D/V *Chikyu*
Standard Measurements Policy

(Ver. 6; July 2015)

A. Standard Measurements

Chikyu standard measurements are those that are collected on all *Chikyu* IODP riser and riserless expeditions if practical for the material being drilled or recovered. Data from standard measurements are critical to long-term IODP and *Chikyu* science, regardless of scientific or operational purposes of an expedition. Deviations from standard measurements should be identified in the Scientific Prospectus. In addition, the Center for Deep Earth Exploration (CDEX), as operator of *Chikyu* may require additional measurements to meet safety requirements and protocols. In the case of riserless drilling, *Chikyu* will follow the standard measurements of the *JOIDES Resolution.*

1. Core Characterization Measurements

These measurements are made on cores or subsamples from cores. They are grouped in whole round and split round measurements. Split rounds are separated into working halves (WH) and archive halves (AH). AHs are for non-destructive observation and measurements, while WHs are open for all sampling and analysis.

Whole round core measurements

Non-destructive

- Natural Gamma Ray (NGR)
- Gamma Ray Attenuation (GRA)
- Magnetic susceptibility (MS)
- Non-contact Resistivity (NCR) (sediments)
- P-wave Velocity (PWV) (sediments)
- X-ray Computed Tomography (CT)
- Borehole depth scale

Destructive

- Pore water chemistry (or GRIND)
- Thermal conductivity (TC)
- WR Deep biosphere samples (DeepBIOS)

Split core measurements

Non-destructive

- Digital imaging (AH)
- Reflectance spectroscopy and colorimetry (AH)
- Thermal conductivity (hard rock; WH)
- Visual core description (AH)

Destructive

- Moisture and density/porosity (MAD; WH)
- *P*-wave velocity (hard rock; WH)
- Smear slides and/or thin sections (AH/WH)
- Carbonate analyses (WH)
- Bulk carbon-nitrogen-sulfur (CNS) analyses (WH)
- X-ray fluorescence (XRF: major elements in hard rock; WH)

2. Downhole Logging and Measurements

Performed either by logging while drilling or by wireline (availability of logging services subject to budgetary constraints).

- Natural gamma ray
- Resistivity
- Leak-off test (LOT; riser drilling only)

3. Cuttings measurements

- Visual cuttings description
- Cuttings smear slide and/or thin sections
- Mud gas monitoring – hydrocarbon

4. Drilling mud measurements

These data are mainly collected by the mud engineer (service company), and are available upon request,

- Mud component
- Specific gravity (s.g.)
- Acidity or alkalinity (pH)

5. Rig Floor Measurements

These data are collected in real-time by the drillers. Data are available upon request.

- Driller's depth
- Heave compensation
- Weight on bit
- Penetration rate
- Torque

- Mud pressure
- Pump rate

B. Optional/Supplemental Measurements

These measurements are defined as additional measurements that may be needed for expedition objectives, and are conducted where possible and scientifically justified. These will be outlined in the *Scientific Prospectus* for each expedition, available online 6-9 months pre-expedition. Be aware that these may require 3rd-party tools or specialists within the science party.

1. Core measurements

- Core logging
    - Natural remnant magnetism (NRM) with step-wise demagnetization (AH)
    - Whole rock elements and mapping by XRF-CL

- Cluster analysis

  A set of destructive measurements performed on samples from the interval next to all WR pore water samples or residue of squeezed WR pore water samples as cluster analysis.
    - MAD
    - XRD
    - XRF
    - Carbonate analysis
    - CNS analysis

- Biostratigraphy
- Anhysteretic Remanent Magnetization (ARM) and Isothermal Remanent Magnetization (IRM) with step-wise acquisition and demagnetization
- Shear strength
- Cell counts
- Contamination testing
- Microbial activity measurements using radiotracers
- Whole rock major (sediments) and trace elements (sediments and hard rock)*
- Rock maturity analysis*
- X-ray diffraction (XRD) bulk mineralogy *
- Micro-imaging (Scanning Electron Microscope) *
- Headspace gas and void gas analysis*
- Particle size analysis*
- Close-up photography*
- Infrared observation
- Resistivity
- P-wave velocity (sediments)

Also applied to cuttings

2. **Downhole measurements**
    - Nuclear magnetic resonance
    - Sidewall coring
    - Pressurized fluid/gas sampling
    - Borehole temperature
    - Formation pressure
    - Packer tests
    - Spectral gamma
    - Density
    - Porosity
    - Sonic velocity
    - Borehole imaging
    - Borehole caliper measurements
    - Formation temperature (e.g. APCT-3)
    - Annular pressure (LWD only)

3. **Cuttings measurements**
    - Moisture and density
    - Carbonate analyses
    - Bulk carbon- nitrogen-sulfur (CNS) analyses
    - Whole rock major elements
    - Biostratigraphy

4. **Drilling mud gas measurements**
    - Methane carbon isotope
    - Whole gas mass spectrometry