# IODP Proposal Cover Sheet

**Maldives monsoon**

<table>
<thead>
<tr>
<th>Title</th>
<th>Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proponents</td>
<td>C. Betzler, T. Luedmann, J. Reijmer, G. Eberli, P. Swart, A. Droxler, M. Tiwari, E. Gischler, C. Hübscher,</td>
</tr>
<tr>
<td>Keywords</td>
<td>Monsoon, Indian Ocean, Area, Maldives</td>
</tr>
</tbody>
</table>

**Contact Information**

<table>
<thead>
<tr>
<th>Contact Person:</th>
<th>Christian Betzler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department:</td>
<td>Department of Geosciences</td>
</tr>
<tr>
<td>Organization:</td>
<td>University Hamburg</td>
</tr>
<tr>
<td>Address:</td>
<td>Bundesstr. 55, Hamburg 20146</td>
</tr>
<tr>
<td>Tel.:</td>
<td>+49 40 428385011</td>
</tr>
<tr>
<td>Fax:</td>
<td>+49 40 428385007</td>
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<tr>
<td>E-mail:</td>
<td><a href="mailto:christian.betzler@uni-hamburg.de">christian.betzler@uni-hamburg.de</a></td>
</tr>
</tbody>
</table>

**Abstract**

The Maldives carbonate edifice bears a unique and mostly unread Indian Ocean archive of the evolving Cenozoic icehouse world. It has great potential to serve as a key area for a better understanding of the effects of this global evolution in the Indopacific realm. Based mainly on seismic stratigraphic data, a model for the evolution of this carbonate bank has been developed, showing how changing sea level and ocean current patterns shaped the bank geometries. The high-resolution seismic profiles show a dramatic shift in development of the carbonate edifice from a sea-level to a predominately current-controlled system. The stacking pattern of lower to middle Miocene depositional sequences was most likely primarily governed by fluctuations of relative sea level. This phase was followed by a two-fold configuration of bank development: bank growth continued in some parts of the edifice, whilst in other places banks drowned. Drilling steps seem to coincide with onset and intensification of the monsoon deposition of giant sediment-drifts began at this time. The shapes of drowned banks attest to the occurrence of these strong currents. The drift sediments, characterized by offlapping geometries, formed large-scale prograding complexes, filling the Maldives Inner Sea basin. Because the strong current swept most of the sediment around the atolls away, relict banks did not prograde, and steady subsidence was balanced by aggradation of the atolls which are still active today. One important outcome of this drilling project would be ground-truthing of the hypothesis that the dramatic, pronounced change in the style of the sedimentary carbonate sequence stacking was caused by a combination of relative sea-level fluctuations and ocean current system changes. Answering this question would directly improve our knowledge on processes shaping carbonate platforms and their stratigraphic records. Our findings would be clearly applicable to other Tertiary carbonate platforms in the Indo-Pacific region, and to numerous others throughout the geological record. Drilling would also provide the cores required for reconstructing changing current systems through time, and for comparing this image with the data sets acquired in the monsoon-dedicated IODP expeditions. Further, the targeted successions will allow calibrating of the Neogene oceanic 13C record with data from a carbonate platform to platform-margin series. This is becoming important, as such records are the only type that exist in deep time.
Scientific Objectives

The project has five major objectives:
1. To decipher the record of Neogene environmental changes in the Maldives archive and to place the Maldives current system into the larger scale ocean current framework present during Neogene global cooling and monsoon evolution;
2. To determine the onset of the modern depositional system driven by a mix of sea-level changes and strong currents;
3. To provide a reconstruction of the pre- to post-drowning evolution of a carbonate bank by linking the seismic stratigraphic and sedimentary records;
4. To constrain the timing of this evolution by dating unconformities, sedimentary interruptions and turnovers as well as onset of drift sedimentation;
5. To obtain a continuous carbon isotopic record to calibrate a platform and platform margin record with the pelagic record.

Non-standard measurements technology needed to achieve the proposed scientific objectives.

Proposed Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Position (Lat, Lon)</th>
<th>Water Depth (m)</th>
<th>Penetration (m)</th>
<th>Brief Site-specific Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAL-07A</td>
<td>4.766388, 73.135556</td>
<td>419</td>
<td>729</td>
<td>0 729 (1) To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity; (2) To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (3) To constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers.</td>
</tr>
<tr>
<td>MAL-06B</td>
<td>4.77109600, 73.06684800</td>
<td>379</td>
<td>624</td>
<td>0 624 (1) To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity; (2) To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (3) To constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers.</td>
</tr>
<tr>
<td>MAL-05A</td>
<td>4.766388, 72.983889</td>
<td>391</td>
<td>438</td>
<td>0</td>
</tr>
<tr>
<td>MAL-04B</td>
<td>4.9294440, 73.286775</td>
<td>533</td>
<td>554</td>
<td>0</td>
</tr>
<tr>
<td>MAL-03A</td>
<td>4.933064, 73.071305</td>
<td>519</td>
<td>435</td>
<td>0</td>
</tr>
<tr>
<td>MAL-02A</td>
<td>4.933156, 73.027983</td>
<td>516</td>
<td>558</td>
<td>0</td>
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<tr>
<td>MAL-01A</td>
<td>4.933109, 73.011323</td>
<td>512</td>
<td>1059</td>
<td>0</td>
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</tbody>
</table>
Proposal 820-Full Addendum

This addendum to the proposal 820-Full ("Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives") comprises the relocation of the proposed drill sites MAL-04A and -06A to MAL-04B and -06B based on the SEP's recommendations from January 2014. In addition, the SEP recommendation to adapt some of the velocities for the deposits were taken into account. The changes were introduced accordingly in the IODP-PDB and will be introduced in the SSDB. Table 1 shows the adapted main drill site characteristics. Figure 1 shows the map with the relocated drill sites, Fig. 2 the corresponding seismic sections.

As asked by the SEP, the data which were missing in the SSDB will be uploaded (backscatter, velocities, seafloor sediment samples, where present), with exception of the data to be acquired during the Sonne-236 cruise in August 2014 (crossing lines, additional seafloor samples).

Table 1: Main drill site characteristics. Proposed time on site includes logging.

<table>
<thead>
<tr>
<th>Site MAL</th>
<th>Sediment Type</th>
<th>Stratigraphic Interval</th>
<th>Coring Strategy</th>
<th>Total Penetration</th>
<th>Time (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-01A</td>
<td>Inner platform limestone, carbonate ooze</td>
<td>PS1-6, PS7-10 (highstand-lowstand packages), DS9</td>
<td>APC, XCB, RCB (platform deposits)</td>
<td>1059 m</td>
<td>8.5</td>
</tr>
<tr>
<td>-02A</td>
<td>Platform slope chalk-ooze, drifts</td>
<td>PS7-10, DS1-2, DS9</td>
<td>APC, XCB, RCB (platform slope deposits)</td>
<td>558 m</td>
<td>3.5</td>
</tr>
<tr>
<td>-03A</td>
<td>Drifts (ooze to chalk)</td>
<td>DS1-2</td>
<td>APC, XCB</td>
<td>435 m</td>
<td>3</td>
</tr>
<tr>
<td>-04B</td>
<td>Drifts (ooze to chalk)</td>
<td>DS1-9</td>
<td>APC, XCB</td>
<td>554 m</td>
<td>3.3</td>
</tr>
<tr>
<td>-05A</td>
<td>Inner platform limestone, carbonate ooze</td>
<td>PS9-10, DS1-5, DS6-9</td>
<td>APC, XCB, RCB (platform slope deposits)</td>
<td>438 m</td>
<td>4.6</td>
</tr>
<tr>
<td>-06B</td>
<td>Drifts (ooze to chalk)</td>
<td>PS10-DS9</td>
<td>APC, XCB</td>
<td>624 m</td>
<td>5</td>
</tr>
<tr>
<td>-07A</td>
<td>Drifts (ooze to chalk)</td>
<td>DS3-DS9</td>
<td>APC, XCB</td>
<td>729 m</td>
<td>5.3</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>33.2</strong></td>
<td></td>
</tr>
</tbody>
</table>
Fig. 1: Grid of high-resolution seismic lines (M74/4 NEOMA) with proposed location of drill sites.
Fig 2: Location of drill sites MAL-01A -07A with limits of sequences. For location of lines and drill sites see Fig.1 All depth scale are ms (TWT).
Section A: Proposal Information

Title of Proposal: Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.

