Monterey Accelerated Research Site

A Test-bed for ORION Observatories

Start of Full Operations -- Summer 2007
What is MARS?

- 62 km of fiber optic cable
- Single undersea node at .9 km depth
- 100 Mbits per second data rate
- 10 kW of power to 8 instrument ports
- Capability of siting instruments on “extension cords”
- Serviced using *UNOLS* or *MBARI* ships/ROVs
A Test-bed for ORION Observatories

- Currently a funded NSF project with MBARI as lead institution.
- Will transition to NSF funded O&M with MBARI as operator for 3 years.
- MARS is focusing on the instrument developers with an emphasis on testing new technology and associated ROV-based marine operations to enable next-generation experiments.
POWER & COMMUNICATIONS

• 9 kW to science instruments
  – 48 and 400 VDC cover low and high power users effectively
  – Provision for other voltages (12 VDC) will be provided with
    COTS DC/DC converters in the SIIM

• 10/100Base-T at each science port
  – TCP/IP Streams, FTP and … protocols
  – SIIMs support conversion to other protocols
    (RS-232, RS-422, etc.)
  – Port may be connected to 1 instrument or a suite of instruments
    directly or using secondary multiplexers
  – Low latency to enable tele-operations
    (and other activities) is the goal
MARS Overview

MARS New Generation Cable Observatory Test Bed

EXTENSION CABLES

Main Cable
Monterey Canyon

MBARI

SCIENCE INSTRUMENT CONNECTOR PANEL
MARS Users--Possible Projects

Imaging capabilities
- Eye in the Sea (low light camera)--Widder; FUNDED
- Digital still images of experiments

Seismic network
- MOBB to MARS (Buried Seismometer) UCB, Romanowicz

Adaptation of existing sensors
- Rumbleometer (hydrophone and bottom depth recorder)' NOAA/PMEL; Chadwick
- Eddy Flux correlation (O$_2$, ISUS, CTD, flow-meter); Planned; MBARI; Barry/Johnson
MARS Users--Pending Projects

Adaptation of existing sensors--continued

– Electrochemical samplers for in situ chemistry (Medusa Science Mission; Flynn/Schultz
– In situ Voltametric Sensors for Microbiology; Cowen; Hawaii
– Benthic ROVER; MBARI; K. Smith; in development
– Acoustic imaging; Rutgers; Rona; planned
pending projects--continued

Extension of the infrastructure

- Aloha mooring secondary node with guest connectors; APL; McGinnis; FUNDED
- IODP Borehole Observatory--
  - CORKS with T,P sensors (maybe chemical sensors)

Biogeochemical sampling/sensing

- Deep Environmental Sample Processor (D-ESP); MBARI; Scholin; PENDING; NASA
- MEDUSA-ISOSampler system; Oregon State; Schultz
- McLane Remote Water Sampler--Butterfield; planned
- H$_2$S, CH$_4$, H$_2$ sensors--planned; Lilley; UW/Keck
KECK Broadband Sensor
MARS Node is patterned after the MOBB RIN with an Electronic Module as an insert in a trawl resistant bottom mount.

The ROV Ventana connects the MOBB electronics module to the broadband sensor with underwater mateable ODI connectors.
- Illuminators (2 Red, 2 White)
- Bioluminescence Detector
- Intensified Camera
- Communication Bottle
- Borehole Observatories in Monterey Bay (proposal to IODP)
- Connect MARS Cable to IODP boreholes:
Proposed IODP Bore Hole Test Facility

Install three 300 m deep hole near the end of the MARS cable:
• Provide borehole instrument test site
• Develop borehole to cable connections
• Conduct science experiments

MARS node

~1.5 km extension cables

Seismology Borehole

Hydrology Boreholes

300 m

25 m
Seismology Site (IODP proposal)

- ~300 m deep holes with modified Borehole Instrument Hanger
- 1.5 km down slope of MARS node
- Install Broad Band Seismometer
- Located ~8 km to the west of San Gregorio Fault
- Entirely on the Pacific Plate
- Connection with MARS cable provides real-time link to global seismic network
The ROV *Ventana* with cable laying toolsled

4000 to 5000 meter sections of fiber optic cable per run
Cable Laying with Tiburon
After science instrumentation has been bench tested for compliance to MARS power and telemetry protocols, we can test the best ways to emplace the instruments using the ROVs Ventana or Tiburon in the MBARI test tank.
MARS and ORION

• MARS is designed to be a testbed for observatory technology
• The MBARI assumption is that ownership, maintenance and operation of MARS will eventually transition to ORION.
MARS Contacts

MARS Facility

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• Jim Bellingham – Organizational
• Keith Raybould – MARS Project Manager
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