ROV Jason / Medea
De-brief summaries - 2011

7 Cruises total - this summary includes 6 cruises in 2011:

Hawaii: ALOHA cabled observatory and petrologic sampling on Kaena Ridge
May 20 - June 7
Honolulu, HI -> Honolulu, HI
R/V Kilo Moana

NE Pacific - Juan de Fuca Ridge Flank: Hydrogeology, Servicing of 6 - 7 CORK observatories
June 29 - July 14
Astoria, OR -> Astoria, OR
R/V Atlantis

NE Pacific - Juan de Fuca, Endeavor and Axial Segments:
5 individual projects: in-situ instrumentation / fluid and microbial mat sampling / study of inflation-deflation at Axial seamount
July 19 - August 1
Astoria, OR -> Astoria, OR R/V Atlantis

ROV Jason / Medea

cruises continued

NE Pacific - Juan de Fuca Ridge - Endeavor segment: 3 interrelated projects: Heat flow and magnetic studies, high speed optical communication system
August 4 - 28
Astoria, OR -> Astoria, OR
R/V Atlantis

NE Pacific - Hydrate Ridge : 2nd cruise of a field program / recovery of numerous experiments and extensive push-core sampling
August 31 - September 8
Astoria, OR -> San Francisco, CA
R/V Atlantis

East Pacific Rise: 2 projects: Geodetic study at the EPR near 9°50'N / transit ~100km to recover a separate set of up to 20 moored pressure sensors
October 4 - 25
San Diego, CA - > Balboa, Panama
R/V Atlantis

(NE Pacific Santa Barbara, CA: Study of petroleum weathering) *not reported on here*
September 13 - 29
San Francisco, CA -> San Diego, CA
R/V Atlantis

1. Pre-Cruise Planning:

All PIs felt that pre-cruise planning went well in general with only minor issues:

- **Web sites** for Atlantis and Jason cruise planning merit updating:

  - Information is scattered among various sites that are not linked.

  - Information pertinent to a Jason cruise and that the PIs rely on from the internet is **not** available via the ship's intranet.

  - Shorebased available web pages for Jason should be duplicated on the shipboard intranet.

- For the **use of elevators** a list of elevator components is lacking (weights, buoancy pack, frame dimensions) to plan and prepare elevator loads correctly and in advance.

2. Mobilization / Demobilization:

All went well except for:

- Problems with the ship's agent in one of the ports for both mobilization and demobilization. The lack of the agent's attention caused loss of science time. Departure was delayed by one day and there were miscommunications about the transport of equipment.

- The ship's departure was delayed by 12 h because new parts for the ship's bow thruster did not arrive in time.

3. Operations - Vehicle:

In general Jason performed very well.

- The Jason team offered a **quick turn-around** when required
- **Watch changes were optimized to** achieve the shortest turn-around times possible (the record was 45 minutes on deck).
- PIs valued Jason as the **right vehicle** for the **complex tasks** at the boreholes / observatory.

Some technical issues: *Manipulators*

- A ground fault on the Kraft manipulator which was quickly fixed (1 hour).
- The Schilling manipulator was inoperative during the entire dive time due to a ground fault. Because of the limited time available the pilots proceeded with just one manipulator (Kraft) and accomplished all tasks successfully.

Ground faults on Jason

- A persistent ground fault on Jason throughout manifested itself at depth.
- A major ground fault was traced to chafing of the umbilical between Jason and Medea. A replacement umbilical was connected and operations resumed after ~1.5 days.

3. Operations - Vehicle *(continued)*:

o Problems with the **bridle gear** used for lifting ALOHA components, it became entangled with components of the ROV (thrusters, T-handle) and Jason needed to be recovered on one occasion.