Date Form Submitted: 2014-03-14 20:36:01

Site Specific Objectives with Priority (Must include general objectives in proposal)

(1) To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity; (2) to constrain the timing of unconformities and sedimentary interruptions.

List Previous Drilling in Area:


Section B: General Site Information

Site Name: MAL-07A

If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#

Latitude: Deg: 4.766388

Longitude: Deg: 73.135556

Coordinate System: WGS 84

Priority of Site: Primary: yes Alt:

Area or Location: Maldives

Jurisdiction: Republic of Maldives

Distance to Land: (km) 17.7

Water Depth (m): 419
### Section C: Operational Information

<table>
<thead>
<tr>
<th>Proposed Penetration (m):</th>
<th>Sediments</th>
<th>Basement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>729</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Sediment Thickness (m)</th>
<th>2310</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>General Lithologies:</th>
<th>Calcereous ooze, chalk:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>APC, XCB in ooze and chalk</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coring Plan:</th>
<th>(Specify or check)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>APC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wireline Logging Plan:</th>
<th>Standard Measurements</th>
<th>Special Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Magnetic Susceptibility</td>
<td>Formation Image</td>
</tr>
<tr>
<td></td>
<td>Magnetic Field</td>
<td>(Acoustic)</td>
</tr>
<tr>
<td></td>
<td>Borehole Temperature</td>
<td>Formation Fluid</td>
</tr>
<tr>
<td></td>
<td>Nuclear Magnetic</td>
<td>Sampling</td>
</tr>
<tr>
<td></td>
<td>Resonance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geochemical</td>
<td>Formation Temperature &amp; Pressure</td>
</tr>
<tr>
<td></td>
<td>Sonic (Δt)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Formation Image (Res)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check-shot (upon request)</td>
<td></td>
</tr>
</tbody>
</table>

Max. Borehole Temp.: 729 °C

<table>
<thead>
<tr>
<th>Mud Logging:</th>
<th>Cuttings Sampling Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>from m to m m intervals</td>
</tr>
<tr>
<td></td>
<td>from m to m m intervals</td>
</tr>
</tbody>
</table>

Estimated Days: 2.8 Drilling/Coring: 2.5 Logging: Total On-site: 5m

<table>
<thead>
<tr>
<th>Observatory Plan:</th>
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<tr>
<td>Longterm Borehole Observation Plan/Re-entry Plan</td>
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<table>
<thead>
<tr>
<th>Potential Hazards/Weather:</th>
<th>Complicated Seabed Condition</th>
<th>Hydrothermal Activity</th>
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</thead>
<tbody>
<tr>
<td>Shallow Gas</td>
<td></td>
<td></td>
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<tr>
<td>Hydrocarbon</td>
<td>Soft Seabed</td>
<td>Landslide and Turbidity Current</td>
</tr>
<tr>
<td>Shallow Water Flow</td>
<td>Currents</td>
<td>Gas Hydrate</td>
</tr>
<tr>
<td>Abnormal Pressure</td>
<td>Fracture Zone</td>
<td>Diapir and Mud Volcano</td>
</tr>
<tr>
<td>Man-made Objects (e.g., sea-floor cables, dump sites)</td>
<td>Fault</td>
<td>High Temperature</td>
</tr>
<tr>
<td>H2S</td>
<td>High Dip Angle</td>
<td>Ice Conditions</td>
</tr>
<tr>
<td>CO2</td>
<td>Sensitive marine habitat (e.g., reefs, vents)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Other: Estimated depth of DS-01 is at 709 mbsf; 20 m added for logging rathole
<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>6 3.5 kHz</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>9 Photography or video</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>10 Heat Flow</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>11a Magnetics</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>11b Gravity</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>12 Sediment cores</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>13 Rock sampling</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>14a Water current data</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>14b Ice Conditions</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>15 OBS microseismicity</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>16 Navigation</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>17 Other</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
</tbody>
</table>
Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

Estimated total logging time for this site: 2.5

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Shot Survey</td>
<td>Checkshot surveys will provide direct time-depth relationship for complementing synthetic seismograms and provide data for correlation with the seismic sections of the platform deposits.</td>
<td>1</td>
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<tr>
<td>Nuclear Magnetic Resonance</td>
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<tr>
<td>Geochemical</td>
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<tr>
<td>Side-wall Core Sample</td>
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<td></td>
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<tr>
<td>Formation Fluid Sampling</td>
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<tr>
<td>Borehole Temperature</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Magnetic Susceptibility</td>
<td>0</td>
<td></td>
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<tr>
<td>Magnetic Field</td>
<td>0</td>
<td></td>
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<tr>
<td>VSP</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Formation Image (Acoustic)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Formation Pressure &amp; Temperature</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other (SET, SETP, ...)</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
**Pollution & Safety Hazard** | **Comment**
--- | ---
1. **Summary of Operations at site.** | APC to refusal, XPC to bottom of hole
2. **All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.**
3. **All commercial drilling in this area that produced or yielded significant hydrocarbon shows.**
4. **Indications of gas hydrates at this location.**
5. **Are there reasons to expect hydrocarbon accumulations at this site?**
6. **What “special” precautions will be taken during drilling?**
7. **What abandonment procedures need to be followed?**
8. **Natural or manmade hazards which may effect ship’s operations.**
9. **Summary: What do you consider the major risks in drilling at this site?** | Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.
<table>
<thead>
<tr>
<th>Subbottom depth (m)</th>
<th>Key reflectors, Unconformities, faults, etc</th>
<th>Age</th>
<th>Assumed velocity (km/sec)</th>
<th>Lithology</th>
<th>Paleo-environment</th>
<th>Avg. rate of sed. accum. (m/My)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 89</td>
<td>Base DS9</td>
<td>ca. 3.0</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>hemipelagic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89 - 155</td>
<td>Base DS8</td>
<td>ca. 3.5</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
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<tr>
<td>155 - 196</td>
<td>Base DS7</td>
<td>ca. 4.5</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
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<tr>
<td>196 - 224</td>
<td>Base DS6</td>
<td>ca. 6.5</td>
<td>1.8</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
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<tr>
<td>224 - 241</td>
<td>Base DS5</td>
<td>ca. 7.5</td>
<td>1.9</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
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<tr>
<td>241 - 413</td>
<td>Base DS4</td>
<td>ca. 9</td>
<td>1.9</td>
<td>Calcareous ooze</td>
<td>Drift</td>
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<tr>
<td>413 - 555</td>
<td>Base DS3</td>
<td>ca. 10</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>Drift</td>
<td>Chalk</td>
<td></td>
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<tr>
<td>555 - 622</td>
<td>Base DS2</td>
<td>ca. 10.6</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>Drift</td>
<td>Chalk</td>
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<td>622 - 709</td>
<td>Base DS1</td>
<td>ca. 11.6</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>Drift</td>
<td>Chalk</td>
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**IODP Site Summary Forms:**  

**Form 5 – Lithologies**

<table>
<thead>
<tr>
<th>Proposal #:</th>
<th>Site #:</th>
<th>Date Form Subm.:</th>
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<tbody>
<tr>
<td>820</td>
<td>MAL-07A</td>
<td>2013-03-21 14:26:17</td>
</tr>
</tbody>
</table>

**Site Summary Figure Comment**
**Section A: Proposal Information**

**Title of Proposal:**
Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.

**Site Specific Objectives with Priority**

1. To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity;
2. To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record;
3. To constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers, and onset of drift deposition;
4. Reconstruction and dating of bank to drift turnover.

