HD Upgrade Project - Implementation

DESSC
June 2009

NDSF HD Upgrade Program Update

William N. Lange
Advanced Imaging and Visualization Laboratory
Woods Hole Oceanographic Institution

HD Upgrade Project - Implementation

Design Goals for HDTV Upgrade

To develop an imaging system upgrade that improves the overall quality of motion and still-based imagery on *Jason* and *Alvin* without impacting the day rate.

- Endorsed by DESSC, December 2007
- Approved for funding by NSF, Spring 2008
- Camera Head Completion, Spring 2009
- NSF Phase 2 Integration Funding, Summer 2009?
- System Integration/Software Development, Fall 2009
- HD Integration on Jason and Alvin, Early 2010

HD Upgrade Project - Implementation

Phased Implementation

- 2008-2009: Fabrication of two HDTV cameras with zoom optics, including interface and control electronics
- 2009: Testing of the prototype HDTV camera on *Alvin* & *Jason*
    - *Adkins-Thresher-Shank, Deep Sea Corals, Jason*
    - *Chadwick, NW Rota, Jason*
    - *Resing, Lau Basin, Jason*

HD Upgrade Project - Implementation

Schedule for 2009-2010 Activities

- Camera Head Fabrication - Completed
- Electronics & Storage for *Alvin* - In Development
- Integrated Camera Control System - In Development
- *Alvin* Image Storage Bottle - In Development
- Acquisition and Storage Software - In Development
- Final Camera Hardware Integration - Early 2010

HD Upgrade Project – Test Results

Lessons learned from prototype HD Camera that will be incorporated into final HD integration

- HD images significantly increased *Jason* media presence
- Camera control system needs to be integrated with science pan and tilt system and hand box
- *Jason* needs better overall lighting - recommend adding LEDs
- HD imagery needs pre-processing for maximum quality
- Documentation and concept of operations needed for HD camera operations and deliverables
- Need for HD monitoring in back of *Jason* van
- Need for integration of video operations into data section
- Camera system is labor intensive for optimum performance
- Motion recording to be reviewed for workflow, recording ops, media management, archiving issues
- Time stamping improvement for motion and still acquisition

HD Upgrade Project - Implementation

Processing Software Development

- **Still Imagery**
  - Integration into *Alvin* and *Jason* data collection system
  - Pre-processing steps to sharpen, contrast enhance and render files into science user-friendly formats (TIFFs)
  - Multiple file type storage
    - *Raw file, unprocessed*
    - *Processed file, TIFF format 16 bit*
- **Motion Imagery**
  - Addition of real-time sharpening and gamma correction studied for SDI 12 bit conversion system

HD Upgrade Project - Implementation

Alvin Image Data Storage

Separate 7” ID pressure housings

- Allows *Alvin* and *Jason* cameras to be compatible
- Reduces complexity of *Alvin* camera head
- Easier servicing and maintenance
- Design compatible with RHOV
- Requires fiber pull-apart design

HD Upgrade Project - Implementation

Motion Imagery Acquisition

Flexible system design

- Supports both compressed & uncompressed HDTV recording
- Interface compatible with many COTS recording systems
- Research needed to determine best concept of operations for multi-format and full HD motion acquisition
- AIVL will provide motion recorders on a request-for-services basis

HD Upgrade Project - Implementation

HD Upgrade Data Deliverables

Still Images

- Raw, unprocessed image files with time stamp
- Pre-processed 16 bit color TIFF files with time stamp
- Integrated to *Alvin* and *Jason* data collection systems

HD Upgrade Project - Implementation

HD Upgrade Data Deliverables (cont.)

Motion Imagery

- Down-converted HDTV to SDTV video
  - *DVCam and DVD recordings*
  - *Platform time code*
- HD-SDI ITU-709R format output for third party recorders
  - *WHOI AIVL supplied motion recorders*
  - *Platform Time Code*

