

# NDSF Optical Imaging Review

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# 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.

As a by-product of this upgrade, our resulting *infrastructure* would become more closely compatible with *current and future media best-practice*.

This would greatly simplify future collaborations between documentary filmmakers and scientific parties (opportunities that often arise  $\leq 3$  months pre-cruise) and, thus, also enhance NDSF's ability to support "**Broader Impacts**".



# Hybrid HDTV Camera Head

## Design Criteria:

- Small, high dynamic range (12 Bit) CCD camera heads
- High-quality HDTV zoom optics
- Parallel data output pipeline
  - Full native resolution of the sensor's still image data (1920 x 1080 x 12 bit)
  - 29.97 frames per second motion video output (compatible with the existing video plants on *Jason* and *Alvin*)



# Still Frame Acquisition

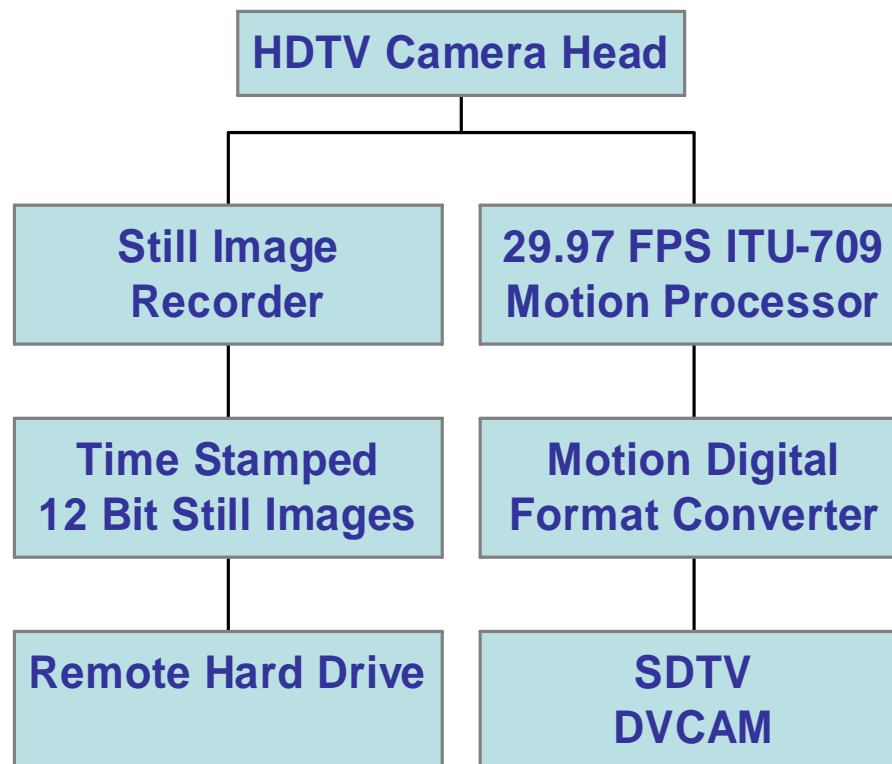
Still frames will be acquired in two modes:

- **Interval Mode**
  - Set by operator such that the images are taken every  $n$  number of seconds
- **Science On-Demand Mode**
  - Frame acquisition initiated by science



## NDSF Optical Imaging Review

# Proposed NDSF HDTV Imaging Upgrade



# Camera Sensitivity

WHOI is currently evaluating sensors for the camera head that may decrease the amount of lighting required.