**List Previous Drilling in Area:**

**Date Form Submitted:**
2014-03-14 20:36:01

---

**Section B: General Site Information**

<table>
<thead>
<tr>
<th>Site Name: MAL-06B</th>
<th>Area or Location: Maldives</th>
</tr>
</thead>
<tbody>
<tr>
<td>If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#</td>
<td>Jurisdiction: Republic of Maldives</td>
</tr>
<tr>
<td>Latitude:</td>
<td>Longitude:</td>
</tr>
<tr>
<td>Deg: 4.77109600</td>
<td>Deg: 73.06684800</td>
</tr>
<tr>
<td>Coordinate System: WGS 84</td>
<td>Distance to Land: 12.1 (km)</td>
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<tr>
<td>Priority of Site: yes</td>
<td>Water Depth (m): 379</td>
</tr>
</tbody>
</table>


### Section C: Operational Information

<table>
<thead>
<tr>
<th>Proposed Penetration (m):</th>
<th>Sediments</th>
<th>Basement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>624</td>
<td>0</td>
</tr>
<tr>
<td>Total Sediment Thickness (m)</td>
<td>1900</td>
<td></td>
</tr>
<tr>
<td>Total Penetration (m):</td>
<td>624</td>
<td></td>
</tr>
</tbody>
</table>

#### General Lithologies:
- Calcereous ooze, chalk

#### Coring Plan:
- (Specify or check)
- APC
- XCB
- MDCB
- PCS
- RCB
- Re-entry

#### Wireline Logging Plan:
- Standard Measurements
  - WL
  - LWD
  - Porosity
  - Density
  - Gamma Ray
  - Resistivity
  - Sonic (Δt)
  - Formation Image (Res)
  - Check-shot (upon request)
- Special Tools
  - Magnetic Susceptibility
  - Magnetic Field
  - Borehole Temperature
  - Nuclear Magnetic Resonance
  - Geochemical
  - Side-Wall Core Sampling
  - Formation Image (Acoustic)
  - Formation Fluid Sampling
  - Formation Temperature & Pressure
  - VSP
  - Others:

#### Max. Borehole Temp.: 80°C

#### Mud Logging:
- (Riser Holes Only)
- Cuttings Sampling Intervals:
  - from m to m m intervals
  - from m to m m intervals

#### Estimated Days:
- Drilling/Coring: 3
- Logging: 2
- Total On-site: n/a

#### Observatory Plan:
- Longterm Borehole Observation Plan/Re-entry Plan

#### Potential Hazards/Weather:
- Shallow Gas
- Hydrocarbon
- Shallow Water Flow
- Abnormal Pressure
- Man-made Objects (e.g., sea-floor cables, dump sites)
- H2S
- CO2
- Soft Seabed
- Landslide and Turbidity Current
- Currents
- Fault
- High Dip Angle
- High Temperature
- Sensitive marine habitat (e.g., reefs, vents)
- Ice Conditions

- Preferred weather window
- Estimated depth of DS-01 is at 604 mbsf; 20 m added for logging rathole

---

**Note:** This document contains a table and several sections detailing operational information, including sediment and basement thickness, coring plans, logging plans, and potential hazards. The table includes specific measurements and intervals, along with various logging and coring techniques. The document also specifies estimated days for drilling, logging, and total on-site time, along with long-term observation and re-entry plans. Potential hazards and weather conditions are listed, along with preferred weather windows and specific monitoring requirements. The document concludes with notes on estimated depths and additional logging details.
IODP Site Summary Forms: Form 2 - Site Survey Detail

| Proposal #: | 820 | Site #: | MAL-06B | Date Form Submitted: | 2014-03-14 20:36:01 |

* Key to SSP Requirements
X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites; R=required for re-entry sites; T=required for high temperature environments; † Accurate velocity information is required for holes deeper than 400m.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 3.5 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9 Photography or video</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10 Heat Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11a Magnetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11b Gravity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Sediment cores</td>
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</tr>
<tr>
<td>13 Rock sampling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14a Water current data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14b Ice Conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 OBS microseismicity</td>
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<td></td>
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</tr>
<tr>
<td>16 Navigation</td>
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<td>17 Other</td>
<td></td>
<td></td>
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</tbody>
</table>
### Estimated total logging time for this site:

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Shot Survey</td>
<td>Checkshot surveys will provide direct time-depth relationship for complementing synthetic seismograms and provide data for correlation with the seismic sections of the platform deposits.</td>
<td>1</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance</td>
<td></td>
<td>0</td>
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<tr>
<td>Geochemical</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Side-wall Core Sample</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Fluid Sampling</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Borehole Temperature</td>
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<td>0</td>
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<td>Magnetic Susceptibility</td>
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<td>Magnetic Field</td>
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<tr>
<td>VSP</td>
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<td>Formation Image (Acoustic)</td>
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<td>Formation Pressure &amp; Temperature</td>
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<td>Other (SET, SETP, ...)</td>
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<td>0</td>
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</tbody>
</table>
1. **Summary of Operations at site.**
   APC to refusal, XCB to bottom of the hole

2. **All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.**

3. **All commercial drilling in this area that produced or yielded significant hydrocarbon shows.**

4. **Indications of gas hydrates at this location.**

5. **Are there reasons to expect hydrocarbon accumulations at this site?**

6. **What “special” precautions will be taken during drilling?**

7. **What abandonment procedures need to be followed?**

8. **Natural or manmade hazards which may effect ship’s operations.**

9. **Summary: What do you consider the major risks in drilling at this site?**
   Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.
### IODP Site Summary Forms: Form 5 – Lithologies

<table>
<thead>
<tr>
<th>Subbottom depth (m)</th>
<th>Key reflectors, Unconformities, faults, etc</th>
<th>Age</th>
<th>Assumed velocity (km/sec)</th>
<th>Lithology</th>
<th>Paleo-environment</th>
<th>Avg. rate of sed. accum. (m/My)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 52</td>
<td>Base DS9</td>
<td>ca. 3.0</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52 - 93</td>
<td>Base DS8</td>
<td>ca. 3.5</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93 - 125</td>
<td>Base DS7</td>
<td>ca. 4.5</td>
<td>1.7</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>125 - 154</td>
<td>Base DS6</td>
<td>ca. 6.5</td>
<td>1.8</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<td>154 - 166</td>
<td>Base DS5</td>
<td>ca. 7.5</td>
<td>1.9</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<td></td>
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<tr>
<td>166 - 216</td>
<td>Base DS4</td>
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<td>1.9</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<tr>
<td>216 - 251</td>
<td>Base DS3</td>
<td>ca. 10</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>Drift</td>
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<td>251 - 322</td>
<td>Base DS2</td>
<td>ca. 11</td>
<td>2.0</td>
<td>Calcareous ooze - chalk</td>
<td>Drift</td>
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<tr>
<td>322 - 604</td>
<td>Base DS1</td>
<td>ca. 11.6</td>
<td>2.1</td>
<td>Calcareous ooze - chalk</td>
<td>Drift</td>
<td></td>
<td></td>
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<tr>
<td>Proposal #:</td>
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<td>MAL-06B</td>
<td>Date Form Subm.:</td>
<td>2013-03-21 14:20:39</td>
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<td>------------------</td>
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<td></td>
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</tbody>
</table>

**Site Summary Figure Comment**
IODP Site Summary Forms:
Form 1 – General Site Information

Section A: Proposal Information

Title of Proposal: Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.

