Okeanos Explorer

EX-10-02: ROV Integration / Shakedown / Field Trials
Data Management Plan

Data Management Plan Overview
The data collected and/or recorded and products generated as a result of cruises aboard the *Okeanos Explorer* will be managed by an Integrated Product Team (IPT) charged with managing data and products for NOAA's Office of Ocean Exploration and Research (OER). The IPT is comprised of personnel from OER, the NOAA Data Centers, and other extramural partners.

In a new exploration paradigm, data recorded, products generated, and reported discoveries made during an *Okeanos Explorer* mission will be made discoverable and accessible to the general public in as close to real-time as possible.

Discoverability and accessibility to these data will be made available through a variety of access points, including the Digital Atlas, the Exploration Command Centers (ECC), metadata search engines, websites, and other geospatial applications.

Data Management Objectives
The data management software team objectives for each leg of the *EX-10-02* cruise are as follows:

Leg I: ROV Integration (February 23 – March 11, 2010)
- Test CIMS At-Sea Data Collection Module and CIMS Broker
- Continue testing adjustments made to SCS for bounding box issue
- Test CIMS Broker email notification capability.
- Test communications throughput between SCS and CIMS, *Okeanos Explorer* and NCDDC
- Test throughput of large video files from ship to NCDDC

Leg II: ROV Shakedown (March 16 – March 31, 2010)
- Update CIMS Broker code base
- Test sending status reports via email
- Install back-up CIMS on back-up SCS system
- Move data file storage to netapps server
- Update ship's CIMS SOP with new data file storage location
- Test SCS metadata generator
- Test Dive data package generator
- Test ftp of HDF5 with bandwidth cap in place

Leg III: ROV/VSAT Field Trials (April 26 – May 12, 2010)
- Test proposed video pipeline
- Test ROV/Sled metadata generation capabilities

Expedition Principals for Data Management
Lt. Nicola ver Planck, NOAA Corps Officer, Field Operations Officer, NOAA Ship *Okeanos Explorer*

Craig Russell, OER Senior Planner, NOAA Ship *Okeanos Explorer*, Leg I Expedition Coordinator
Catalina Martinez, OER Regional Manager, Legs II and III Expedition Coordinator
Webb Pinner, OER Data and Video
Mashkoor Malik, UNH CCOM/JHC, EX Mapping Team, Mapping Survey Lead Scientist
Susan Gottfried, NCDDC, OER Data Management Coordinator

Anticipated Data for Archive

- Meteorological sensor data
- Oceanographic sensor data
- Navigational data
- Mapping Survey raw and edited data