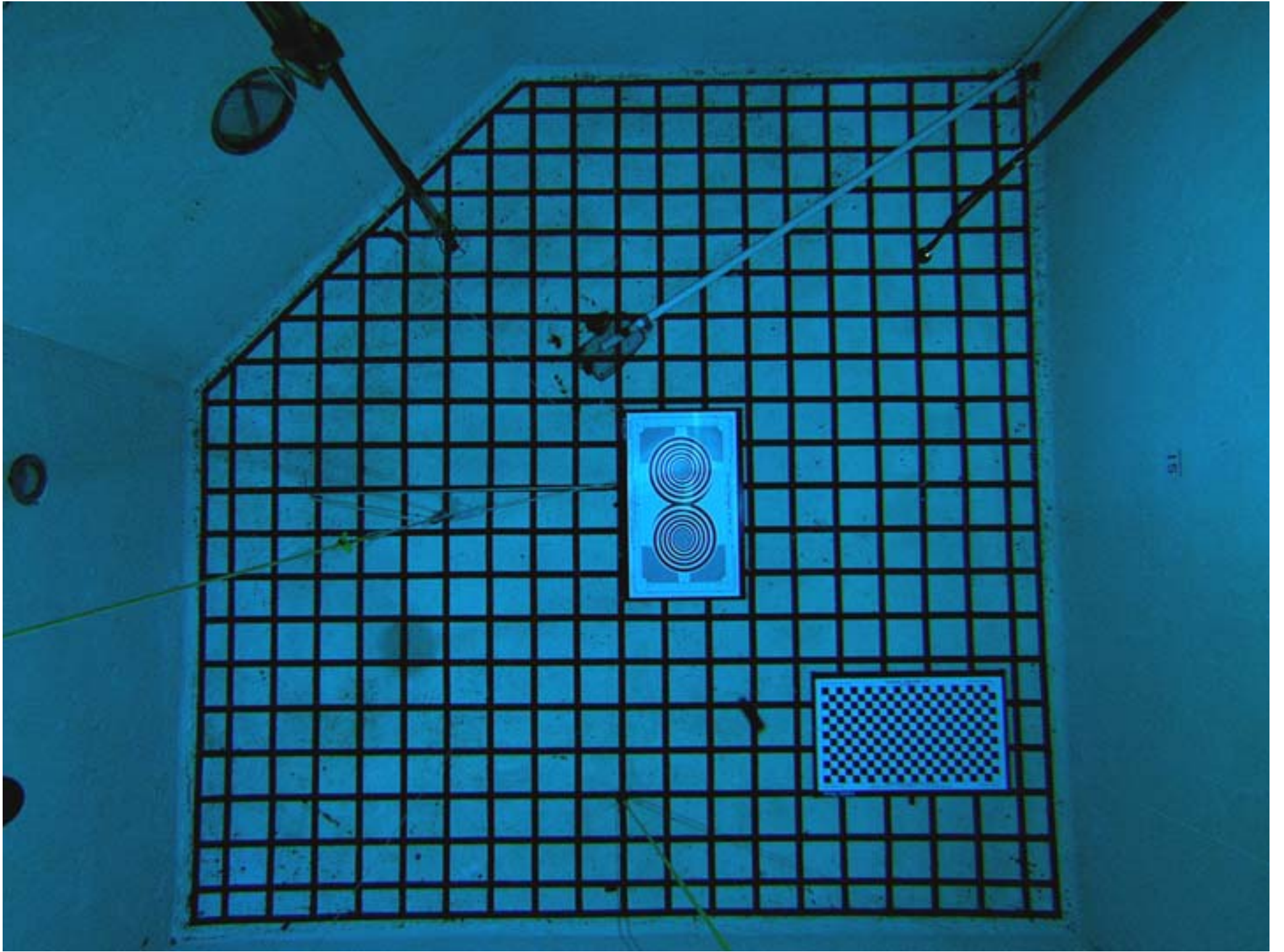
It is hoped that the result will be an increase of 1.5 to 2 times the sensitivity over the cameras used in the 2007 evaluation process.



# Hybrid HDTV Camera Optics

A 13X zoom lens was selected over a smaller, less expensive fixed focal length lens design after input from the scientific community at the spring DESSC Meeting. This change requires a 7-inch OD housing.









Recommended upgrade date, Jul. 20

Tel: (905) 673-3211    www.dsclabs.com    e-mail: dsc



# Camera Head Design

The Advanced Imaging and Visualization Lab (AIVL) at WHOI has already developed this design for the US Navy as well as other customers.

The design is based on a 13,500 psi, 7000m-rated camera pressure housing sufficient for use on *Alvin*, RHOV and *Jason*.

