



Scientific Report for IODP Expedition 386 Japan Trench Paleoseismology



Weekly Report

28th February to 6th March 2022

1. Location

D/V Chikyu, Shimizu Port, Japan

Onshore Science Party (OSP)

2. Activity Summary

The participants of the OSP have made good progress throughout Week 3, and have adjusted to the unusual circumstances and challenges of a hybrid OSP. Normal 12-hr shift working has continued for the participants on board *Chikyu*, with virtual participants lending as much time as they can to review, interpret, and enter data, and to write content for the Expedition Report.

On 28 February, splitting, scanning, analysis and sampling work continued on Hole M0085D, and the *Chikyu* team processed another 15 holes and 223.4 m of core throughout the week (see table below). Analytical activities have continued smoothly on *Chikyu*: visual core description, line scanning, RGB, color reflectance, paleomagnetism, moisture and density, and cation analysis.

Ship general safety meetings were held for both shifts on 28 February. Science Party sedimentologist Kanhsi Hsiung hosted livestream events “Chikyu Online Tour and IODP EXP386 Introduction” to 50 high school students in Taiwan on 2 March, and college students at the National Sun-Yat-sen University, Taiwan, on 4 March. Science Party microbiologist Kana Iitsuno disembarked on 3 March, and Science Party radiolarian specialist Takuya Itaki disembarked on 5 March. We are extremely grateful to them both for their contribution to the OSP on board the *Chikyu* – thank you Kana and Takuya! The week ended with a Sunday ship drill on 6 March.

Data continues to flow from the *Chikyu* to ESO in Europe and to remote Science Party members worldwide for quality assessment and data entry, before being shared with the entire Science Party. The Science Party are also feeding back their observations and comments to the operators and the *Chikyu* team.

This week the ESO BCR/MARUM team began processing OSP samples received from Japan (SedGC), to be shortly followed by sample processing by the ESO EPC team in Leicester (Pwave).

By 2400hrs JST on Sunday 6 March, the team aboard the *Chikyu* had split, scanned, described and analysed 223.4m of core up to hole M0090D. The remote Science Party had further described 84 core sections from M0091 A,B,C,D and M0090 A,B, and entered the final descriptions into the DIS. The remote Science Party members have continued working with the new OSP datasets in parallel with the existing offshore datasets, and are busy producing written content for the Expedition Report.

3. Activities for Next Week (28th February to 6th March)

The *Chikyu* team will continue splitting, scanning, describing and sampling cores from holes M0093A and M0093B, along with further paleomagnetic measurements. Remote participants and ESO staff will continue to update offshore VCD descriptions, analyse offshore and OSP data, and continue Expedition reporting. OSP geochemistry and physical properties measurements will continue at BCR/MARUM and EPC Leicester.

4. Current Status

Hole	Total Core Length (m)	Split Core Described (m)	No. Samples Collected
M0084A	0.95	0.95	8
M0084B	19.94	19.94	91
M0084C	0.46	0.46	8
M0084D	35.43	35.43	168
M0084E	0.5	0.5	10
M0084F	38.77	38.77	219
M0085A	0.72	0.72	8
M0085B	18.31	18.31	82
M0085C	0.43	0.43	8
<i>Rows above from Week 2, included here with number of samples collected for completeness.</i>			
M0085D	33.69	33.69 (17.59 on 28 Feb)	192
M0091A	0.84	0.84	8
M0091B	19.22	19.22	89
M0091C	0.77	0.77	8
M0091D	31.12	31.12	146
M0092A	1.1	1.1	8
M0092B	30.7	30.7	133
M0092C	0.785	0.785	6
M0092D	36.205	36.205	155
M0095A	0.895	0.895	8
M0095B	28.345	28.345	127
M0090A	1.145	1.145	8
M0090B	19.675	19.675	90
M0090C	1.075	1.075	Data to follow
M0090D	33.935	33.935	Data to follow

5. Preliminary Scientific Assessment

Onboard *Chikyu* visual core description, smear slide description, penetrometer-strength, moisture and density and paleomagnetic measurements have made very good progress this week, and by now has documented the lithology and acquired physical property and paleomagnetic data for eleven sites along the entire along-strike extent of the Japan Trench. Preliminary scientific assessment and comparison between these sites reveal consistent trends within certain along-trench segments (with variable thicknesses and absolute values of proxy data of event beds, depending on site locations of either basin center or topographic highs), but also differences in the nature,

thickness, frequency of occurrence and stratigraphic position of event beds when compared on a larger scale between the different along-strike segments of the Japan Trench.