Ship related issues:

o R/V Atlantis lost **dynamic positioning** on 6 separate occasions while Jason was in the water. All operations had to be interrupted for ~ 1 h during

o The **winch** on the R/V Atlantis for Medea developed a leak, for repairing the seawater cooling system was turned off and was not turned back on again. During the next dive the winch overheated severely. The problem was spotted (by a member of the Jason team) and the whole system was shut down. - *A near-catastrophic failure had been averted.*

o A problem with a sheave in the **ship's winch system** caused a kink in the deep-tow cable. This led to dramatic shorting and shut down of all power to the vehicle.
~ 2500m cable had to be replaced before Jason operations could be resumed after 1.5 days.

4. NDSF - provided equipment

Navigation (USBL) worked really well except for some issues:

- USBL was used throughout the cruise and in hindsight it was questioned whether LBL might have been better for the deployment of components at the seafloor .
- It was noted that when USBL and DVL were used in concert, post-dive processing of the navigation still propagates erroneous data if the DVL was left running while the vehicle was on the bottom for extended periods (e.g. during sampling).
- A 200m mooring had been installed on the seafloor just 50m from the planned ALOHA deployment site. On 2 occasions during the cruise there were near-miss incidents of the Jason/Medea package with risk of entanglement.

4. NDSF - provided equipment

Cameras:

- HDTV worked well in general with some issues:

o It still yielded relatively dark video imagery.

o The new LED light banks are a welcome improvement but more are required.

o The controller for the HD Science Camera is a marked improvement, but the response for Pan & Tilt was too slow, while that for the Zoom function was too fast – neither were ideal in terms of routine operation.

Image quality:

o During 3 cruises it was noticed that the quality of the video image from the Mini Zeus on its dedicated monitor appeared to be superior to that for the NDSF Science Camera/Monitor.

- Specifically, at full zoom, the pilot's camera provided twice the detail, yet only the Science Camera currently offers a "frame-grab" option.

4. Operations - NDSF Equipment (continued):

Other equipment:

o *Bug in the Event Logger software*: When the "&" character was used everything that was typed following "&" was deleted by hitting "return"

o The exported version of the *Jason Virtual Van* (VVan) is not searchable in the same way that the online version is.

o *Payload* remained an issue for Jason operations on one cruise because of the use of a heavy sampling device (95 lbs).'Surplus' components had to be removed (camera, strobes, lights).

Reson multibeam system:

o The system was used for sea floor mapping - no problems were encountered at sea but the data had not been worked up at the time of the debrief call.

o Once set up correctly, the system worked extremely well. Initially there was an offset in the timing between the Reson and the navigation on Jason but that was solved well.

5. User-provided equipment

Handling and interfacing user-provided equipment worked really well in general.

- One major challenge was to connect to the observatory system in different modes to ensure functionality. Jason was not equipped for this, yet the Jason team developed a '*test-connector system*' at sea which proved to be extremely useful (-> recommendation).

- The tested *optical modem program* worked extremely well. A particular highlight was that the system could be used, coupled to a stand-alone camera, to film Jason as it conducted heat-flow blanket deployments.

Some technical issues:

o A user provided GC was interfaced for the first time with mixed success due to problem on the instrument side.

o A long-term deployed equipment failed because of corrosion problems around penetrator fittings.

8. Data hand-over:

Data hand-over went well for the most part with some remarks:

- Generating hundreds of DVDs seems an obsolete way of operating.
- There was confusion about how much data storage capacity should be provided by the PIs
- A set of HD video files recorded to the hard drive were initially assigned incorrect filenames and this had to be corrected after the cruise.
- There was great pressure to get all the data together at the end of the cruise - making copies of the entire data set for 4 PIs aboard ship.
- Some of the Jason vehicle navigation data had not been provided as a copy.

10. User Recommendations:

- The ‘test connector system’ developed at sea proved extremely useful and it is recommended that Jason be equipped with a whole series of such “test” connectors
- While the HDTV camera worked well, it was recommended that some formal training for the science team be provided during the first few watches of any cruise.
- The Digital Still Camera appeared unnecessary and was removed from Jason. Should it be permanently removed from Jason?
- Additional Jason bio-boxes with 4-way separators inside are needed
- It would be useful if Jason had some kind of cable-laying capability.
- It is highly recommended to notify PIs prior to the cruise about how much is needed in terms of data storage capacity (hard drives).