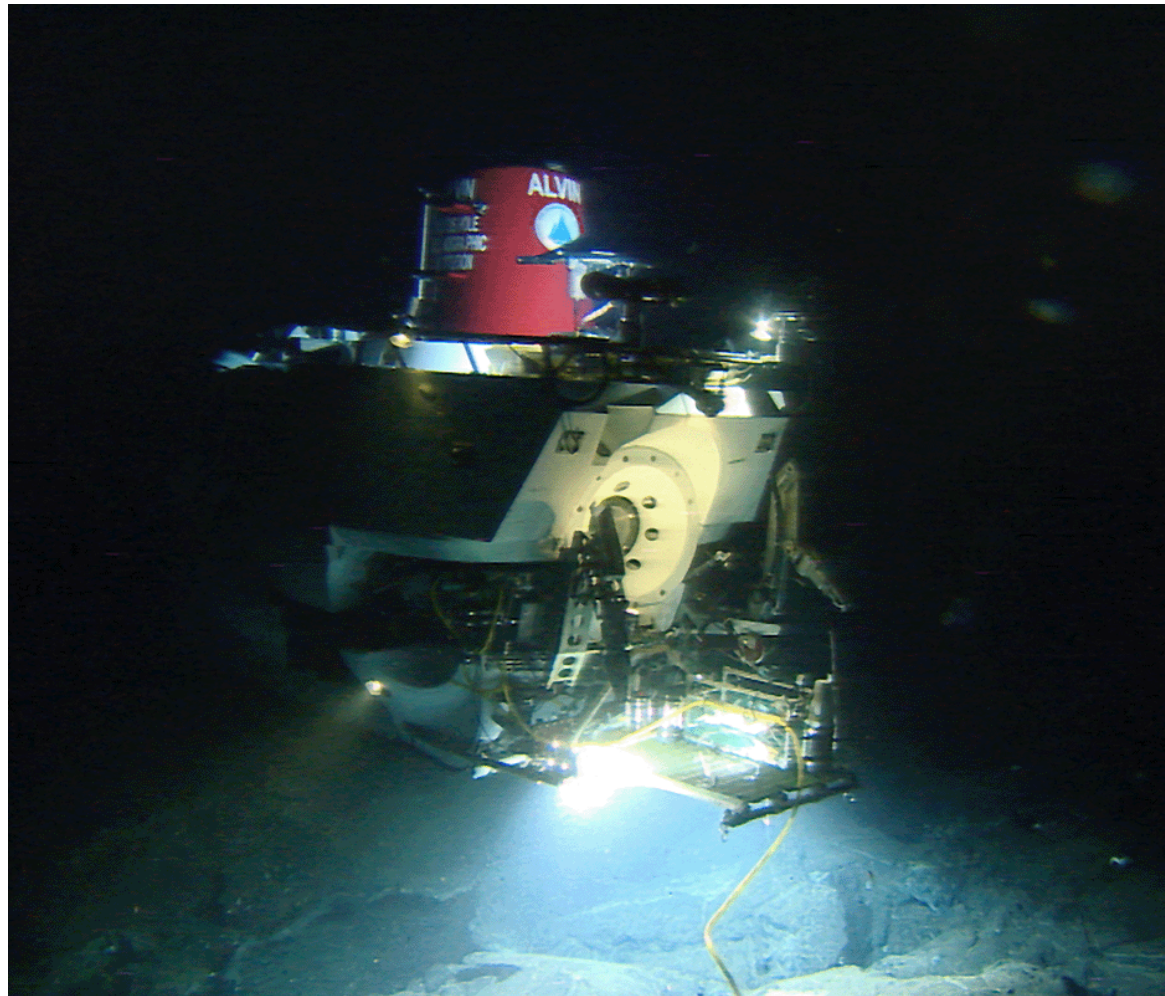


# NDSF 2007 Tests and Evaluation

- ***Alvin, AT15-15, January***
  - 3-CCD HDTV ½” camera with zoom optics
  - 3D HDTV stereoscopic single-CCD cameras with fixed optics
- ***Jason, JDF, August***
  - Single-CCD HDTV camera with zoom optics
  - Recording format and compression testing