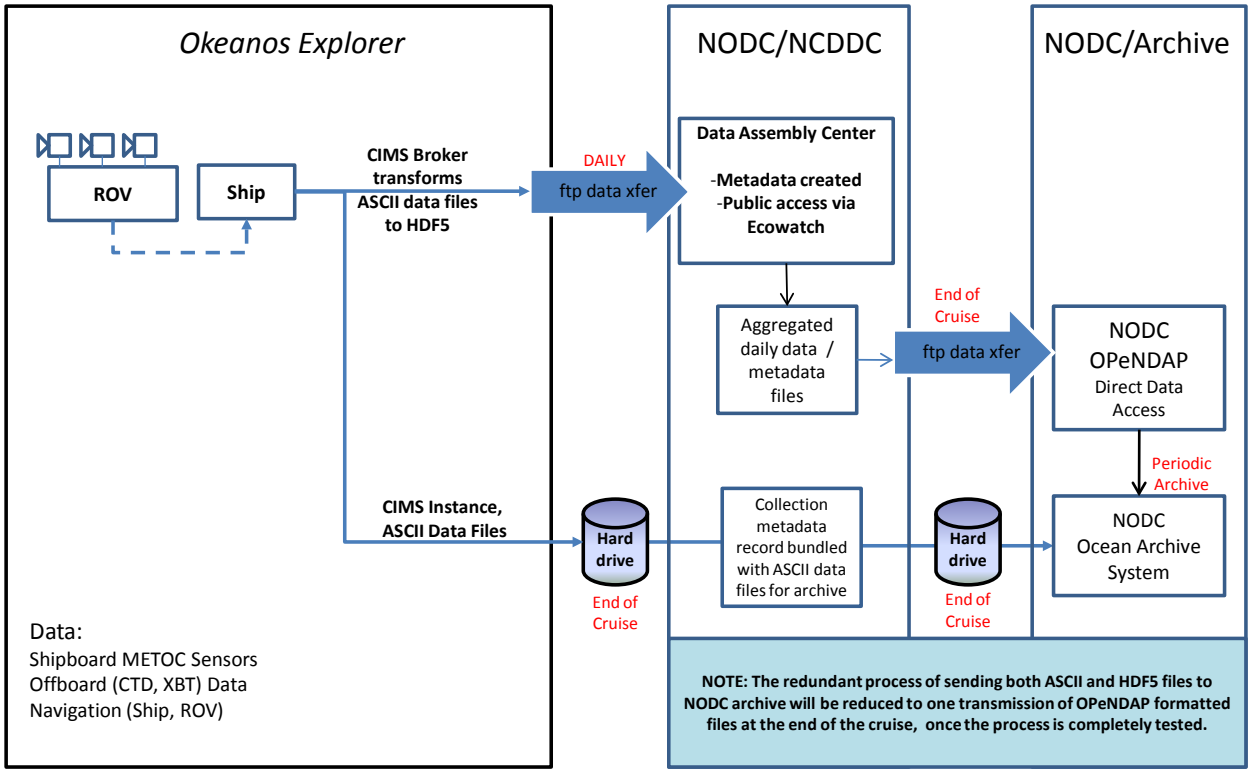
Data Pipelines

For the 2010 *Okeanos Explorer* field season, NCDDC will be responsible to ensure that the data, multimedia, and products from the ship and its submersible vehicles are bundled with accompanying standard metadata and delivered to the appropriate archive center. NCDDC will also ensure that targeted data and products will be incorporated into various geospatial applications and websites which showcase the ship, its data capabilities, and provide discoverability and access to the data and products that result from the mission.

Data from hull-mounted, off-board, and submersible vehicle meteorological and oceanographic (METOC) sensors monitored through the ship's Scientific Computer System (SCS) will be archived at the National Oceanographic Data Center (NODC) Marine Data Stewardship Division (MDSD) in Silver Spring, MD. A collection level metadata record describing the data inventory to be archived at the NODC/MDSD will be included with the data submission.

Planning and scientific reports, physical and digital multimedia, and iconographic data products will be archived at the NOAA Central Library (NCL) in Silver Spring, MD, a division of NODC.

Oceanographic / Navigational / Meteorological Data Pipeline



Oceanographic/Navigational/Meteorological Metadata Generation Instructions:

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
MET	RM Young 61202V	Barometric Pressure (mB)	.raw (ASCII)	1 meta rec = baro*.raw files in SCS_Data/Met folder	NODC/MDSD
MET	RM Young 41382VC	Air Temperature (deg C)	.raw (ASCII)	1 meta rec = met*.raw files in SCS_Data/Met folder	NODC/MDSD
MET	RM Young 41003P	Relative Humidity (Pct)	.raw (ASCII)	1 meta rec = met*.raw files in SCS_Data/Met folder	NODC/MDSD
MET	RM Young 05106/RM Young 05306B	Relative Wind Speed (knots)/Relative Wind Direction (degrees)	.raw (ASCII)	1 meta rec = Wind*.raw files in SCS_Data/Met and SCS_Data/Wind folder	NODC/MDSD
MET	Derived	True Wind Speed (knots)/True	.raw (ASCII)	1 meta rec = SCS_Data/TWind folder	NODC/MDSD