Date Form Submitted: 2014-03-14 20:36:01

Site Specific Objectives with Priority
(Must include general objectives in proposal)

List Previous Drilling in Area:

Section B: General Site Information

Site Name: MAL-05A
Area or Location: Maldives
Jurisdiction: Republic of Maldives
Distance to Land: 7.7 km
Water Depth (m): 391

Latitude: 4.766388 Deg.
Longitude: 72.983889 Deg.
Coordinate System: WGS 84
Priority of Site: Primary: yes  Alt: 

(1) To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (2) to constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers, and onset of drift deposition; (3) Reconstruction and dating of bank to drift turnover.
**Section C: Operational Information**

### Proposed Penetration (m):
- **Sediments**: 438 m
- **Basement**: 0 m

![Table showing Sediments and Basement thickness with values filled in.](image)

### General Lithologies:
- Calcereous ooze, chalk, limestone

### Coring Plan:
- APC and XCB in ooze and chalk, RCB in limestone

### Wireline Logging Plan:
- **Standard Measurements**
  - Magnetic Susceptibility
  - Magnetic Field
  - Borehole Temperature
  - Nuclear Magnetic Resonance
  - Geophysical (resistivity)
  - Gamma Ray
  - Geochemical
  - Sonic (∆t)
  - Formation Image (Acoustic)
  - Formation Fluid Sampling
  - Formation Temperature & Pressure
  - Side-Wall Core Sampling
  - Geochemical

- **Special Tools**
  - WL
  - LWD
  - Porosity
  - Density
  - Gamma Ray
  - Resistivity
  - Sonic (Δt)
  - Formation Image (Res)
  - Check-shot (upon request)

### Max. Borehole Temp.:
- 438 °C

### Cuttings Sampling Intervals:
- From ___ m to ___ m
- From ___ m to ___ m

### Estimated Days:
- Drilling/Coring: 2.6
- Logging: 2
- Total On-site: ___

### Observatory Plan:
- Longterm Borehole Observation Plan/Re-entry Plan

### Potential Hazards/Weather:
- Shallow Gas
- Hydrocarbon
- Shallow Water Flow
- Abnormal Pressure
- Man-made Objects
- H₂S
- CO₂
- Soft Seabed
- Landslide and Turbidity Current
- Gas Hydrate
- Fracture Zone
- Fault
- High Temperature
- High Dip Angle
- Ice Conditions
- Sensitive marine habitat (e.g., reefs, vents)

### Other:
- Estimated depth of PS-10 is at 418 mbsf; 20 m added for logging rathole

---

*Note: The table entries and values have been filled in.*

*Generated: Fri Mar 14 20:37:10 2014 by if351_pdf □ (user 0.1765)*
IODP Site Summary Forms: Form 2 - Site Survey Detail

<table>
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<th>Proposal #:</th>
<th>820</th>
<th>Site #:</th>
<th>MAL-05A</th>
<th>Date Form Submitted:</th>
<th>2014-03-14 20:36:01</th>
</tr>
</thead>
</table>

* Key to SSP Requirements

X = required; X* = may be required for specific sites; Y = recommended; Y* = may be recommended for specific sites; R = required for re-entry sites; T = required for high temperature environments; † Accurate velocity information is required for holes deeper than 400m.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>no</td>
<td></td>
<td>Crossing line will be acquired during SONNE-236 cruise in August 2014</td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6 3.5 kHz</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Photography or video</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10 Heat Flow</td>
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<td></td>
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<td>11a Magnetics</td>
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<td>11b Gravity</td>
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<td>12 Sediment cores</td>
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<td>13 Rock sampling</td>
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<td>14a Water current data</td>
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<td></td>
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<tr>
<td>14b Ice Conditions</td>
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<td></td>
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<tr>
<td>15 OBS microseismicity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16 Navigation</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>17 Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

Estimated total logging time for this site: 2

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
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<tbody>
<tr>
<td>Check Shot Survey</td>
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<tr>
<td>Nuclear Magnetic Resonance</td>
<td>0</td>
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<tr>
<td>Geochemical</td>
<td>0</td>
</tr>
<tr>
<td>Side-wall Core Sample</td>
<td>0</td>
</tr>
<tr>
<td>Formation Fluid Sampling</td>
<td>0</td>
</tr>
<tr>
<td>Borehole Temperature</td>
<td>0</td>
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<tr>
<td>Magnetic Susceptibility</td>
<td>0</td>
</tr>
<tr>
<td>Magnetic Field</td>
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</tr>
<tr>
<td>VSP</td>
<td>0</td>
</tr>
<tr>
<td>Formation Image (Acoustic)</td>
<td>0</td>
</tr>
<tr>
<td>Formation Pressure &amp; Temperature</td>
<td>0</td>
</tr>
<tr>
<td>Other (SET, SETP, ...)</td>
<td>0</td>
</tr>
</tbody>
</table>
**Summary of Operations at site:**
(Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on form 3); include # of holes for APC/XCB, # of temperature deployments

**Based on previous DSDP/ODP/IODP drilling,** list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock.

From available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.

Are there any indications of gas hydrates at this location? Give details.

Are there reasons to expect hydrocarbon accumulations at this site? Please give details.

What “special” precautions need to be taken during drilling?

What abandonment procedures need to be followed?

Please list other natural or manmade hazards which may effect ship’s operations:
(e.g. ice, currents, cables)

**Pollution & Safety Hazard**

<table>
<thead>
<tr>
<th>1. Summary of Operations at site.</th>
<th>APC and XCB to refusal, RCB in limestones of PS10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.</td>
<td></td>
</tr>
<tr>
<td>3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows.</td>
<td></td>
</tr>
<tr>
<td>4. Indications of gas hydrates at this location.</td>
<td></td>
</tr>
<tr>
<td>5. Are there reasons to expect hydrocarbon accumulations at this site?</td>
<td></td>
</tr>
<tr>
<td>6. What “special” precautions will be taken during drilling?</td>
<td></td>
</tr>
<tr>
<td>7. What abandonment procedures need to be followed?</td>
<td></td>
</tr>
<tr>
<td>8. Natural or manmade hazards which may effect ship’s operations.</td>
<td></td>
</tr>
<tr>
<td>9. Summary: What do you consider the major risks in drilling at this site?</td>
<td>Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.</td>
</tr>
</tbody>
</table>
# IODP Site Summary Forms: Form 5 – Lithologies

<table>
<thead>
<tr>
<th>Subbottom depth (m)</th>
<th>Key reflectors, Unconformities, faults, etc</th>
<th>Age</th>
<th>Assumed velocity (km/sec)</th>
<th>Lithology</th>
<th>Paleo-environment</th>
<th>Avg. rate of sed. accum. (m/My)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 56</td>
<td>Base DS9</td>
<td>ca. 3.0</td>
<td>1.7</td>
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<td>Hemipelagic</td>
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<td></td>
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<tr>
<td>56 - 70</td>
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<td>1.7</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<td></td>
</tr>
<tr>
<td>70 - 156</td>
<td>Base DS6</td>
<td>ca. 6.5</td>
<td>1.8</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
<td></td>
<td>Hiatus at base</td>
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<tr>
<td>156 - 233</td>
<td>Base DS2</td>
<td>ca. 10.6</td>
<td>3.5</td>
<td>Calcareous ooze</td>
<td>Drift</td>
<td></td>
<td></td>
</tr>
<tr>
<td>233 - 295</td>
<td>Base DS1</td>
<td>ca. 11.5</td>
<td>2.5</td>
<td>Chalk - limestone</td>
<td>Drift</td>
<td></td>
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<tr>
<td>295 - 418</td>
<td>Base PS10</td>
<td>?11.5 - 14</td>
<td>3.5</td>
<td>Chalk - limestone</td>
<td>neritic?</td>
<td></td>
<td>Age assignment relies on seismic tie to well Ari 1</td>
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**IODP Site Summary Forms:**

<table>
<thead>
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<th>Date Form Subm.:</th>
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<td>2013-03-21 14:16:50</td>
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</table>

<table>
<thead>
<tr>
<th>Site Summary Figure Comment</th>
</tr>
</thead>
</table>
IODP Site Summary Forms:
Form 1 – General Site Information

Section A: Proposal Information

Title of Proposal: Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.

Date Form Submitted: 2014-03-14 20:36:01

Site Specific Objectives with Priority (Must include general objectives in proposal)

(1) To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity; (2) to constrain the timing of unconformities and sedimentary interruptions.