# *Alvin* 3-CCD HDTV Still Image



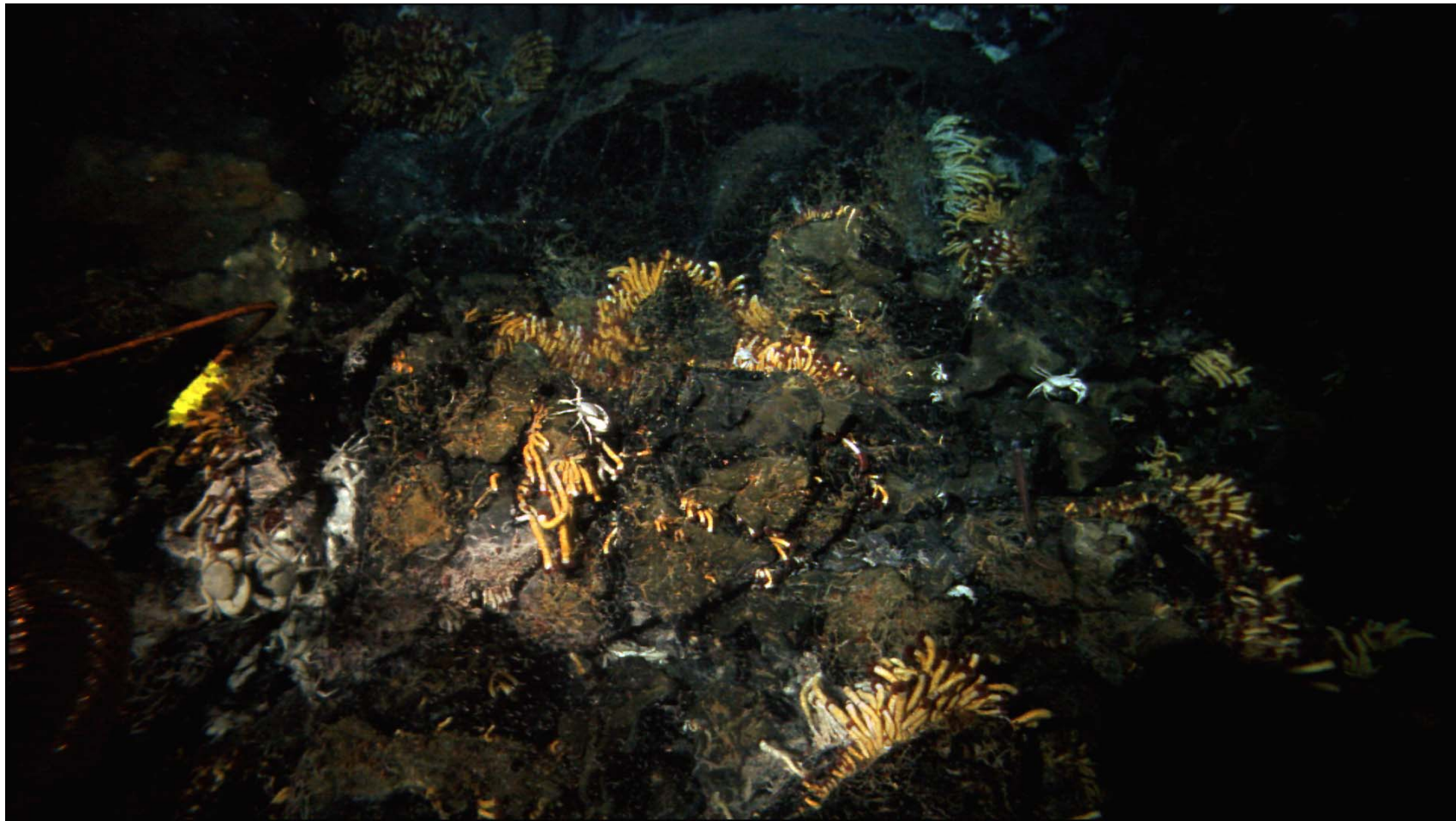
# *Alvin* 3-CCD HDTV Still Image



# *Alvin* Single-CCD HDTV Still Image



# *Alvin* Single-CCD HDTV Still Image

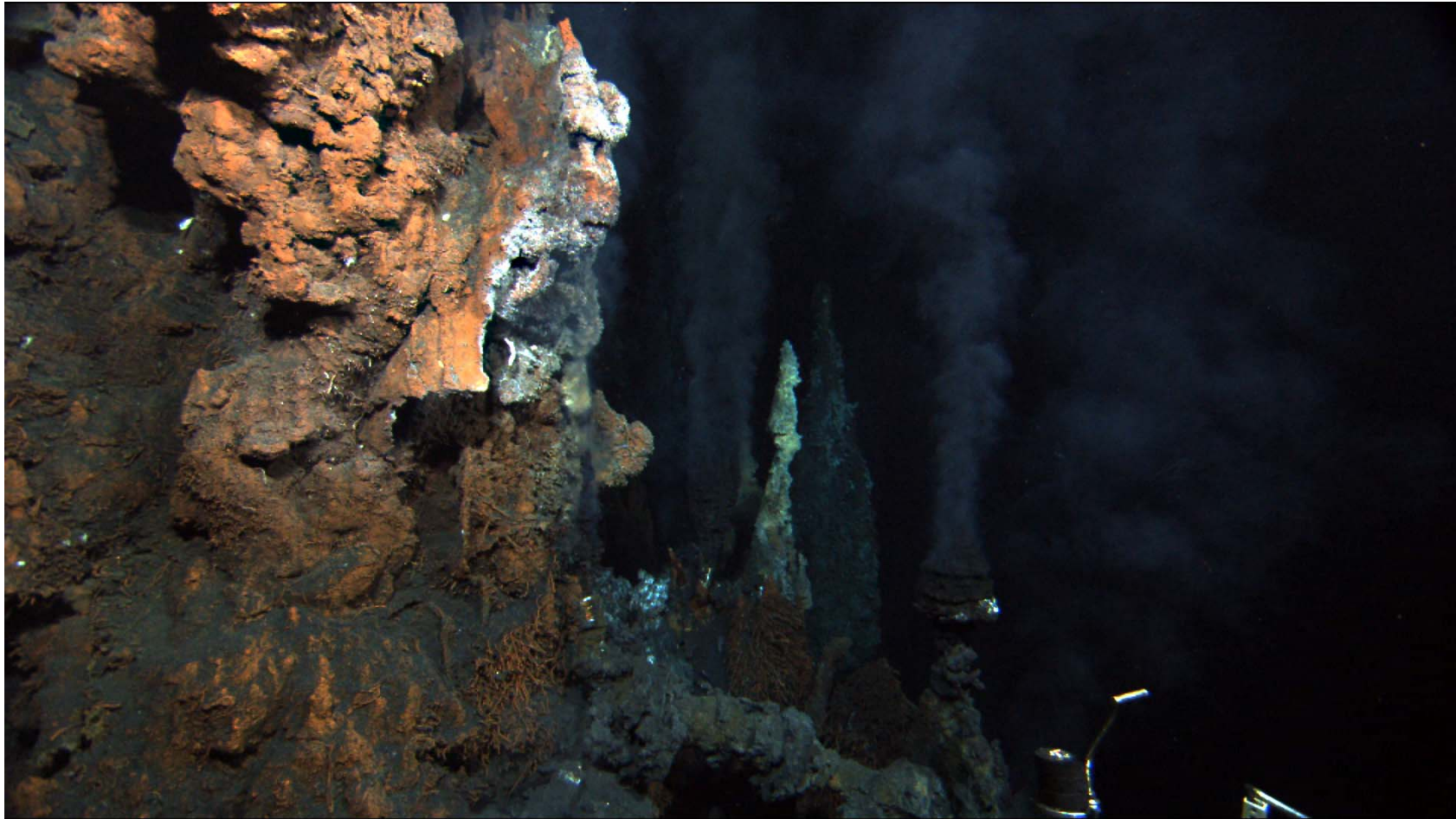


# Jason Single-CCD HDTV Still Image

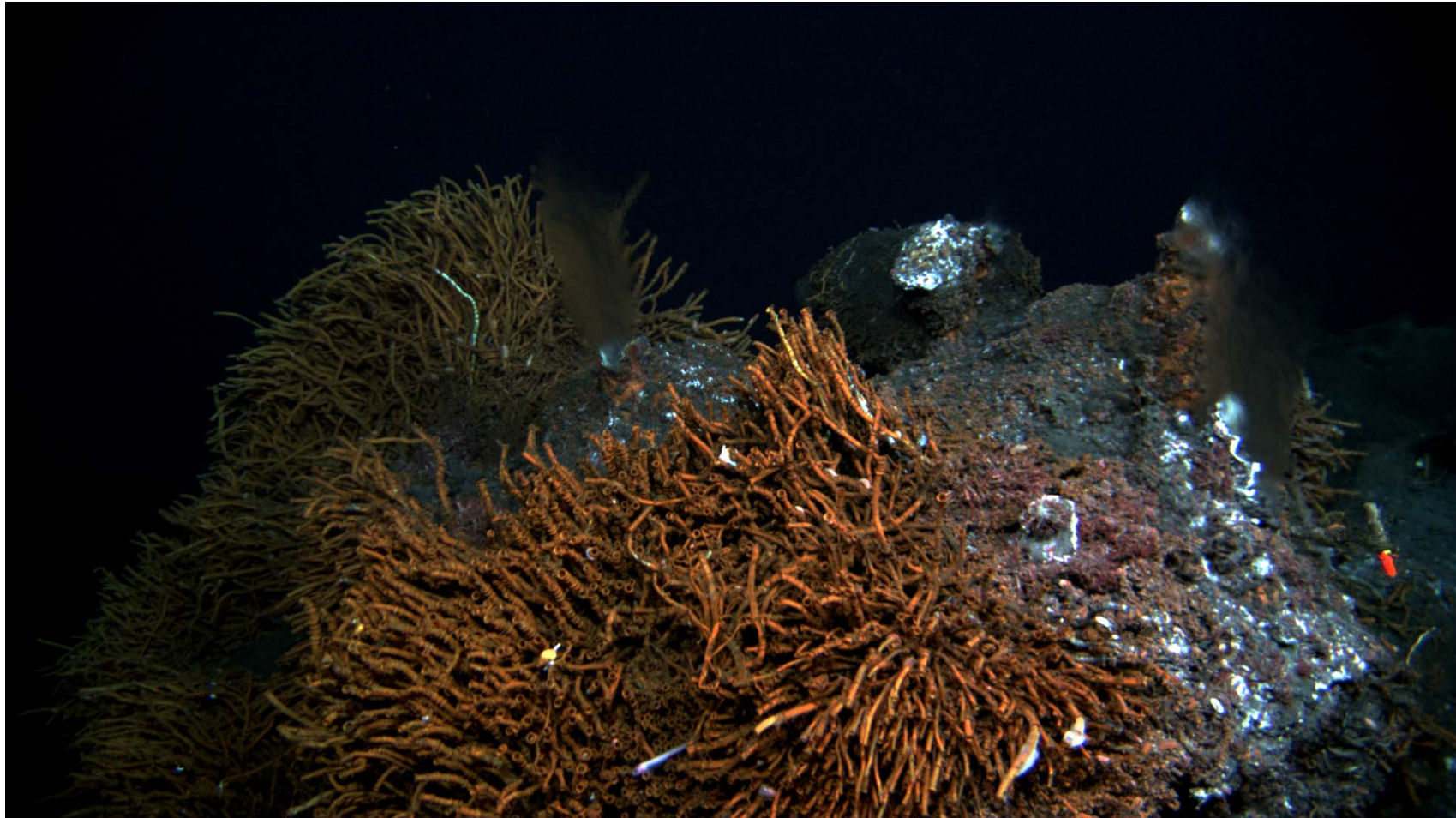




# Jason Single-CCD HDTV Still Image



# Wide View



# Medium



# Close-Up



# Lighting and Placement

- *Alvin* operated with three 400W HMIs
- *Jason* operated with four 400W HMIs
- *Jason's* imagery appeared to be darker than *Alvin*, but the HDTV camera was not mounted in an ideal position
- *Alvin* and *Jason* can benefit from improved utilization of their existing lighting systems
- Reorientation of camera/light geometries and lighting footprints should improve overall quality