Other recommendations

- After numerous years of operations there are a lot of ALVIN and JASON weights on the sea floor. It is time for a ‘clean-up’.

- In the context of OOI, working at Hydrate Ridge continues to present problems in terms of respecting and avoiding deployed experiments.

- *One of the cruises made use of the new EM122 water column module on the Atlantis to conduct seismic surveys of the water column. Despite not being optimized yet, the system was clearly* ***able to image all three hydrothermal plumes present*** *in the study area.*

Sentry de-brief summaries – 2011

Three cruises

- 1 Alvin/Sentry
- 2 Sentry/TowCam

Sentry de-brief summaries – 2011

Pre-Cruise Planning:

- Overall NDSF pre-cruise planning went very well, special needs identified and accommodated.
- Last minute ship scheduling (non-UNOLS) and contract complicated one cruise, but WHOI/NDSF personnel ensured all was on track
- Many PIs had previous experience with NDSF assets which helped with pre-cruise planning
- WHOI on-line pre-cruise planning did not only allow for more than one study area to be entered, making it difficult to enter all necessary information for program
- Overview document requested prior to cruise specifying vehicle capabilities was delivered, but not in a particularly timely fashion.

Sentry de-brief summaries – 2011

Mobilization/Demobilization:

- All went very well
- No significant issues - even under difficult circumstances leading up to cruise (e.g. delays with truck causing late delivery)
- Demob consistently completed within ~ 1.5 days

Sentry de-brief summaries – 2011

Operations - Vehicle:

- Overall vehicle performed very well
- Batteries and endurance were good
- When there were problems they were overcome quickly and skillfully:
    - Hard drive stack failure (first instance)
    - Abort time for one mission set too early ending dive too soon
    - Shear pin failures
- Noted that Sentry could not easily accommodate short dives in rapid succession, which may be desirable based on science objectives. It was suggested that given extended battery life, personnel may prove to be the rate-determining step in turn-around time.

Sentry de-brief summaries – 2011

Operations - NDSF Equipment:

- Navigation
  - USBL+DVL
  - Quality was good, often ‘impressive’
- Reson Multibeam sonar
  - Data quality very good, meter to sub-meter resolution
  - Water-column mode very useful for plume mapping
  - Need for tide corrections
  - Incorrect sound velocity during acquisition several dives to diagnose and then several days to establish appropriate post-processing to address in data already collected
  - Catastrophic failure of two units on one cruise

Sentry de-brief summaries – 2011

Operations - NDSF Equipment:

- Camera/Lighting
  - Adequate, but could be improved esp. for biology
- EdgeTech Sidescan sonar
  - Quickly integrated to compensate for lack of MB
  - Performed well, but final data products still pending after cruise
  - Needs a standard data processing pipeline and products
- EdgeTech Subbottom Profiler
  - When used, provided quality data
  - Needs a standard data processing pipeline and products

Sentry de-brief summaries – 2011

Operations - User Provided Equipment:

- Numerous instruments were successfully integrated:
  - NOAA ORP Sensor
  - Eh Sensor
  - Fluorometer
  - Mass Spectrometer
- In later dives during one cruise an issue was noted that during the last line of each mission and during the ascent, a series of false Eh and Aquatracka anomalies were recorded – the source of which was not resolved by cruise end.

Sentry de-brief summaries – 2011

Data hand-over:

- Overall went fine
- Large data volumes made duplication difficult in some cases
- Google Earth visualizations were useful
- EdgeTech sidescan data (initial use of sonar when MB failed) was not delivered at end of cruise.

Sentry de-brief summaries – 2011

User Recommendations:

- "Best efforts" basis not suitable for all expeditions
- WHOI needs to match the commitment to success, made in good faith by the PI and funding agencies, to ensure the final data sets are delivered in a timely fashion
- Methods for improving sensor reliability at sea should be considered, including the provision of key spares for critical operations.
- Both the lighting and Sentry camera should be upgraded to meet science needs of biologists, in particular.