List Previous Drilling in Area:


Section B: General Site Information

Site Name: MAL-04B

Area or Location: 

If site is a reoccupation of an old DSDP/ODP Site, Please include former Site# 716

Latitude: Deg: 4.9294440

Longitude: Deg: 73.28677595

Coordinate System: WGS 84

Jurisdiction: 

Distance to Land (km): 

Priority of Site: Primary: yes Alt: 

Water Depth (m): 533
### Section C: Operational Information

<table>
<thead>
<tr>
<th>Sediments</th>
<th>Basement</th>
</tr>
</thead>
<tbody>
<tr>
<td>554</td>
<td>0</td>
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</tbody>
</table>

**Total Sediment Thickness (m):**

| Total Penetration (m): | 554 |

**General Lithologies:**
- Calcareous ooze, chalk

**Coring Plan:**
- APC and XCB in ooze and chalk, RCB in limestone

**Wireline Logging Plan:**

<table>
<thead>
<tr>
<th>Standard Measurements</th>
<th>Special Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>WL</td>
<td>Magnetic Susceptibility</td>
</tr>
<tr>
<td>LWD</td>
<td>Magnetic Field</td>
</tr>
<tr>
<td>Porosity</td>
<td>Borehole Temperature</td>
</tr>
<tr>
<td>Density</td>
<td>Nuclear Magnetic Resonance</td>
</tr>
<tr>
<td>Gamma Ray</td>
<td>Geochemical</td>
</tr>
<tr>
<td>Resistivity</td>
<td>Side-Wall Core Sampling</td>
</tr>
<tr>
<td>Sonic (∆t)</td>
<td></td>
</tr>
<tr>
<td>Formation Image (Res)</td>
<td>Others:</td>
</tr>
<tr>
<td>Check-shot (upon request)</td>
<td></td>
</tr>
</tbody>
</table>

**Max. Borehole Temp.:**

| °C |

**Mud Logging:**
(Riser Holes Only)

- Cuttings Sampling Intervals:
  - from m to m m intervals
  - from m to m m intervals

**Estimated Days:**
- Drilling/Coring: 1.8
- Logging: 1.5
- Total On-site: 2400

**Estimated depth of DS-01 is at 534 mbsf; 20 m added for logging rathole**

**Potential Hazards/Weather:**

<table>
<thead>
<tr>
<th>Shallow Gas</th>
<th>Complicated Seabed Condition</th>
<th>Hydrothermal Activity</th>
<th>Preferred weather window</th>
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<tbody>
<tr>
<td>Hydrocarbon</td>
<td>Soft Seabed</td>
<td>Landslide and Turbidity Current</td>
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<td>Shallow Water Flow</td>
<td>Currents</td>
<td>Gas Hydrate</td>
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<td>Abnormal Pressure</td>
<td>Fracture Zone</td>
<td>Diapir and Mud Volcano</td>
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<tr>
<td>Man-made Objects (e.g., sea-floor cables, dump sites)</td>
<td>Fault</td>
<td>High Temperature</td>
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<tr>
<td>H₂S</td>
<td>High Dip Angle</td>
<td>Ice Conditions</td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td>Sensitive marine habitat (e.g., reefs, vents)</td>
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<td></td>
</tr>
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</table>

**Other:**

- Other: Estimated depth of DS-01 is at 534 mbsf; 20 m added for logging rathole
<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
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<tbody>
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<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
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<td>4 Seismic Grid</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>6 3.5 kHz</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td>Location:</td>
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<tr>
<td>9 Photography or video</td>
<td></td>
<td>Location:</td>
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<tr>
<td>10 Heat Flow</td>
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<td>Location:</td>
<td></td>
</tr>
<tr>
<td>11a Magnetics</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>11b Gravity</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>12 Sediment cores</td>
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</tr>
<tr>
<td>13 Rock sampling</td>
<td></td>
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</tr>
<tr>
<td>14a Water current data</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>14b Ice Conditions</td>
<td></td>
<td>Location:</td>
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<tr>
<td>15 OBS microseismicity</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>16 Navigation</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>17 Other</td>
<td></td>
<td>Location:</td>
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</table>
### Detailed Logging and Downhole Measurement Plan

<table>
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<th>820</th>
<th>Site #:</th>
<th>MAL-04B</th>
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<tbody>
<tr>
<td>Water Depth (m):</td>
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<td>Sed. Penetration (m):</td>
<td>554</td>
<td>Basement Penetration (m):</td>
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</table>

Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

Estimated total logging time for this site: 1.5

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance (1=high, 3=low)</th>
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<tr>
<td>Check Shot Survey</td>
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<tr>
<td>Nuclear Magnetic Resonance</td>
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<td>Geochemical</td>
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<td>0</td>
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<tr>
<td>Side-wall Core Sample</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Fluid Sampling</td>
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<td>0</td>
</tr>
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<tr>
<td>VSP</td>
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<tr>
<td>Formation Image (Acoustic)</td>
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<tr>
<td>Formation Pressure &amp; Temperature</td>
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</tr>
<tr>
<td>Other (SET, SETP, ...)</td>
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</tr>
</tbody>
</table>
   APC to refusal, XCB to bottom of the hole.

2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.

3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows.

4. Indications of gas hydrates at this location.

5. Are there reasons to expect hydrocarbon accumulations at this site?

6. What “special” precautions will be taken during drilling?

7. What abandonment procedures need to be followed?

8. Natural or manmade hazards which may effect ship’s operations.

9. Summary: What do you consider the major risks in drilling at this site?
<table>
<thead>
<tr>
<th>Subbottom depth (m)</th>
<th>Key reflectors, Unconformities, faults, etc</th>
<th>Age</th>
<th>Assumed velocity (km/sec)</th>
<th>Lithology</th>
<th>Paleo-environment</th>
<th>Avg. rate of sed. accum. (m/My)</th>
<th>Comments</th>
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<tbody>
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<td>ca. 3.0</td>
<td>1.6</td>
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<td>Hemipelagic</td>
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<td>65 - 118</td>
<td>Base DS8</td>
<td>ca. 3.5</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<tr>
<td>118 - 147</td>
<td>Base DS7</td>
<td>ca. 4.5</td>
<td>1.7</td>
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<td>Hemipelagic</td>
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<tr>
<td>147 - 218</td>
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<td>ca. 6.5</td>
<td>1.7</td>
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<td>Hemipelagic</td>
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<td>218 - 259</td>
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<td>1.9</td>
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<td>Hemipelagic</td>
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<td>259 - 430</td>
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<td>1.9</td>
<td>Calcareous ooze</td>
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<td>430 - 462</td>
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<td>ca. 10</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>distal drift</td>
<td></td>
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<td>462 - 492</td>
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<td>ca. 10.7</td>
<td>2.0</td>
<td>Calcareous ooze</td>
<td>distal drift</td>
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<td>2.0</td>
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<td>distal drift</td>
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<td>Date Form Subm.:</td>
<td>2013-03-21 14:12:14</td>
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</table>

**Site Summary Figure Comment**
### Section A: Proposal Information

**Title of Proposal:**
Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.

**Date Form Submitted:**
2014-03-14 20:36:01

**Site Specific Objectives with Priority**

1. To analyze cyclostratigraphy of drift deposits therefore providing reconstructions of changes in the current regime and monsoon cyclicity;
2. To constrain the timing of unconformities and sedimentary interruptions.

**List Previous Drilling in Area:**

### Section B: General Site Information

**Site Name:**
MAL-03A

**Area or Location:**
Maldives

**Latitude:**
Deg: 4.933064

**Longitude:**
Deg: 73.071305

**Coordinate System:**
WGS 84

**Jurisdiction:**
Republic of Maldives

**Distance to Land (km):**
10.8

**Priority of Site:**
Primary: yes

**Water Depth (m):**
519
### Section C: Operational Information

#### Proposed Penetration (m):
- **Sediments**: 435 m
- **Basement**: 0 m
- **Total Sediment Thickness (m)**: 1880 m
- **Total Penetration (m)**: 435 m

#### General Lithologies:
- Calcareous ooze, chalk, limestone

#### Coring Plan:
- APC and XCB in ooze and chalk

#### Wireline Logging Plan:

<table>
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<tr>
<th>Measurements</th>
<th>Standard</th>
<th>Special Tools</th>
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</thead>
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<tr>
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<td>LWD</td>
<td>Magnetic Field</td>
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<tr>
<td>Porosity</td>
<td>Borehole Temperature</td>
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<tr>
<td>Density</td>
<td>Nuclear Magnetic Resonance</td>
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<tr>
<td>Gamma Ray</td>
<td>Geochronal</td>
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<td>Resistivity</td>
<td>Side-Wall Core Sampling</td>
<td>No</td>
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<tr>
<td>Sonic (Δt)</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Formation Image (Res)</td>
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<td>No</td>
</tr>
<tr>
<td>Check-shot (upon request)</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