- The addition of HMI, HID, LED or quartz light heads on *Jason* is recommended



# Lighting (cont.)

## Hybrid Pulsed Illumination Lighting and Lighting Augmentation

- WHOI will evaluate using strobe or LEDs for a pulsed illumination lighting source to augment the continuous lights for still image acquisition.
- This will necessitate a software modification to the camera controller to release the motion mode presets so that the motion frame is not saturated.
- LED tests currently being conducted on *Alvin* are showing promise as a viable lower power alternative to HMI and HID lighting systems. These will be equally applicable to *Jason* in the future.



# NDSF 2007 HDTV Programs

## *Jason* Recording System Evaluations:

- RAID recorder
  - Raw, still, time lapse, motion 29.97 fps
- Sony HDCam recorder
- Sony SRW recorder
- Sony DVCam recorder
- *Jason* DVD recorder

All systems were time-stamped to the *Jason* time source for comparison



Evaluating still image capture allows us to test both still and motion recording quality.





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**DVD Recorder Full Frame**  
(e.g. from current *Jason* system)

DESSC  
December 2007



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**DVCam Recorder Full Frame**  
(e.g. from current *Alvin* system)

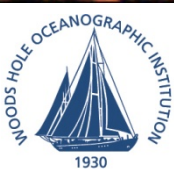
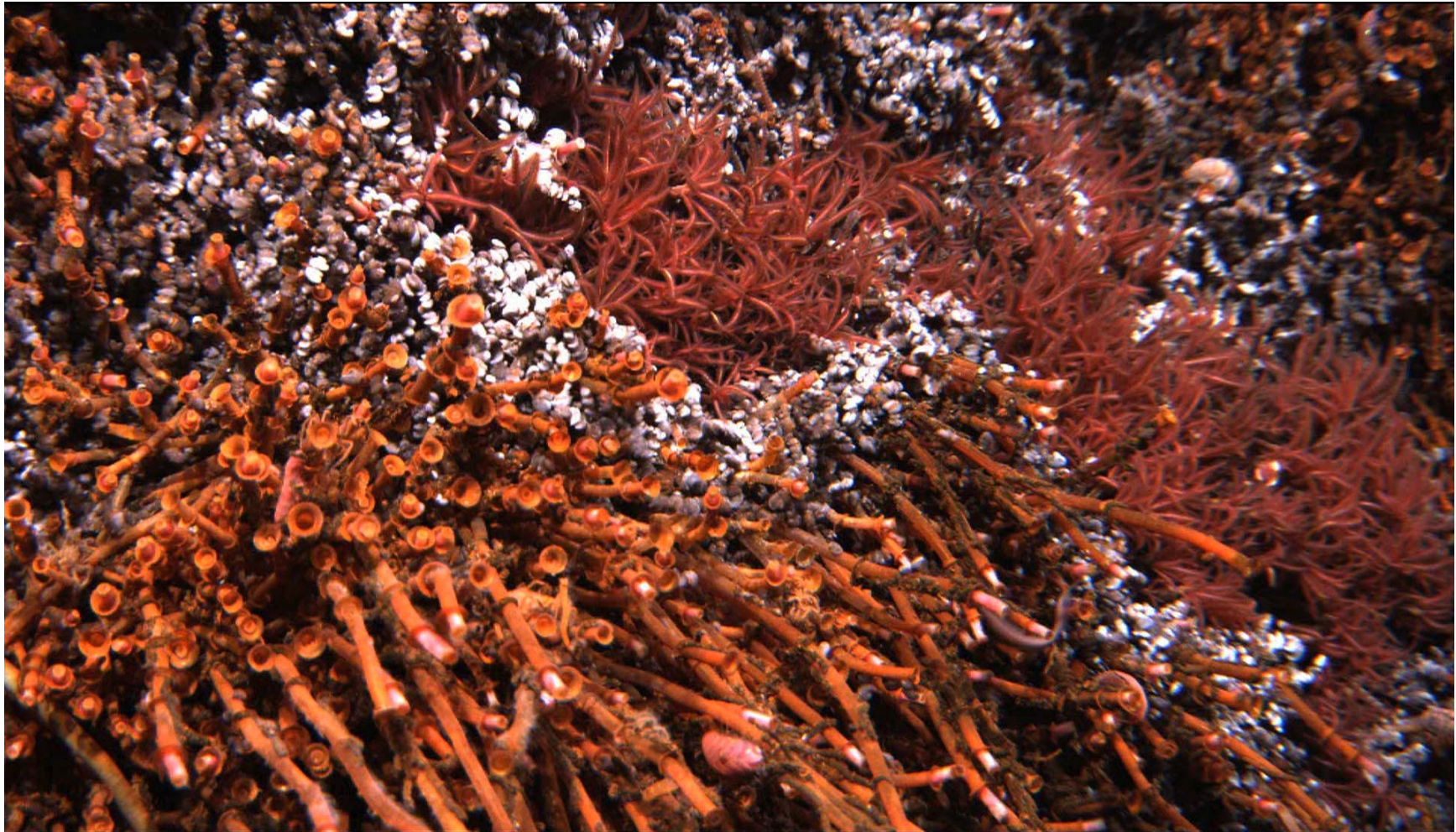
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## HDCam Recorder Full Frame