The hydroacoustic team has completed the first report drafts for three main focus areas located in three trench fill-basin in the very south, the central part and in the northern most part of the Japan Trench (Sites M0081A-F, M0082A-D; M0083A-F, M0089A-D; and M0084A-F, M0085A-D). The high-resolution subbottom profiler (SBP) data document and will allow mapping the acoustically-transparent bodies interpreted as event beds of variable thickness and extent away from the coring sites to the whole basin scale.

The remote lithostratigraphy team has further investigated high-resolution section images and X-ray computed tomography scans to integrate the information from the onboard-Chikyu visual core and smear slide description, along with consultation of physical property data such as the Magnetic Susceptibility from the Multis-Sensor-Core-Logging (MSCL). At Hole M0083B we recovered 20 m of sediment that can be grouped into four distinct intervals. Two of those intervals (7.5-9.5 m; 13.5-19.5 m) contain thin beds (1-3 cm) and/or laminae composed of fine sand, v.f. sand, silt, and silty clay capped by coarse grained beds and or laminae composed of fine sand that fine out to silty clay from 7.5 to 5 m and 13.5 to 13 m. A fining upwards trend to silty clay continues above the laminated interval (7.5 to 5 m). The other two intervals (0-5 m; 9.5-13 m) are composed of thick structureless clay. In the laminated intervals, the physical properties are generally consistent with the lithology showing high variability between 7.5 and 9.5 m, except in the lower part of the Hole, where the magnetic susceptibility doesn't. This can be related to the fact that bioturbation and iron monosulfide staining are sparse in the lithology. In the structureless clay intervals, magnetic susceptibility, density and natural gamma show little variability. Whether the structureless and laminated intervals are related and represent thick event deposit or they represent many separate event deposits is a task that will be addressed in our post-cruise studies

The tephra specialist onboard Chikyu has observed more tephra layers in the processed cores this week. These occur as mostly thin lenticular lamina or are patchy, with only few occurrences of thicker tephra beds. Based on smear slide observation, it is found that type and color of glass shards, as well as the relative abundance of hornblende and pyroxene minerals can vary for samples taken from different stratigraphic positions and from different sites along the Japan Trench. Such tephra characteristics can be tentatively correlated between holes at a single site, whereas tephra layers are not correlated on the several 100km-scale between the sites from the southern, central and northern Japan trench.

Chikyu-based processing of radiolarian samples for preliminary radiolarian biostratigraphy is completed for 11 sites (the other 4 sites comprising mainly thick intervals of event beds as observed on the hydroacoustic and X-ray Computed Tomography data, are not analyzed). Shipboard analyses show that stratigraphic changes and events of changes in the relative abundance for three radiolarian species or species groups - *Cycladophora davisiana*, *Tetrapyle circularis/fruticosa* *Lithomelissa setosa* can be used to establish good radiolarian biostratigraphy for the cored stratigraphic succession. Preliminary results reveal that all except two investigated

trench-basin comprise stratigraphic successions spanning the entire Holocene and reaching well back into the Late Pleistocene. Only for two basins in the southern-most and central part of the southern Japan Trench (Sites M0081&M0082; and Site M0091) the lowermost part of the cored section still in Holocene in age, reveal much higher than expected sedimentation rates at these sites.

Micropaleontology sample are also being analyzed for foraminifers in the “remote” lab at the University of Central Missouri. At least 35 benthic foraminiferal taxa have been identified at M0081. These taxa occur sporadically, with no taxon exceeding 3 specimens where present. Not enough benthic specimens were found to make a determination of source depth.