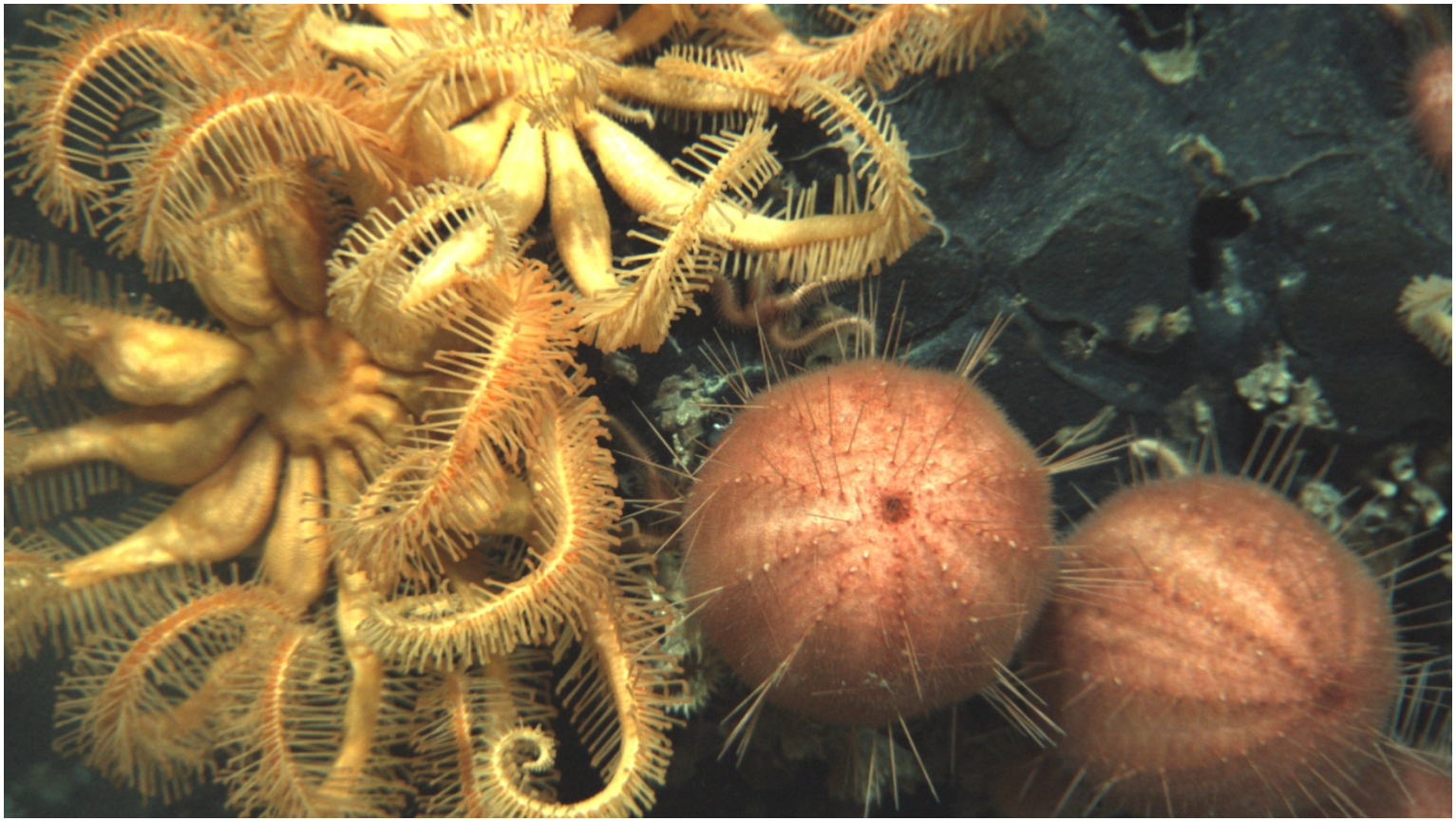
HD Upgrade Project - Implementation

Still Image Examples

- *Adkins-Thresher-Shank, Deep Sea Corals, Jason*
- *Chadwick, NW Rota, Jason*
- *Resing, Lau Basin, Jason*