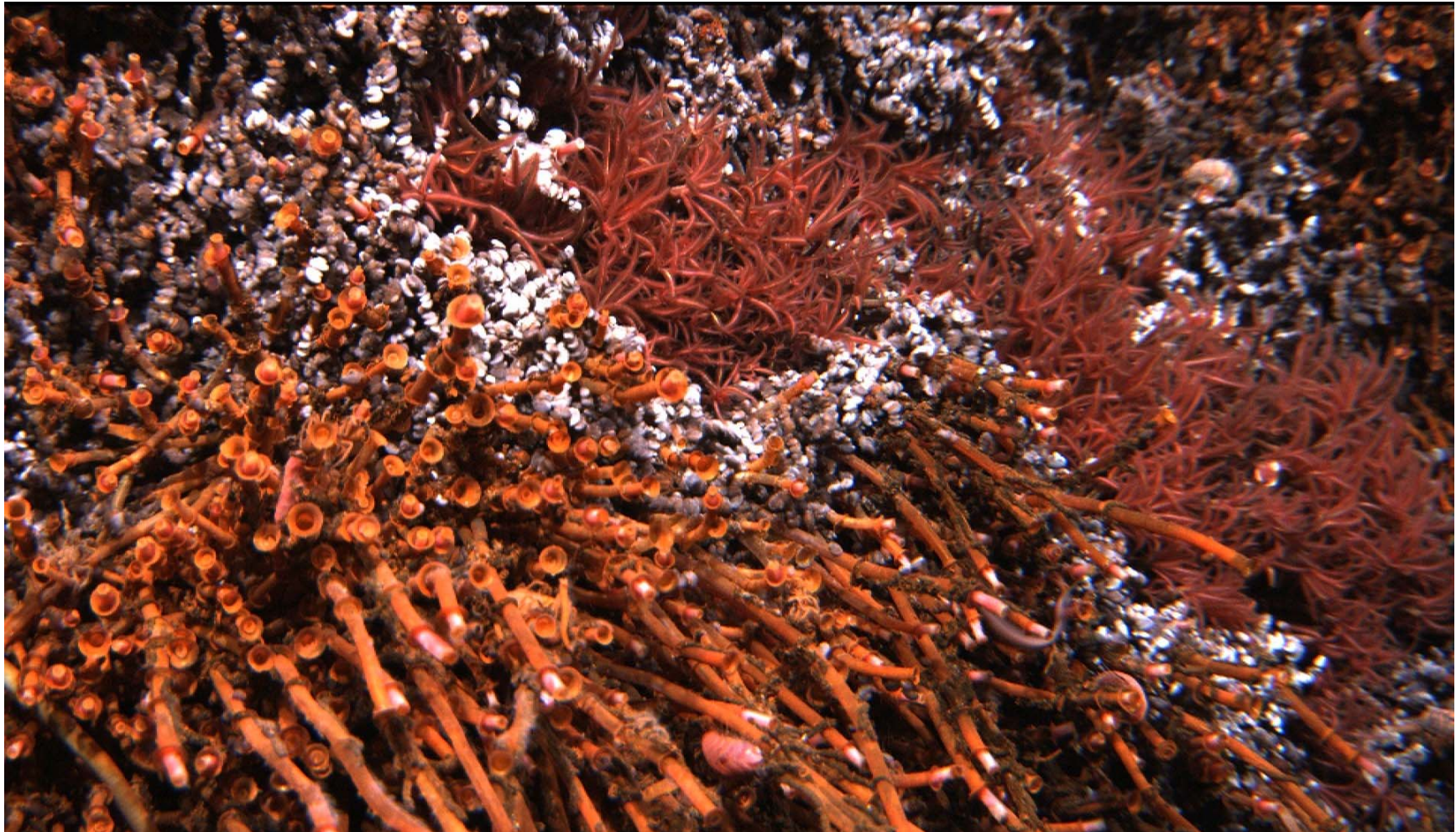
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## SRW Recorder Full Frame