The geochemical results of the available interstitial water (IW) data indicate that the South Basin sites (M0081 and M0082) have similar IW profiles, suggesting comparable rates of biogeochemical processes at both sites. Similarly, the Central Basin sites (M0089 and M0083) show comparable IW trends, although Site M83 shows slight non-steady state signals. In contrast, the North Basin sites (M0084 and M0085) display outliers in terms of organic matter degradation and diagenetic processes, and likely much higher sedimentation rates at site M0084 than at site M0085.

The Physical properties group has focused their work this week on analyzing new data being generated during the OSP of Moisture and Density (MAD), pocket penetrometer shear strength, and color spectrometry. These new data have been generated for Sites M0084, M0085, M0091, and M0092. These new results have also been integrated with offshore data from the Multi-sensor core logger (MSCL) to make initial comparisons and initial results. In addition, the group continues to analyze and present the offshore-generated data for Sites that have not yet been processed in the OSP. Preliminary science assessments are stimulated during inter-group discussion meetings with the hydroacoustics group and the lithology this discussing how patterns in the impedance and magnetic susceptibility profiles of the cores link to reflection patterns and lithology and early diagenesis, respectively.

The paleomagnetism group reports interesting preliminary results from paleomagnetic inclination, declination, and intensity profiles investigated from sites M0084 and M0085 (northern focus area) were investigated. It is found that site M0085 located on a relative topographic high, reveals a good paleomagnetic record, with potential perspectives for establishing age constraints by using paleomagnetic secular variation. Paleomagnetic records of holes from Sites M0084, located in the depocenter of the basin, are not consistent among the holes, probably due to the magnetization caused by thick mass transport deposit intercalation.

6. Figures

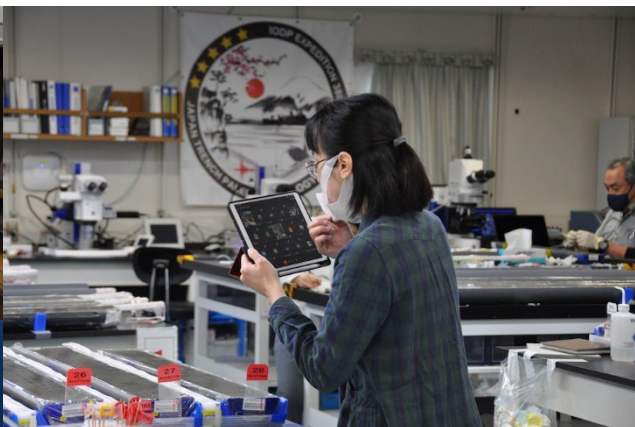


Figure 1: Number of core sections split, scanned and described aboard the *Chikyu*.

7. Photographs



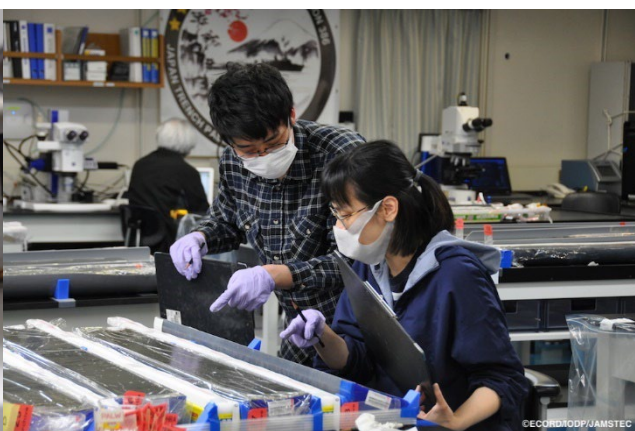
A



B



C



D

A: Samples being prepared for shipping to remote OSP labs; B: Kan-Hsi Hsiung live streaming to a high school in Taiwan; C: Splitting a giant piston core; D: *Chikyu* team conducting visual core description.