1. Pre-Cruise Planning

All PIs felt that pre-cruise planning went well with only minor issues:

- **Web sites** for *Atlantis* and *Jason* cruise planning merit updating:

  - Information is scattered among various sites that are not linked.

We will give the web site a face lift in 2012.

  - Information pertinent to a *Jason* cruise and that the PIs rely on from the internet is **not** available via the ship's intranet.

  - Shore-based available web pages for *Jason* should be duplicated on the shipboard intranet.

We will put this info on the shipboard web at the beginning of cruises, if supported by the ship.

- For the **use of elevators** a list of elevator components is lacking (weights, buoyancy pack, frame dimensions) to plan and prepare elevator loads correctly and in advance.

We will add this during the web site face lift.

3. Operations - Vehicle

In general Jason performed very well.

- The *Jason* team offered a **quick turn-around** when required.
- **Watch changes were optimized** to achieve the shortest turnaround times possible (the record was 45 minutes on deck).
- PIs valued *Jason* as the **right vehicle** for the **complex tasks** at the boreholes / observatory.

Some technical issues: Manipulators

- A ground fault on the Kraft manipulator which was quickly fixed (1 hour).
- The Schilling manipulator was inoperative during the entire dive time due to a ground fault. Because of the limited time available the pilots proceeded with just one manipulator (Kraft) and accomplished all tasks successfully.

The Kraft manip was inop for this dive. Kraft manips are old and require much more maintenance than the newer Schilling.

- Will be evaluated by manufacturer this winter
- May overhaul or request funds to replace

3. Operations - Vehicle

Ground faults on Jason

- A persistent ground fault on *Jason* throughout manifested itself at depth.
- A major ground fault was traced to chafing of the umbilical between *Jason* and *Medea*. A replacement umbilical was connected and operations resumed after ~1.5 days.

We try to avoid these ground-related delays, but there will be grounds on underwater vehicles.

Bridle Gear

- Problems with the bridle gear used for lifting ALOHA components; it became entangled with components of the ROV (thrusters, T-handle) and *Jason* needed to be recovered on one occasion.

The methods to deploy packages beneath *Medea* are being developed. We hope that AHC improvements in the LARS upgrade will greatly improve this.

4. NDSF - Provided Equipment

Navigation (USBL) worked really well except for some issues:

- USBL was used throughout the cruise and in hindsight it was questioned whether LBL might have been better for the deployment of components at the seafloor.

Decision on Nav is normally made with Chief Scientist input. USBL has proven sufficient for all but the deepest dives.

- It was noted that when USBL and DVL were used in concert, post-dive processing of the navigation still propagates erroneous data if the DVL was left running while the vehicle was on the bottom for extended periods (e.g. during sampling).

The Nav software is being replaced, and a function for setting zero velocity is being added. Prototype tests in Jan 2012; will require Navigator attention.

4. NDSF - Provided Equipment

- A 200m mooring had been installed on the seafloor just 50m from the planned ALOHA deployment site. On two occasions during the cruise there were near-miss incidents of the *Jason/Medea* package with risk of entanglement.

  Mooring was installed where Chief Scientist requested. This issue will continue with ROVs in the vicinity of OOI nodes when entanglement hazards are deployed so close. ROVs that do not have *Medea* will have LESS knowledge of the cable location and be more prone to entanglement. *Medea* should make this easier, but any time entanglements are placed close to where ROVs work there will be entanglement danger.

4. NDSF - Provided Equipment

Cameras:

•HDTV worked well in general with some issues.

•It still yielded relatively dark video imagery.

We're adding more LED lights in 2012.

•The new LED light banks are a welcome improvement but more are required.

•The controller for the HD Science Camera is a marked improvement, but the response for pan & tilt was too slow, while that for the zoom function was too fast – neither were ideal in terms of routine operation.

The zoom speed is driven by the lens and will remain as is. Pan and tilt speed is a software tuning issue and is being addressed.