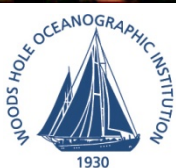
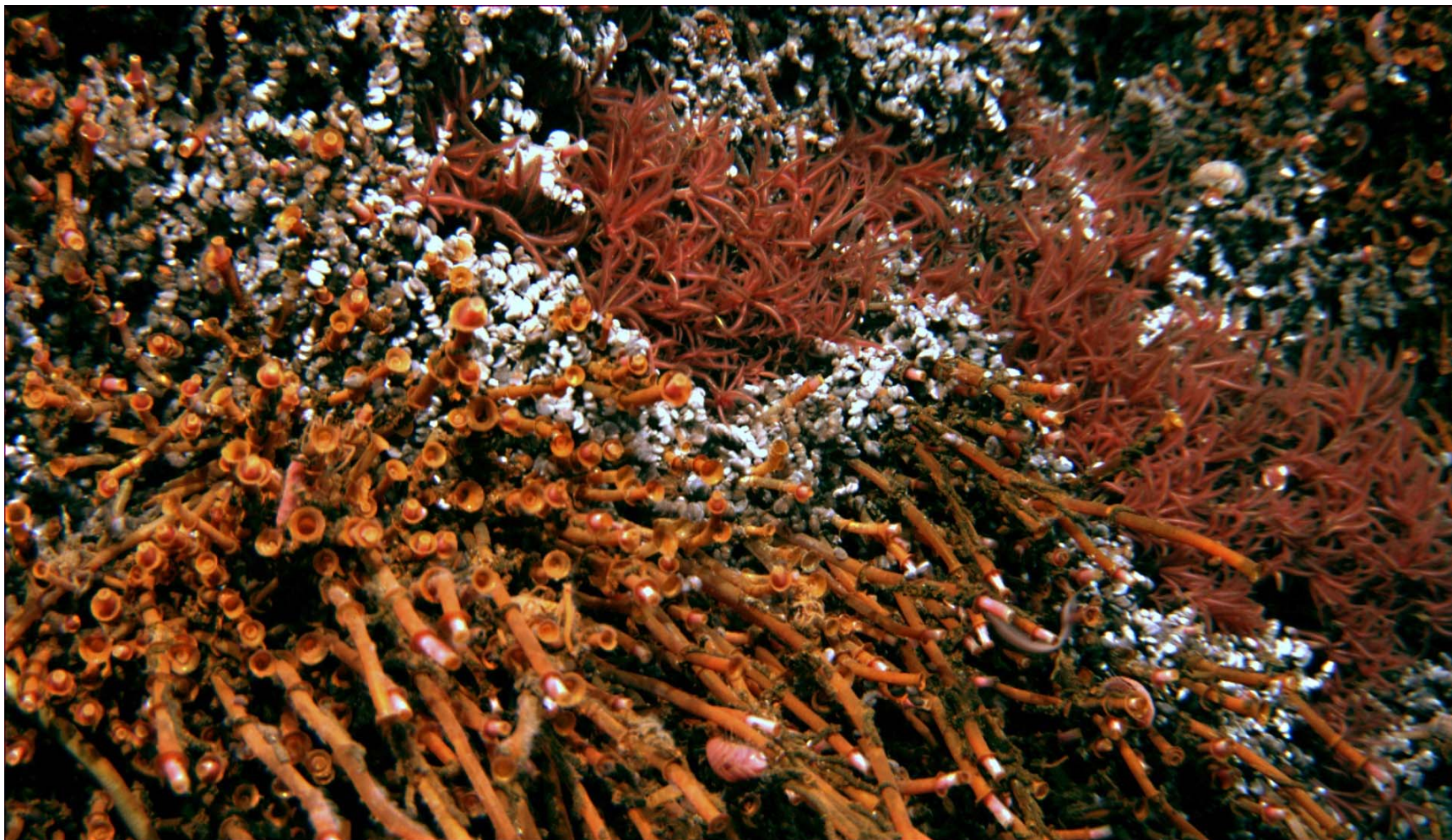
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# NDSF Optical Imaging Review

## RAID Recorder Full Frame

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December 2007



# The Way Forward

- Endorsement by DESSC of HDTV upgrade plan for *Alvin* and *Jason*
- Acquisition of two HDTV cameras with zoom optics; interface and control electronics
- Integration and testing of HDTV cameras on *Alvin* and *Jason* by end of 2008
- Operated as standard equipment; zero cost impact on vehicle day rate