HD Upgrade Project -Examples TN-228

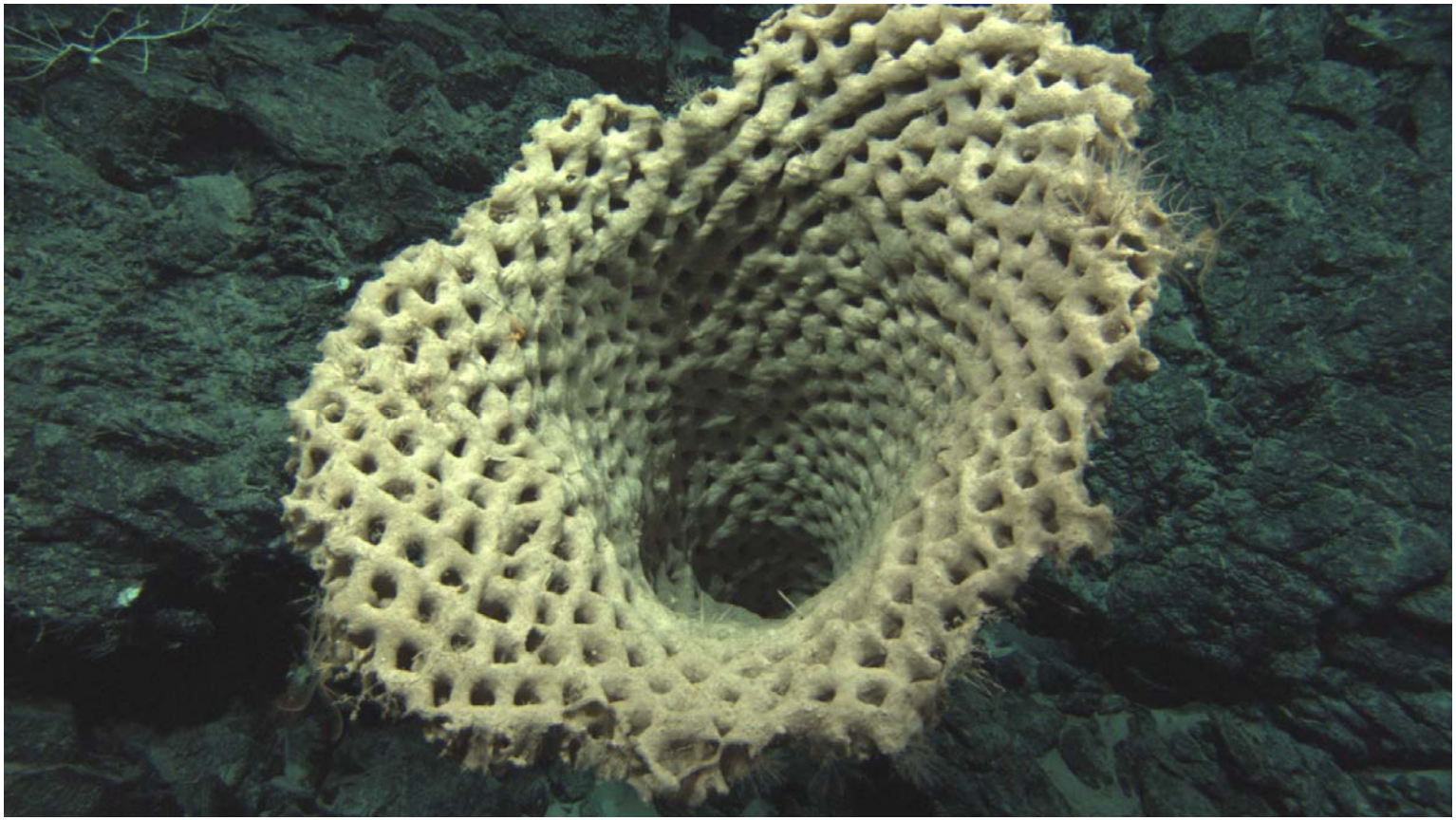
HD Upgrade Project -Examples TN-228



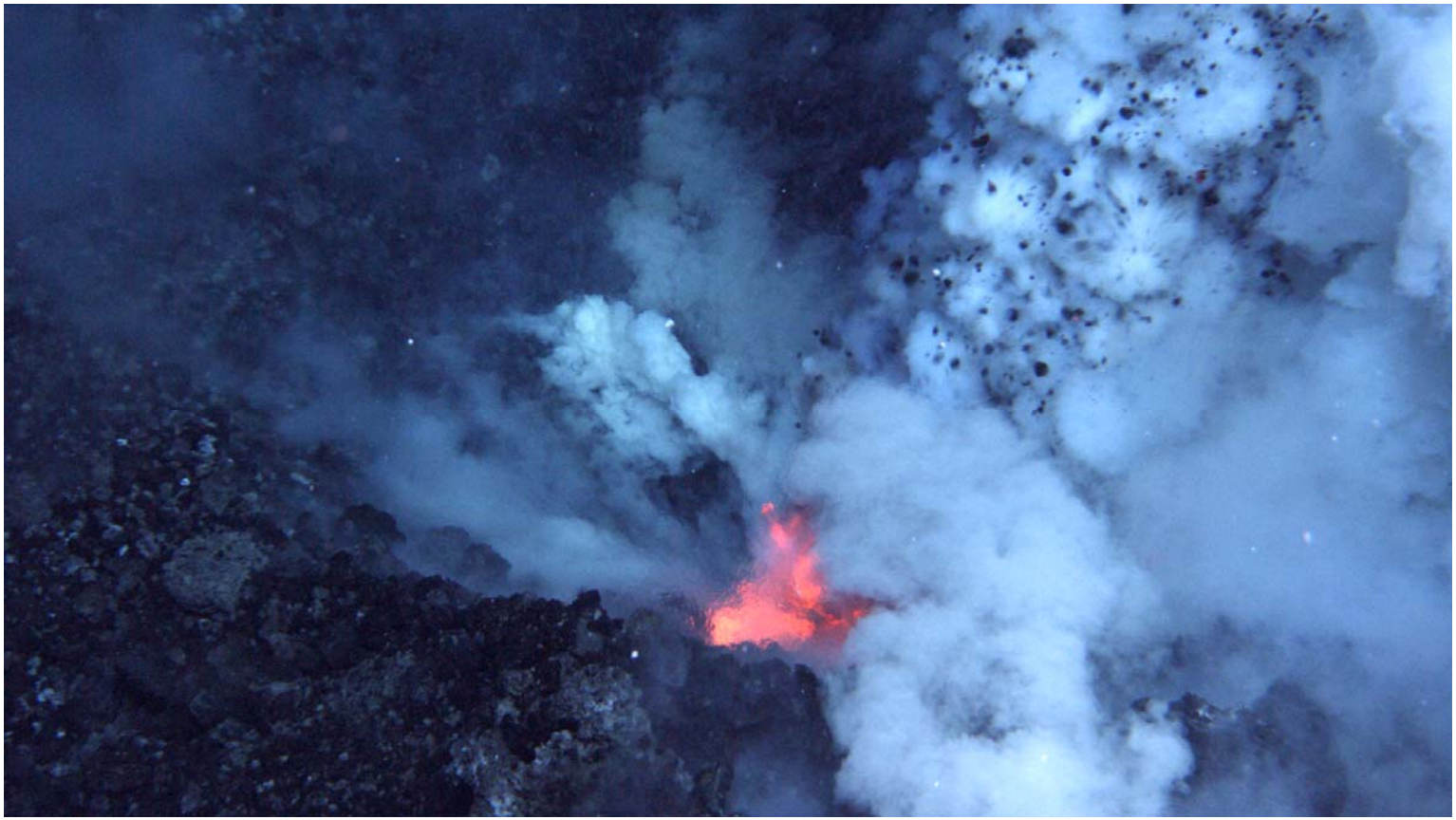
HD Upgrade Project -Examples TN-228

HD Upgrade Project -Examples TN-228

HD Upgrade Project -Examples TN-228

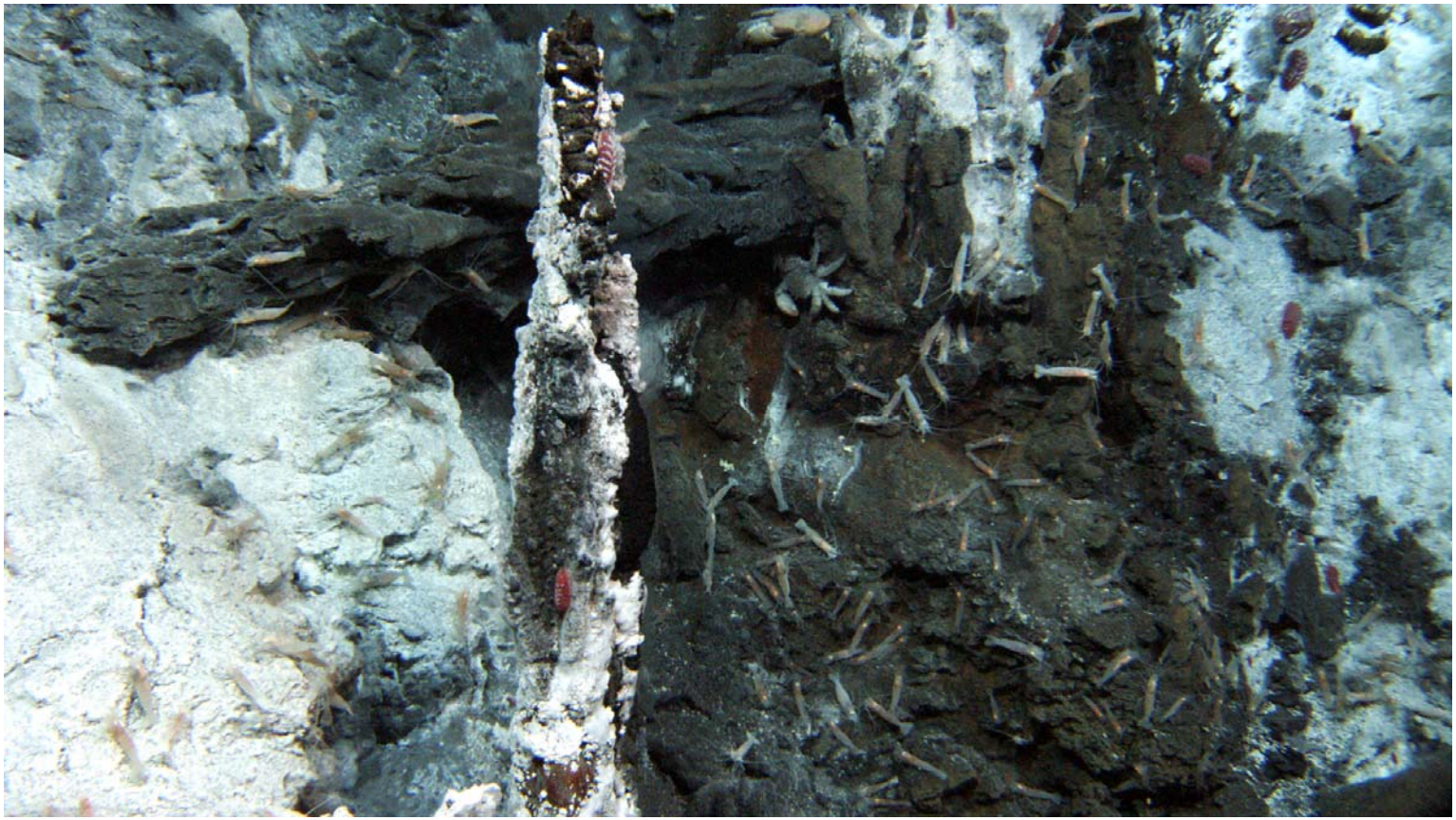


HD Upgrade Project -Examples TN-234



HD Upgrade Project -Examples TN-234

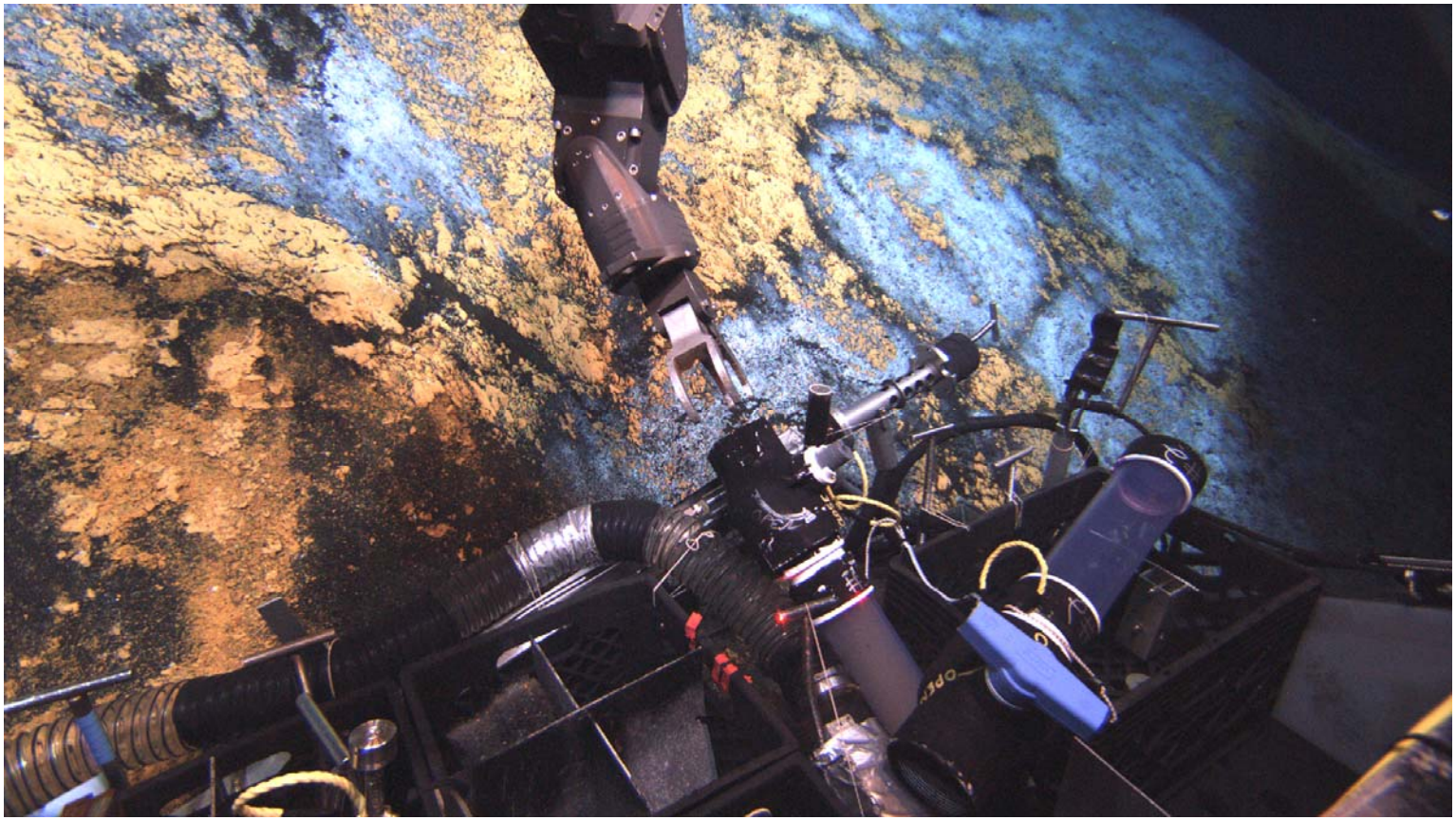