Image quality:

•During 3 cruises it was noticed that the quality of the video image from the Mini-Zeus on its dedicated monitor appeared to be superior to that for the NDSF Science Camera/Monitor.

Being addressed in NDSF imaging discussion later.

4. NDSF - Provided Equipment

Other equipment:

•*Bug in the Event Logger software*: When the "&" character was used everything that was typed following "&" was deleted by hitting "return"

Being addressed

•The exported version of the *Jason* Virtual Van (VVan) is not searchable in the same way that the online version is.

The nature of a write-once DVD makes searches within this product less flexible.

•*Payload* remained an issue for *Jason* operations on one cruise because of the use of a heavy sampling device (95 lbs).'Surplus' components had to be removed (camera, strobes, lights).

There are limits to our payload that we all have to work within; at least we were able to remove other items to accommodate this work.

Reson multibeam system:

•The system was used for sea floor mapping - no problems were encountered at sea but the data had not been worked up at the time of the debrief call.

•Once set up correctly, the system worked extremely well. Initially there was an offset in the timing between the Reson and the navigation on *Jason* but that was solved well.

5. User - Provided Equipment

Handling and interfacing user-provided equipment worked really well in general.

•One major challenge was to connect to the observatory system in different modes to ensure functionality. *Jason* was not equipped for this, yet the *Jason* team developed a '*test-connector system'* at sea which proved to be extremely useful (-> recommendation).

We intend to make this functionality available for future OOI operations. Using our spare fiber, eliminating the NDSF HD camera. This is useful for troubleshooting shore signals or deployed sensor signals.

•The tested *optical modem program* worked extremely well. A particular highlight was that the system could be used, coupled to a stand-alone camera, to film *Jason* as it conducted heat-flow blanket deployments.

Some technical issues:

• A user provided GC was interfaced for the first time with mixed success due to problem on the instrument side.

• A long-term deployed equipment failed because of corrosion problems around penetrator fittings.

These issues apply to user supplied sensors. *Jason* personnel assisted in troubleshooting these as needed.

8. Data Handover

Data hand-over went well for the most part with some remarks:

- Generating hundreds of DVDs seems an obsolete way of operating.

We are working to replace DVD video recorders with direct-to-file recorders.

- There was confusion about how much data storage capacity should be provided by the PIs.

A primer covers this, but its content can and will be improved. We will take steps to ensure that PIs receive the primer during the pre-cruise phase.

- A set of HD video files recorded to the hard drive were initially assigned incorrect filenames and this had to be corrected after the cruise.

A script has been developed that can help catch errors of this type.

- There was great pressure to get all the data together at the end of the cruise - making copies of the entire data set for four PIs aboard ship.

Jason offers a 1-to-2 copy DVD duplicator that is available from the beginning of the cruise to help with this.

- Some of the *Jason* vehicle navigation data had not been provided as a copy.

We alerted the PI upon inspection of the archive package and later

10. User Recommendations

- The ‘test connector system’ developed at sea proved extremely useful and it is recommended that *Jason* be equipped with a whole series of such “test” connectors
- While the HDTV camera worked well, it was recommended that some formal training for the science team be provided during the first few watches of any cruise.

Agreed we’ll provide more detailed training, but video expertise is not trained into a person in a matter of hours, and we’re not video experts

- The Digital Still Camera appeared unnecessary and was removed from *Jason*. Should it be permanently removed from *Jason*?

NO: other PIs still require this sensor and have requested an upgrade.

- Additional *Jason* bio-boxes with 4-way separators inside are needed.
- It would be useful if *Jason* had some kind of cable-laying capability.

If supported by NSF we would like to develop this capability. We could capitalize on the MBARI and ROPOS experience.

Other Recommendations

- It is highly recommended to notify PIs prior to the cruise about how much is needed in terms of data storage capacity (hard drives).

See earlier comment about a primer. At this time most cruises will find a 320GB drive for sensor & still image data and 8TB for HD video to be sufficient.