#### Max. Borehole Temp.: 
- 4°C

#### Mud Logging: (Riser Holes Only)
- Cuttings Sampling Intervals:
  - from _m_ to _m_ intervals
  - from _m_ to _m_ intervals

#### Estimated Days:
- Drilling/Coring: 1.5
- Logging: 1.5
- Total On-site:

#### Observatory Plan:
- **Longterm Borehole Observation Plan/Re-entry Plan**: 

#### Potential Hazards/Weather:
- Shallow Gas
- Hydrocarbon
- Shallow Water Flow
- Abnormal Pressure
- Man-made Objects (e.g., sea-floor cables, dump sites)
- H₂S
- CO₂
- High Dip Angle
- Ice Conditions
- Sensitive marine habitat (e.g., reefs, vents)
- Gas Hydrate
- Landslide and Turbidity Current
- Fault
- High Temperature
- Diapir and Mud Volcano
- Soft Seabed
- Soft Seabed
- Gas Hydrate
- Landslide and Turbidity Current
- Fault
- High Temperature
- Diapir and Mud Volcano

#### Other:
- Estimated depth of DS-01 is at 415 mbsf; 20 m added for logging rathole

---

*Estimated depth of DS-01 is at 415 mbsf; 20 m added for logging rathole.*

---

*Other: Estimated depth of DS-01 is at 415 mbsf; 20 m added for logging rathole.*
<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>no</td>
<td>Crossing line will be acquired during SONNE-236 cruise in August 2014 Location:</td>
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</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td>Location:</td>
<td></td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
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<td>Location:</td>
<td></td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
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</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5a Refraction (surface)</td>
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</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 3.5 kHz</td>
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</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
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</tr>
<tr>
<td>9 Photography or video</td>
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<tr>
<td>10 Heat Flow</td>
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<td></td>
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<td>11a Magnetics</td>
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<td>11b Gravity</td>
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<td>13 Rock sampling</td>
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<td>14a Water current data</td>
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<td>14b Ice Conditions</td>
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<td>15 OBS microseismicity</td>
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<tr>
<td>16 Navigation</td>
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</tr>
<tr>
<td>17 Other</td>
<td></td>
<td></td>
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</tbody>
</table>
Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance</th>
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<tbody>
<tr>
<td>Check Shot Survey</td>
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<td>Nuclear Magnetic Resonance</td>
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<td>Geochemical</td>
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<td>Side-wall Core Sample</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Fluid Sampling</td>
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<td>Borehole Temperature</td>
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<tr>
<td>Formation Pressure &amp; Temperature</td>
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</tr>
<tr>
<td>Other (SET, SETP, …)</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Summary of Operations at site:
(Example: Triple-APC to refusal, XCB 10 m into basement, log as shown on form 3)

Based on previous DSDP/ODP/IODP drilling, list all hydrocarbon occurrences of greater than background levels. Give nature of show, age and depth of rock.

From available information, list all commercial drilling in this area that produced or yielded significant hydrocarbon shows. Give depths and ages of hydrocarbon-bearing deposits.

Are there indications of gas hydrates at this location? Give details.

Are there reasons to expect hydrocarbon accumulations at this site? Please give details.

What “special” precautions need to be taken during drilling?

What abandonment procedures need to be followed:

Please list other natural or manmade hazards which may affect ship’s operations:

(e.g. ice, currents, cables)

Summary: What do you consider the major risk in drilling at this site?

<table>
<thead>
<tr>
<th>Pollution &amp; Safety Hazard</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of Operations at site.</td>
<td>APC to refusal, XPC to bottom of the hole. Logging.</td>
</tr>
<tr>
<td>2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.</td>
<td></td>
</tr>
<tr>
<td>3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows.</td>
<td></td>
</tr>
<tr>
<td>4. Indications of gas hydrates at this location.</td>
<td></td>
</tr>
<tr>
<td>5. Are there reasons to expect hydrocarbon accumulations at this site?</td>
<td></td>
</tr>
<tr>
<td>6. What “special” precautions will be taken during drilling?</td>
<td></td>
</tr>
<tr>
<td>7. What abandonment procedures need to be followed?</td>
<td></td>
</tr>
<tr>
<td>8. Natural or manmade hazards which may effect ship’s operations.</td>
<td></td>
</tr>
<tr>
<td>9. Summary: What do you consider the major risks in drilling at this site?</td>
<td>Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.</td>
</tr>
<tr>
<td>Subbottom depth (m)</td>
<td>Key reflectors, Unconformities, faults, etc</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>0 - 53</td>
<td>Base DS9</td>
</tr>
<tr>
<td>53 - 166</td>
<td>Base DS2</td>
</tr>
<tr>
<td>166 - 415</td>
<td>Base DS1</td>
</tr>
</tbody>
</table>
**IODP Site Summary Forms:**

**Form 1 – General Site Information**

### Section A: Proposal Information

<table>
<thead>
<tr>
<th>Title of Proposal:</th>
<th>Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Form Submitted:</td>
<td>2014-03-14 20:36:01</td>
</tr>
<tr>
<td>Site Specific Objectives with Priority (Must include general objectives in proposal)</td>
<td>(1) To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (2) to constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers, and onset of drift deposition; (3) Reconstruction and dating of bank to drift turnover.</td>
</tr>
</tbody>
</table>

### Section B: General Site Information

<table>
<thead>
<tr>
<th>Site Name:</th>
<th>MAL-02A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area or Location:</td>
<td>Maldives</td>
</tr>
<tr>
<td>Jurisdiction:</td>
<td>Republic of Maldives</td>
</tr>
<tr>
<td>Latitude:</td>
<td>4.933156</td>
</tr>
<tr>
<td>Longitude:</td>
<td>73.027983</td>
</tr>
<tr>
<td>Coordinate System:</td>
<td>WGS 84</td>
</tr>
<tr>
<td>Distance to Land: (km)</td>
<td>7.9</td>
</tr>
<tr>
<td>Water Depth (m):</td>
<td>516</td>
</tr>
<tr>
<td>Priority of Site:</td>
<td>Primary: yes Alt:</td>
</tr>
</tbody>
</table>

---

Page 1 of 2

(i) to provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (2) to constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers, and onset of drift deposition; (3) Reconstruction and dating of bank to drift turnover.
### Section C: Operational Information

<table>
<thead>
<tr>
<th>Proposed Penetration (m):</th>
<th>Sediments</th>
<th>Basement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>558</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Sediment Thickness (m)</th>
<th>2090</th>
</tr>
</thead>
</table>

#### General Lithologies:
- Calcareous ooze, chalk, possibly limestone

#### Coring Plan:
- APC - XCB in chalk, RCB if limestone is present

#### Wireline Logging Plan:
- **Standard Measurements**
  - WL
  - LWD
  - Porosity
  - Density
  - Gamma Ray
  - Resistivity
  - Sonic (Δt)
  - Formation Image (Res)
  - Check-shot (upon request)
- **Special Tools**
  - Magnetic Susceptibility
  - Magnetic Field
  - Borehole Temperature
  - Nuclear Magnetic Resonance
  - Geochemical
  - Side-Wall Core Sampling
  - Formation Image (Acoustic)
  - Formation Fluid Sampling
  - Formation Temperature & Pressure
  - VSP
  - Others:

#### Max. Borehole Temp.:
- °C

#### Mud Logging:
- Cuttings Sampling Intervals
  - from m to m m intervals
  - from m to m m intervals

#### Estimated Days:
- Drilling/Coring: 2
- Logging: 1.5
- Total On-site: 

#### Observatory Plan:
- Longterm Borehole Observation Plan/Re-entry Plan

#### Potential Hazards/Weather:
- Shallow Gas
- Hydrocarbon
- Shallow Water Flow
- Abnormal Pressure
- Man-made Objects (e.g., sea-floor cables, dump sites)
- H₂S
- CO₂
- Soft Seabed
- Landslide and Turbidity Current
- Currents
- Fracture Zone
- Fault
- High Dip Angle
- High Temperature
- Ice Conditions
- Estimated depth of PS-07 is at 538 mbsf; 20 m added for logging rathole

#### Other:
- Estimated days:
- Preferred weather window

---

### Additional Information

- **Operational Information**
  - Estimated depth of PS-07 is at 538 mbsf; 20 m added for logging rathole