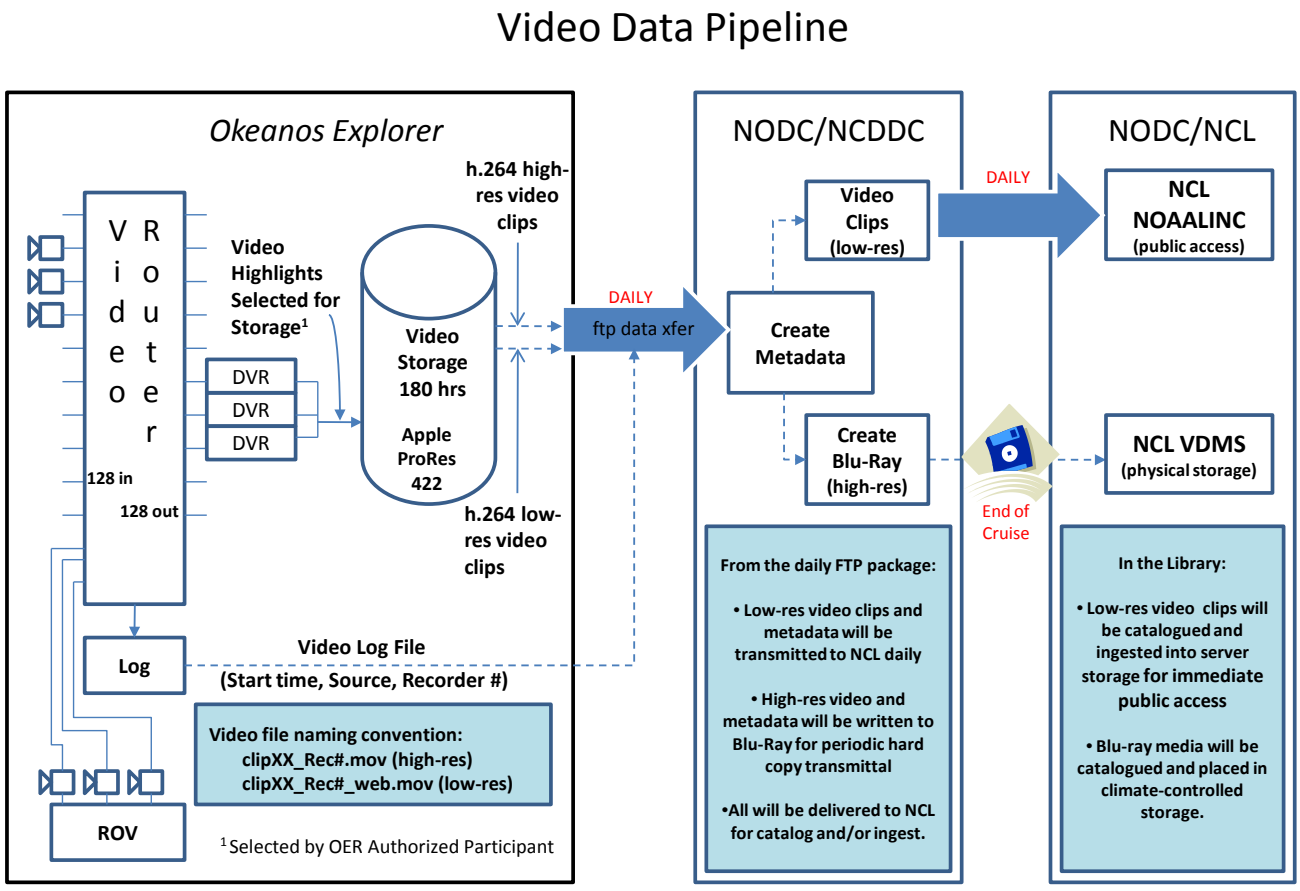
		Wind Direction (degrees)			
MET	Epply PSP and PIR	Solar Radiation (kWh/m2)	.raw (ASCII)	1 meta rec = met*.raw files in SCS_Data/Met folder	NODC/MDSD
NAV	Applanix POS/MV 320	Location, Heading, Attitude (Decimal degrees, degrees, degrees)	.raw (ASCII)	1 meta rec = SCS_Data/POSMV folder	NODC/MDSD
NAV	CNAV DGPS/C-NAV 2000	Global Position (Decimal degrees)	.raw (ASCII)	1 meta rec = SCS_Data/CNAV and SCS_Data/DGPS	NODC/MDSD
NAV	Gyro Compass	Compass Readings	.raw (ASCII)	1 meta rec = SCS_Data/Gyro folder	
OCN	SeaBird SBE-9plus	Conductivity, Temperature, Depth	.raw (ASCII)	1 meta rec = SCS_Data/CTD folder and Profile_Data/CTD folder	NODC/MDSD
OCN	SeaBird SBE-45 Micro	Temperature, Salinity, Sound Velocity (deg C, psu, m/s)	.raw (ASCII)	1 meta rec = SCS_Data/SciSwSys folder	NODC/MDSD
OCN	Sippican MK-21 eXpendable BathyThermograph (XBT)	Temperature, Depth, Sound Velocity (deg C, meters, m/s)	.edf (ASCII)	1 meta rec = Profile_Data/XBT folder	NODC/MDSD
OCN	Calculated	Sound Velocity (m/s)	.asvp (ASCII)	1 meta rec = Profile_Data/SVP or Profile_Data/ASVP	NODC/MDSD