- After numerous years of operations there are a lot of *Alvin* and *Jason* weights on the sea floor. It is time for a 'clean-up'

Recommend NSF provide *Jason* days in the schedule to facilitate a cleanup during cruises in these areas.

- In the context of OOI, working at Hydrate Ridge continues to present problems in terms of respecting and avoiding deployed experiments.
- One of the cruises made use of the new EM122 water column module on the Atlantis to conduct seismic surveys of the water column. Despite not being optimized yet, the system was clearly able to image all three hydrothermal plumes present in the study area.

NDSF Feedback to Science Users

- **Science equipment preparation for your cruises is critical**
  - When *Jason* ops personnel spend MOB or at-sea time making your sensors work we can't effectively keep the core vehicle working.
  - Wiring harnesses, pin outs, weights etc. provided in advance
- Knowing the correct weights of science gear is required prior to putting them on the vehicles
- **Attitude of PIs in the control van and in general**
  - It is unproductive to question the EL when he/she makes the obviously difficult weather call to not go in
- **NDSF would like to suggest modifying the post cruise debrief to include the vehicle manager to avoid misconceptions and errors**
  - Would still be a portion of the meeting w/o the manager
- During pre-cruise planning process, Chief Scientist is asked to please be sure to pass NDSF docs to other PIs, e.g. 'Data Overview' that is provided during pre-cruise.

Sentry Responses - 2011

Pre-Cruise Planning:

- WHOI on-line pre-cruise planning did not only allow for more than one study area to be entered, making it difficult to enter all necessary information for program
  - PI's are advised to enter a box large enough to cover all proposed operations areas. Specific locations can and should be brought up as a part of the pre-cruise planning process.

- Overview document requested prior to cruise specifying vehicle capabilities was delivered, but not in a particularly timely fashion.
  - These documents are now readily available and can be delivered in a timely fashion.

Sentry Responses - 2011

Operations - NDSF Equipment:

Reson Multibeam sonar

- Need for tide corrections

We now use the OSU tidal correction model.

- Incorrect sound velocity during acquisition several dives to diagnose and then several days to establish appropriate post-processing to address in data already collected.

We have now ordered and will integrate in 2012 a sound velocity probe removing the human element from this.

- Catastrophic failure of two units on one cruise

We continue to work closely with Reson to improve their reliability. We have a service agreement which puts us under perpetual warranty eliminating repair costs. We have also worked to purchase spares as budgets will allow.

Sentry Responses - 2011

Operations - NDSF Equipment:

Camera/Lighting

- Adequate, but could be improved esp. for biology

We have purchased a new strobe which should be delivered in early 2012. We continue to search for an appropriate off the shelf camera which will also require funding.

- EdgeTech sidescan sonar/sub-bottom profiler performed well, but final data products still pending after cruise.

  Delivered early September 2011, PI is satisfied.

- Need a standard data processing pipeline and products.

  Defined in new data products document. Delivered to DESSC in Sentry Y1 Report, ahead of this meeting.

Sentry Responses - 2011

Operations - User Provided Equipment:

- In later dives during one cruise an issue was noted that during the last line of each mission and during the ascent, a series of false Eh and Aquatracka anomalies were recorded – the source of which was not resolved by cruise end.

  We still do not understand this but since it is only the final moments of a dive, it has not been a priority.

Sentry Responses - 2011

User Recommendations:

- "Best efforts" basis not suitable for all expeditions

Best effort continues to be the standard model. Exceptions can be considered but involve significant risks to the Institution and cannot be undertaken lightly or regularly.

- WHOI needs to match the commitment to success, made in good faith by the PI and funding agencies, to ensure the final data sets are delivered in a timely fashion.

This data has been delivered.

- Methods for improving sensor reliability at sea should be considered, including the provision of key spares for critical operations.

We continue to purchase spares as budgets will allow and have made significant progress this year, particularly on the Reson system.

- Both the lighting and *Sentry* camera should be upgraded to meet science needs of biologists, in particular.

We are in the process of upgrading the lighting. We are evaluating camera options