HD Upgrade Project -Examples TN-234



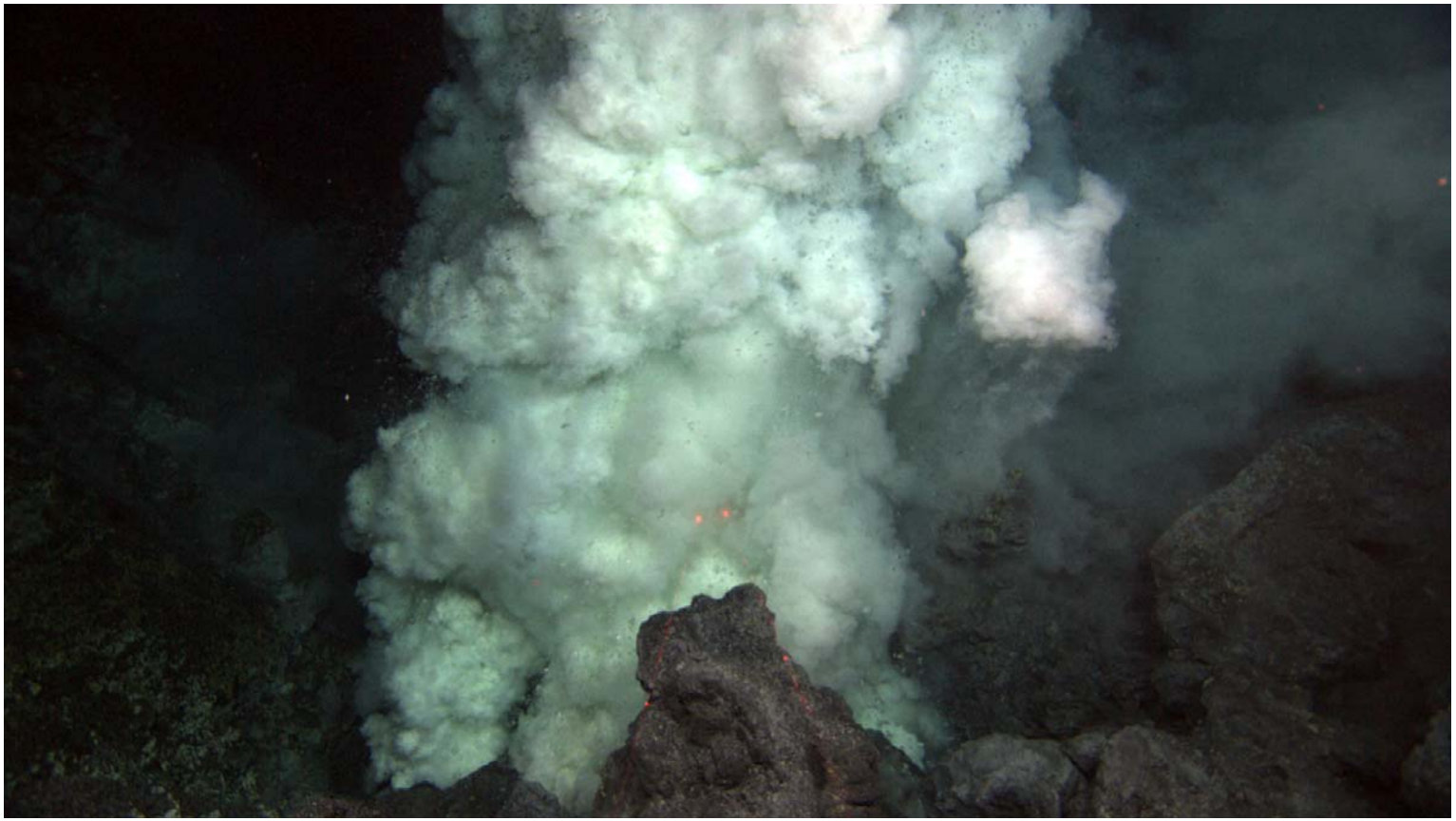
HD Upgrade Project -Examples TN-234

HD Upgrade Project -Examples TN-234

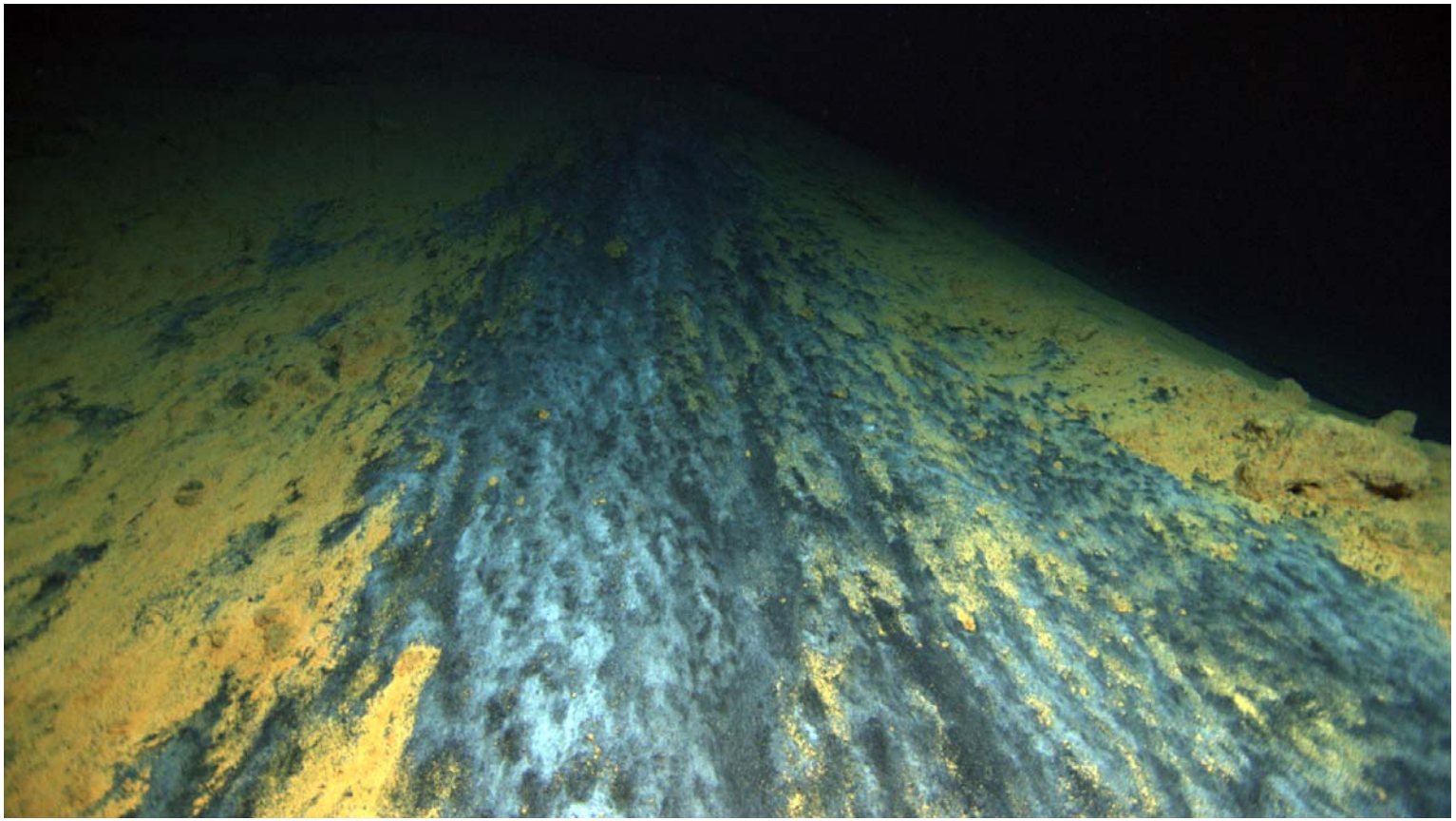
HD Upgrade Project -Examples TN-234



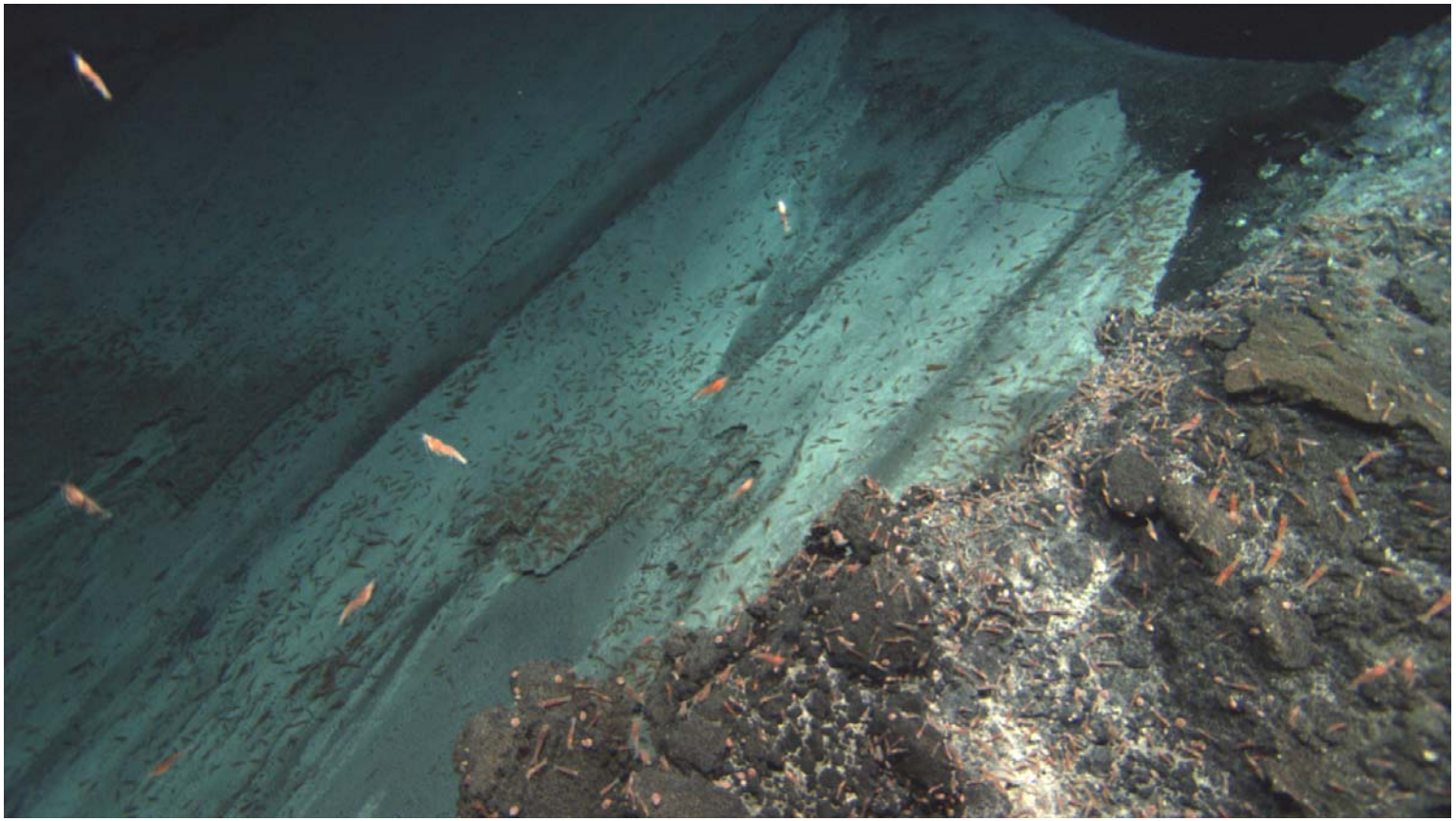
HD Upgrade Project -Examples TN-232



HD Upgrade Project -Examples TN-232

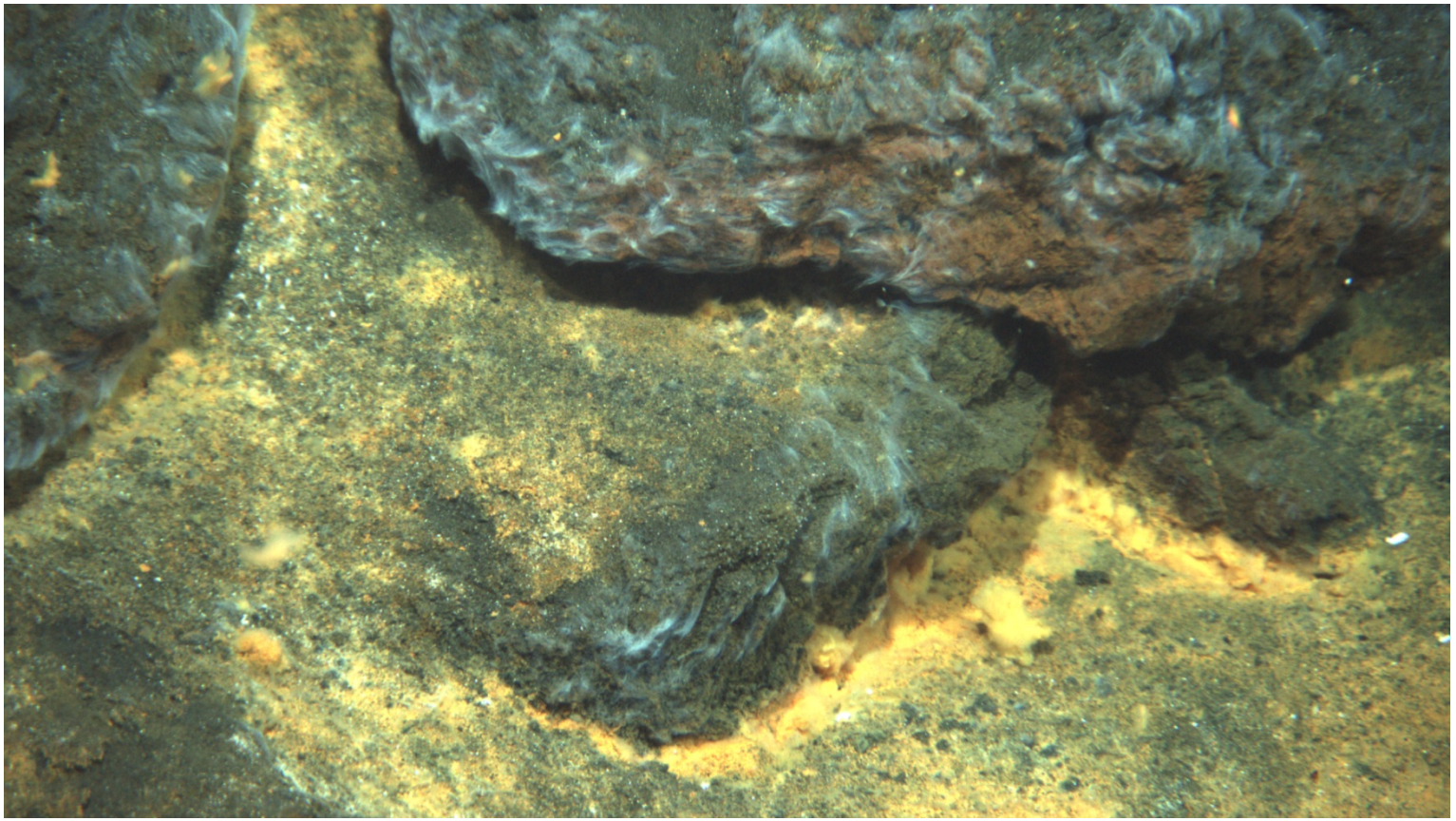


HD Upgrade Project -Examples TN-232