Anticipated Multimedia for Archive:

- Web-streaming quality video segments
- High-resolution video segments

Video Data Pipeline

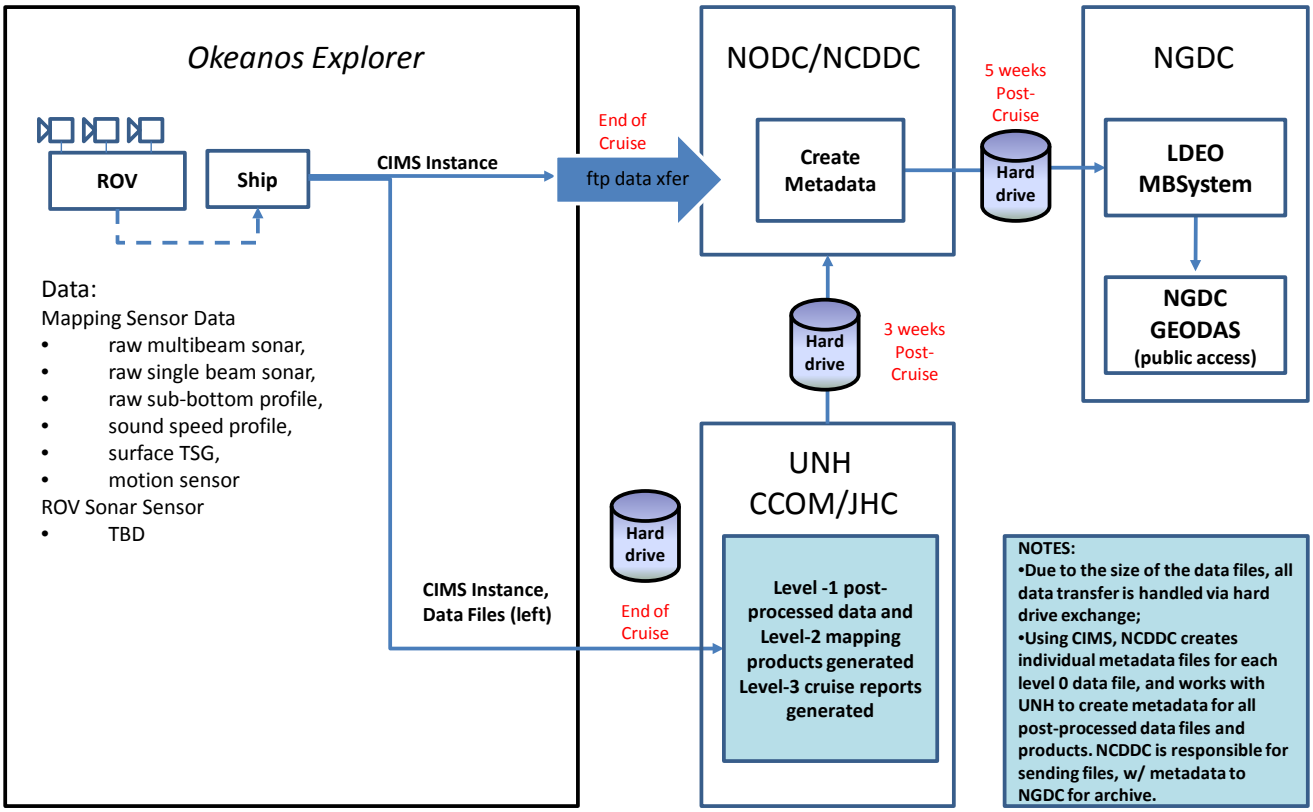
During EX-10-02, the video data pipeline will be tested. Video segments will be flagged by an onboard videographer. A video router log routine (being developed by W. Pinner) will be tested to return metadata about the video clip and the camera that recorded it. Each day two-hours of flagged video will be delivered via ftp to NCDDC in two resolutions, web-streaming quality and high-def quality, totaling a maximum of 25 gigabytes. The web-streaming quality video clips will be delivered to the NOAA Central Library for their NOAALINC. Until the clip is available through NOAALINC, the clip will be served through the Digital Atlas interface. The high resolution video clips will be written to Blu-ray and delivered as a set to the NCL at the completion of the cruise for physical media storage. Metadata will be written for each individual clip and for each Blu-Ray media unit.