---

Page 2 of 2

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(user 0.3345)
### IODP Site Summary Forms: Form 2 - Site Survey Detail

<table>
<thead>
<tr>
<th>Proposal #:</th>
<th>820</th>
<th>Site #:</th>
<th>MAL-02A</th>
<th>Date Form Submitted:</th>
<th>2014-03-14 20:36:01</th>
</tr>
</thead>
</table>

*Key to SSP Requirements*

- X=required; X*=may be required for specific sites; Y=recommended; Y*=may be recommended for specific sites;
- R=required for re-entry sites; T=required for high temperature environments; †Accurate velocity information is required for holes deeper than 400m.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 3.5 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Photography or video</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Heat Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11a Magnetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11b Gravity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Sediment cores</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Rock sampling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14a Water current data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14b Ice Conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 OBS microseismicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Navigation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17 Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IODP Site Summary Forms:

Form 3 – Detailed Logging and Downhole Measurement Plan

<table>
<thead>
<tr>
<th>Proposal #:</th>
<th>820</th>
<th>Site #:</th>
<th>MAL-02A</th>
<th>Date Form Submitted:</th>
<th>2014-03-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Depth (m):</td>
<td>516</td>
<td>Sed. Penetration (m):</td>
<td>558</td>
<td>Basement Penetration (m):</td>
<td>0</td>
</tr>
</tbody>
</table>

Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

Estimated total logging time for this site: 1.5

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance (1=high, 3=low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Shot Survey</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Geochemical</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Side-wall Core Sample</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Fluid Sampling</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Borehole Temperature</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Magnetic Susceptibility</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Magnetic Field</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>VSP</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Image (Acoustic)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Pressure &amp; Temperature</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Other (SET, SETP, …)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Pollution &amp; Safety Hazard</td>
<td>Comment</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>1. Summary of Operations at site.</td>
<td>APC to refusal, XCB to refusal. Lower part of hole may need RCB for drilling (periplatform deposits).</td>
<td></td>
</tr>
<tr>
<td>2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Indications of gas hydrates at this location.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Are there reasons to expect hydrocarbon accumulations at this site?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. What &quot;special&quot; precautions will be taken during drilling?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. What abandonment procedures need to be followed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Natural or manmade hazards which may effect ship's operations.</td>
<td>Currents</td>
<td></td>
</tr>
<tr>
<td>9. Summary: What do you consider the major risks in drilling at this site?</td>
<td>Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.</td>
<td></td>
</tr>
<tr>
<td>Subbottom depth (m)</td>
<td>Key reflectors, Unconformities, faults, etc</td>
<td>Age</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>0 - 63</td>
<td>Base DS9</td>
<td>ca. 3</td>
</tr>
<tr>
<td>63 - 71</td>
<td>Base DS8</td>
<td>1.6</td>
</tr>
<tr>
<td>71 - 77</td>
<td>Base DS7</td>
<td>1.6</td>
</tr>
<tr>
<td>77 - 83</td>
<td>Base DS6</td>
<td>1.7</td>
</tr>
<tr>
<td>83 - 96</td>
<td>Base DS5</td>
<td>1.8</td>
</tr>
<tr>
<td>96 - 272</td>
<td>Base DS1</td>
<td>ca. 11.6</td>
</tr>
<tr>
<td>272 - 333</td>
<td>Platform Sequence 10</td>
<td>?11.5-14</td>
</tr>
<tr>
<td>333 - 392</td>
<td>Platform Sequence 9</td>
<td>?11.5-14</td>
</tr>
<tr>
<td>392 - 442</td>
<td>Platform Sequence 8</td>
<td>?11.5-14</td>
</tr>
<tr>
<td>442 - 538</td>
<td>Platform Sequence 7</td>
<td>?11.5-14</td>
</tr>
<tr>
<td>Proposal #:</td>
<td>820 - Add</td>
<td>Site #:</td>
</tr>
</tbody>
</table>

**Site Summary Figure Comment**
Proposal 820
Sites MAL-01A, -02A

Site Summary Form 6

Line 65

MAL-01A MAL-02A MAL-03A

500 m

400 m

300 m

200 m

100 m

p65

0 500 1000 1500 2000 2500 3000 m

0 500 1000 1500 2000 2500 3000 m

0 500 1000 1500 2000 2500 3000 m

0 500 1000 1500 2000 2500 3000 m
### IODP Site Summary Forms:

**Form 1 – General Site Information**

#### Section A: Proposal Information

<table>
<thead>
<tr>
<th>Title of Proposal:</th>
<th>Currents, monsoon and sea level in the Indian Ocean: the Neogene of the Maldives.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Form Submitted:</td>
<td>2014-03-14 20:36:01</td>
</tr>
</tbody>
</table>

(1) To provide a detailed reconstruction of the pre-drowning, drowning and post-drowning evolution of the carbonate bank by linking the seismic stratigraphic record to the sedimentary record; (2) to constrain the timing of this evolution thus allowing age assignments of unconformities, sedimentary interruptions, sedimentary turnovers, and onset of drift deposition; (3) Reconstruction and dating of bank to drift turnover.


#### Section B: General Site Information

<table>
<thead>
<tr>
<th>Site Name:</th>
<th>MAL-01A</th>
</tr>
</thead>
<tbody>
<tr>
<td>If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#:</td>
<td></td>
</tr>
<tr>
<td>Latitude:</td>
<td>Deg: 4.933109</td>
</tr>
<tr>
<td>Longitude:</td>
<td>Deg: 73.011323</td>
</tr>
<tr>
<td>Coordinate System:</td>
<td>WGS 84</td>
</tr>
<tr>
<td>Priority of Site:</td>
<td>Primary: yes Alt:</td>
</tr>
<tr>
<td>Area or Location:</td>
<td>Maldives</td>
</tr>
<tr>
<td>Jurisdiction:</td>
<td>Republic of Maldives</td>
</tr>
<tr>
<td>Distance to Land: (km)</td>
<td>6.2</td>
</tr>
<tr>
<td>Water Depth (m):</td>
<td>512</td>
</tr>
</tbody>
</table>
## Section C: Operational Information

<table>
<thead>
<tr>
<th>Proposed Penetration (m):</th>
<th>Sediments</th>
<th>Basement</th>
<th>Total Penetration (m): 1059</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sediment Thickness (m):</td>
<td>2200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### General Lithologies:
- Calcareous ooze, chalk, limestone

### Coring Plan:
- APC
- XCB
- MDCB
- PCS
- RCB

### Wireline Logging Plan:
- Standard Measurements
  - WL
  - LWD
  - Porosity
  - Density
  - Gamma Ray
  - Resistivity
  - Sonic (Δt)
  - Formation Image (Res)
  - Check-shot (upon request)
- Magnetic Susceptibility
- Magnetic Field
- Borehole Temperature
- Nuclear Magnetic Resonance
- Geochemical
- Side-Wall Core Sampling
- Others:
  - Magnetic Field
  - Formation Image (Acoustic)
  - Formation Fluid Sampling
  - Formation Temperature & Pressure
  - Geochemical
  - VSP

### Max. Borehole Temp.: 0°C

### Mud Logging:
- Cuttings Sampling Intervals
  - from m to m m intervals
  - from m to m m intervals
- (Riser Holes Only)

### Estimated Days:
- Drilling/Coring: 6
- Logging: 2.5
- Total On-site:

### Observatory Plan:
- Longterm Borehole Observation Plan/Re-entry Plan

### Potential Hazards/Weather:
- Shallow Gas
- Hydrocarbon
- Shallow Water Flow
- Abnormal Pressure
- Man-made Objects (e.g., sea-floor cables, dump sites)
- H₂S
- CO₂
- Other:
  - Complicated Seabed Condition
  - Soft Seabed
  - Landslide and Turbidity Current
  - Gas Hydrate
  - Fracture Zone
  - Fault
  - High Temperature
  - High Dip Angle
  - Ice Conditions
  - Sensitive marine habitat (e.g., reefs, vents)

### Preferred weather window

---

**Note:** The document appears to be a form or table with checkboxes and fillable fields, indicating sections for operational information, sediment thickness, proposed penetration, general lithologies, coring plan, wireline logging plan, maximum borehole temperature, mud logging, estimated days, and potential hazards/weather. The form is filled out with specific values and sections marked as checked or unchecked, indicating a structured approach to planning and monitoring in an operational context.
## IODP Site Summary Forms: Form 2 - Site Survey Detail

**Proposal #:** 820  
**Site #:** MAL-01A  
**Date Form Submitted:** 2014-03-14 20:36:01

---

*Key to SSP Requirements*

- X = required
- X* = may be required for specific sites
- Y = recommended
- Y* = may be recommended for specific sites
- R = required for re-entry sites
- T = required for high temperature environments
- † Accurate velocity information is required for holes deeper than 400m.