HD Upgrade Project -Examples TN-232

HD Upgrade Project -Examples TN-232



AIVL Imaging Update

2009 Advanced Imaging and Visualization Lab (AIVL)
Imaging Developments

Offload HDTV Cameras

- Tested autonomous HD on *Alvin*, Winter 2008
- *Medea,* Spring 2009, HD (internalized recording)
- *Jason,* Spring 2009, with macro-capability (internalized recording)
- 3D HDTV stereoscopic autonomous camera system shallow tests, Spring 2009

Hyper Spectral Sensor Testing

- Shallow water testing, Fall 2008
- *Jason* Tests, Summer 2008

AIVL Imaging Update

2009 AIVL Imaging Developments

Mini ROV / Stereoscopic Penetration ROV Development Program

- Successfully tested inside sunken B-29 Aircraft
- Successfully tested inside USS *Arizona*
- Successfully tested inside HMHS *Britannic*
- Full ocean depth system in discussion

Stereoscopic Survey Program

- 3D site surveys, 9 wrecks surveyed to date
- AUV integration planned

AIVL Imaging Update

2009 AIVL Imaging Developments

Mosaicing Program with State of Wisconsin

- Quicker, easier mosaicing techniques

LED Lighting Evaluation Effort

- Comparison and field evaluation of WHOI and COTS LEDs

Digital HD Recorder Evaluation Effort

- Comparison and field evaluation of :
  - Solid State Recorders
  - Flash Drive Recorders
  - Hard Drive Recorders
  - Optical Disk Recorders TBD

AIVL Imaging Update

2009 AIVL Imaging Developments

Kane Fracture Zone Angus 35mm Survey Data Restoration and Conversion Effort

- 18 *Angus* 35mm film 400ft rolls converted
  - HDTV videos created
  - Digital stills, TIFF format
  - Quality reported “better than original film”

USGS 35mm Film Conversion Program

- Conversion of USGS tripod 35mm camera data and metadata