.

- Each IO will have a set of predefined (baseline) QA/QC guidelines relating to a specific platform and scientific objectives.
- Each IO should have a suite of relevant dictionaries/catalogs (digital or otherwise) available for the science party prior to each expedition (e.g., micropaleontology, lithologic classifications, timescales, etc.), and it should be clear which are being used on any given expedition.
- The responsibility for generating expedition-specific QA/QC protocols and resulting data, where appropriate, falls jointly to the IO and the scientific party (defined here as the Expedition Party). This also includes third-party tools.
- IODP-MI and SAS will provide the means for reviewing all expedition QC results through the existing Operations Review Task Force (ORTF)/SAS structure and will amend protocols as necessary.
- IODP-MI and STP will provide the means for reviewing the QA/QC procedures across platforms and for long-term monitoring of QA/QC for individual platforms.

Consequently, an Expedition Party needs to generate expedition-specific QA/QC documents for that particular expedition.

1. For each expedition:

Although each IO will have a set of predefined (baseline) QA/QC guidelines relating to a specific platform and scientific objectives, planning of expedition-specific QA/QC should begin at the earliest opportunity. This planning can start at the proposal stage, and scientists should familiarize themselves with the existing procedures and propose recommended changes to the QA/QC process to maximize the quality of the data acquired during an expedition. SAS (e.g., Science Steering and Evaluation Panel [SSEP], STP, Engineering Development Panel [EDP], and Science Planning Committee [SPC]) involvement will underpin the QA/QC process.

    a. Prior to or at the beginning of each expedition, co-chiefs/staff scientist should identify lead contributors from Expedition Party, based on individual expertise, to work with IO staff identified by IO management to plan any expedition-specific QA/QC activities and requirements.
    b. The IO will provide access to the following QC results, where applicable :
        i. Calibration of instrument(s)/tool(s)
        ii. Use of standards for absolute calibration and drift characterization
        iii. Repeatability of method (defined by QA above)
        iv. Precision and accuracy

c. Each Expedition Party will:
    i. Include QA/QC procedures and protocols that were followed in the "Methods" chapter of the Expedition Report
    ii. Document deviations from routine analyses with reasons for change to measurement procedures and strategies
    iii. Highlight successes where extraordinary
    iv. Highlight problems and where possible and propose changes
d. The IO will provide the following long-term QC results:
    i. Routine QC data across multiple expeditions
    ii. Reporting to the SAS on implementation of changes proposed as a result of previous QA/QC results

To facilitate the above points the Task Force proposes that the IOs develop a common questionnaire form or QA/QC template with some generic structure, but also specific measurement content.

2. We propose that QA/QC reports will be reviewed at the expedition level at the ORTF meetings, where improvements to current protocols can be proposed; this needs to have some STP involvement (as proposed and accepted at STP San Francisco Dec 06 – 0612-11).

3. We propose that STP review/synthesize cross-platform QA/QC issues, using input/output to (2.) and propose changes for implementation to IODP-MI/SPC in the following areas:

    i. Monitoring of similar measurements and observations across platforms
    ii. Long-term monitoring of similar measurements and observations on same platform across different expeditions

4. In order to take full advantage of this STP input, we propose that feedback from the QA/QC process be collected through a variety of routes:
    a. The QA/QC process builds on best practices in providing short-term immediate feedback to the IOs both during and at the end of each expedition, enabling assessment of performance and implementation of improvements.
    b. Feedback to the Expedition Party from the IO can be achieved through the postexpedition science meeting.
    c. Feedback to the larger IODP science community about improvements and successes should be achieved through existing formal reporting mechanisms through the inclusion of QA/QC as part of each regular report from the IO to STP.

ADDITIONAL ISSUES:

Third-Party Analytical Tools

Third-party analytical tools are subject to QA/QC criteria as defined in this document. The Third Party Tools policy should be amended to add QA/QC requirements to the acceptance criteria.

Time Stamps

Critical sample handling processes (e.g., "core-on-deck," splitting, sampling, analysis, etc.) need to be time-stamped. In addition, core/sample status at time of analysis (e.g., wet/dry) needs to be recorded with the time stamp. For this reason, IOs are encouraged to adopt a clear timekeeping policy so that time-stamps can be accurately made.

Digital Dictionaries/Catalogs

Although the IOs are responsible for maintaining dictionaries, scientific oversight of their content is also an important issue. We recommend that IOs collaborate on the consistency of these dictionaries. This can be facilitated by creation of working groups such as the Paleontology Working Group. Updates to digital dictionaries/catalogs should also be time-stamped.

Contamination Testing

It is critical that the baseline environment be documented in order for contamination to be identified/characterized and minimized. This is important not only for many geochemical and microbiological measurements conducted on drilling platforms and in shore-based laboratories but also for long-term sample storage. This ranges from simple procedures (i.e., running preparation blanks samples in chemistry analyses) to more complicated protocols for organic chemistry and microbiological science (e.g., perfluorocarbon tracer [PFT], natural chemical and/or molecular tracer[s]). The baseline environment at the time of measurement is critical for properly interpreting measurements, and the measurement of this environment should be time-stamped, as should the subsequent sample analysis. Such baseline data are particularly important for microbiological science, especially for deep consolidated sediments and rock samples, in which biomass and activity is expected to be lower than these in drilling fluids. Importantly, the contamination by circulation of mud during *Chikyu* riser drilling is a cause for concern in terms of negatively impacting microbiological science objectives. Development of new drilling technologies and/or sample processing techniques that minimize the effects, and allow the quantification of, such contamination need to be explored.

Responsibilities

- Accomplishing a high standard of QA/QC within IODP requires adequately trained IO staff.
- It is the IO responsibility to inform the Expedition Party of QA/QC protocols and procedures and to ensure that relevant documentation is made available to the Expedition Party.
- It is the responsibility of the expedition scientist involved in gathering data to ensure that procedural changes are sufficiently documented.

Flagging Data Violating QC Parameters
The QA/QC Task Force identifies the need to flag data in the database that violates the QC parameter range of a given measurement. If possible, such flagged data should be examined by the Expedition Party during a given expedition to establish the reason(s) for the deviation.

Saving Raw and Processed Data
Where appropriate and practical, the IOs should retain and archive both raw and processed data, thus enabling reconstruction and reprocessing of legacy data.

Cross-Platform QA/QC Comparison
To facilitate comparison of QA/QC across different platforms, the use of common standards is advised. IOs are encouraged to collaborate toward achieving this goal. The ability to compare and contrast data from different platforms raises the issue of the data moratorium. Permission may be required to access QC data as well as sample data within the moratorium period.

Appendices:
1. Glossary
   http://www.iodp.org/acronyms/
2. Minutes of meetings
   http://www.iodp.org/qaqc-taskforce
3. Membership of QA/QC Task Force
4. Individual Query Forms

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