For cruise EX-10-02, the data collected and products generated by bottom-looking sensors and complementary sensors will be archived at the National Geophysical Data Center (NGDC) in Boulder, CO. These data will be accompanied with a collection level metadata record for the NGDC. In addition, the submission to NGDC will include the following:

- raw (level-0) mapping survey data,
- post-processed, quality assured, and edited (level-1) data,
- specific data products (level-2) including GeoTIF images and gridded bathymetric files, and
- comprehensive mapping survey data cruise summary (level-3) report.

Bathymetric / Geophysical Data Pipeline (current state)



Metadata Generation Instructions:

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
GEO	Kongsberg Simrad EM-302 (30 kHz)	Multibeam Bathymetry, Bottom Backscatter, Water Column Backscatter (proprietary format read into MBSystem)	.all, .wcd (proprietary)	1 meta rec per .all file in Multibeam Data folder and subfolders	NGDC
GEO	Kongsberg EA600 (12 kHz)	Singlebeam (x,y,depth)	.txt, .xyz (ASCII), .dg, .out, .raw (proprietary)	1 meta rec = SingleBeam Raw Data folder	NGDC
GEO	Knudsen CHIRP 3260 (3.5 kHz)	Sub-bottom profile	.sgy, .kea, .keb (proprietary) .	1 meta rec = Subbottom Profile Data folder	NGDC
OCN	Calculated	Sound Velocity (m/s)	.asvp (ASCII)	1 meta rec = Profile_Data/SVP or Profile_Data/ASVP	NGDC

Anticipated Products for Archive:

- Quick Look Report
- Final Cruise Plan report
- Final Cruise Summary report
- Final Mapping Survey Data Summary report
- Mapping Survey Products from edited data

Product	Release?	Archive?	Format/Size	Archive Center	Originator
Daily Situation Report	No	No	.doc/ <500K	n/a	Lead Scientist
Quick Look Report	Yes	Yes	.pdf/	NCL	Lead Scientist
Final Cruise Plan	Yes	Yes	.pdf	NCL	Expedition Coordinator
Final Cruise Summary Report*	Yes	Yes	.pdf	NCL	Expedition Coordinator, Lead Scientist
Final Cruise Mapping Data Report*	Yes	Yes	.pdf	NCL, NGDC	Mapping Survey Lead Scientist
Gridded Mapping Data Products*	Yes	Yes	GeoTIFF (.tif), xyz grids (.txt), IVS objects (.dtm, .sd, .shade, .geo), screen shots (.bmp)	NCL, NGDC	Mapping Survey Lead Scientist
Bottom Mosaics*	Yes	Yes	GeoTIFF (.tif)	NCL, NGDC	Mapping Survey Lead Scientist

***Approval Process required before publishing**

The approval process for publishing final cruise products is yet to be determined.

Geographic Information Systems:

Links to these archived data sets and products will be discoverable through the Digital Atlas, a Geographic Information System (GIS) application developed and maintained at NCDDC, a division of NODC. NCDDC also maintains a Google based application called "Okeanos Explorer Atlas," which will display the ship's hourly track and an hourly snapshot of selected METOC sensors along the track. Some time after the cruise's end, the hourly track will be thinned to a daily track that will be displayed from a geospatial data base. The following lists the geospatial layers that will represent the cruise in the GIS.

Layer	Spatial Data Source	GIS format	Additional Data, if available
Cruise Track	SCS	Line	Daily snapshot of METOC sensor readings
CTD Casts	SCS	Point	CTD Profile
XBT Casts	SCS	Point	XBT Profile
Web-streaming video clip			
Final Cruise Summary Report*	n/a	n/a	
Final Cruise Mapping Data Report**	n/a	n/a	
Mapping Data Products**	n/a	n/a	
Bottom Mosaics	Geospatially tagged	Image Overlay	

*Not geospatially tagged.
**If available, and if so, not geospatially tagged.