---

<table>
<thead>
<tr>
<th>Data Type</th>
<th>In SSDB</th>
<th>SSP Req.</th>
<th>Details of available data and data that are still to be collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a High resolution seismic reflection (primary)</td>
<td>yes</td>
<td></td>
<td>Location: Crossing line will be acquired during SONNE-236 cruise in August 2014</td>
</tr>
<tr>
<td>1b High resolution seismic reflection (crossing)</td>
<td>no</td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2a Deep penetration seismic reflection (primary)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>2b Deep penetration seismic reflection (crossing)</td>
<td></td>
<td></td>
<td>Location:</td>
</tr>
<tr>
<td>3 Seismic Velocity</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Seismic Grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5a Refraction (surface)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5b Refraction (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 3.5 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Swath bathymetry</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a Side looking sonar (surface)</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b Side looking sonar (bottom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Photography or video</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Heat Flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11a Magnetics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>11b Gravity</td>
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<td></td>
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<tr>
<td>12 Sediment cores</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>13 Rock sampling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14a Water current data</td>
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</tr>
<tr>
<td>14b Ice Conditions</td>
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<td></td>
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<tr>
<td>15 OBS microseismicity</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>16 Navigation</td>
<td></td>
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<tr>
<td>17 Other</td>
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<td></td>
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</tbody>
</table>
### IODP Site Summary Forms:

Form 3 – Detailed Logging and Downhole Measurement Plan

<table>
<thead>
<tr>
<th>Proposal #:</th>
<th>820</th>
<th>Site #:</th>
<th>MAL-01A</th>
<th>Date Form Submitted:</th>
<th>2014-03-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Depth (m):</td>
<td>512</td>
<td>Sed. Penetration (m):</td>
<td>1059</td>
<td>Basement Penetration (m):</td>
<td>0</td>
</tr>
</tbody>
</table>

Are high temperatures or other special requirements (e.g., unstable formations), anticipated for logging at this site?

Estimated total logging time for this site: 2.5

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Scientific Objective</th>
<th>Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Shot Survey</td>
<td>Checkshot surveys will provide direct time-depth relationship for complementing synthetic seismograms and provide data for correlation with the seismic sections of the platform deposits.</td>
<td>1</td>
</tr>
<tr>
<td>Nuclear Magnetic Resonance</td>
<td></td>
<td>0</td>
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<tr>
<td>Geochemical</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Side-wall Core Sample</td>
<td></td>
<td>0</td>
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<tr>
<td>Formation Fluid Sampling</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Borehole Temperature</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Magnetic Susceptibility</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Magnetic Field</td>
<td></td>
<td>0</td>
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<tr>
<td>VSP</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Image (Acoustic)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Formation Pressure &amp; Temperature</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Other (SET, SETP, ...)</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
Summary of Operations at site: (Example: Triple-APC to refusal, XCB to refusal. RCB may be needed for penetrating the platform sequences PS9 and PS10. Those deposits are thought to ovezie less cemented carbonate (chalks). Log as described.)

All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.

All commercial drilling in this area that produced or yielded significant hydrocarbon shows.

Indications of gas hydrates at this location.

Are there reasons to expect hydrocarbon accumulations at this site?

What "special" precautions will be taken during drilling?

What abandonment procedures need to be followed?

Natural or manmade hazards which may effect ship’s operations.

Summary: What do you consider the major risks in drilling at this site?

<table>
<thead>
<tr>
<th>Pollution &amp; Safety Hazard</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Summary of Operations at site.</td>
<td>APC to refusal, XCB to refusal. RCB may be needed for penetrating the platform sequences PS9 and PS10. Those deposits are thought to ovezie less cemented carbonate (chalks). Log as described.</td>
</tr>
<tr>
<td>2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling.</td>
<td>Non described</td>
</tr>
<tr>
<td>3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows.</td>
<td>Non described</td>
</tr>
<tr>
<td>4. Indications of gas hydrates at this location.</td>
<td>No</td>
</tr>
<tr>
<td>5. Are there reasons to expect hydrocarbon accumulations at this site?</td>
<td>No</td>
</tr>
<tr>
<td>6. What &quot;special&quot; precautions will be taken during drilling?</td>
<td></td>
</tr>
<tr>
<td>7. What abandonment procedures need to be followed?</td>
<td></td>
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<tr>
<td>8. Natural or manmade hazards which may effect ship’s operations.</td>
<td>Currents.</td>
</tr>
<tr>
<td>9. Summary: What do you consider the major risks in drilling at this site?</td>
<td>Currents, although no problems were reported in the operation chapter of the Initial Res. ODP leg 115 for ODP Site 716.</td>
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### IODP Site Summary Forms: Form 5 – Lithologies

<table>
<thead>
<tr>
<th>Subbottom depth (m)</th>
<th>Key reflectors, Unconformities, faults, etc</th>
<th>Age</th>
<th>Assumed velocity (km/sec)</th>
<th>Lithology</th>
<th>Paleo-environment</th>
<th>Avg. rate of sed. accum. (m/My)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 71 m</td>
<td>Base DS9</td>
<td>0 - 2</td>
<td>1.6</td>
<td>Calcareous ooze</td>
<td>Hemipelagic</td>
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<td></td>
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<tr>
<td>71 - 240</td>
<td>Platform Sequence 10</td>
<td>?11.5 - 14</td>
<td>3.5</td>
<td>Limestone</td>
<td>Neritic</td>
<td></td>
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<tr>
<td>240 - 446</td>
<td>Platform Sequence 9</td>
<td>?11.5 - 14</td>
<td>3.5</td>
<td>Limestone - chalk</td>
<td>Periplatform</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1, where a late middle Miocene age for sequence formation appears.</td>
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<tr>
<td>446 - 522</td>
<td>Platform Sequence 8</td>
<td>?11.5 - 14</td>
<td>2.5</td>
<td>Limestone - chalk</td>
<td>Periplatform</td>
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<td>522 - 630</td>
<td>Platform Sequence 7</td>
<td>?11.5 - 15</td>
<td>2.7</td>
<td>Chalk - limestone</td>
<td>Periplatform</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1, where a middle Miocene age for sequence formation appears.</td>
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<td>630 - 717</td>
<td>Platform Sequence 6</td>
<td>?15-19</td>
<td>2.7</td>
<td>Chalk</td>
<td>Periplatform</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1, where an early Miocene age for sequence formation appears.</td>
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<tr>
<td>717 - 804</td>
<td>Platform Sequence 4 &amp; 5</td>
<td>?15-19</td>
<td>2.9</td>
<td>Chalk</td>
<td>Periplatform</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1, where an early Miocene age for sequence formation appears.</td>
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<tr>
<td>804 - 900</td>
<td>Combined PS1-3</td>
<td>?19-23</td>
<td>2.9</td>
<td>Chalk</td>
<td>Periplatform - hemipelagic</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1, where an early Miocene age for sequence formation appears.</td>
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<td>1059</td>
<td>Oligocene - Miocene boundary</td>
<td>23</td>
<td>3.5</td>
<td>Limestone</td>
<td>Hemipelagic</td>
<td>Age assignment relies on seismic ties to industrial well ARI 1.</td>
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<td>Proposal #:</td>
<td>820 - Add</td>
<td>Site #:</td>
<td>MAL-01A</td>
<td>Date Form Subm.:</td>
<td>2013-03-21 13:22:22</td>
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**Site Summary Figure Comment**

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**Page 1 of 1 - Site Summary Figure**

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