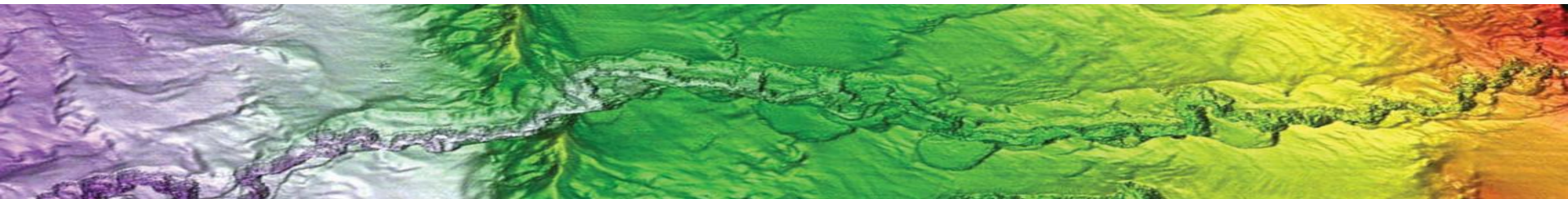


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Pipeline inspection using Underwater Hyperspectral Imager

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15.12.2016



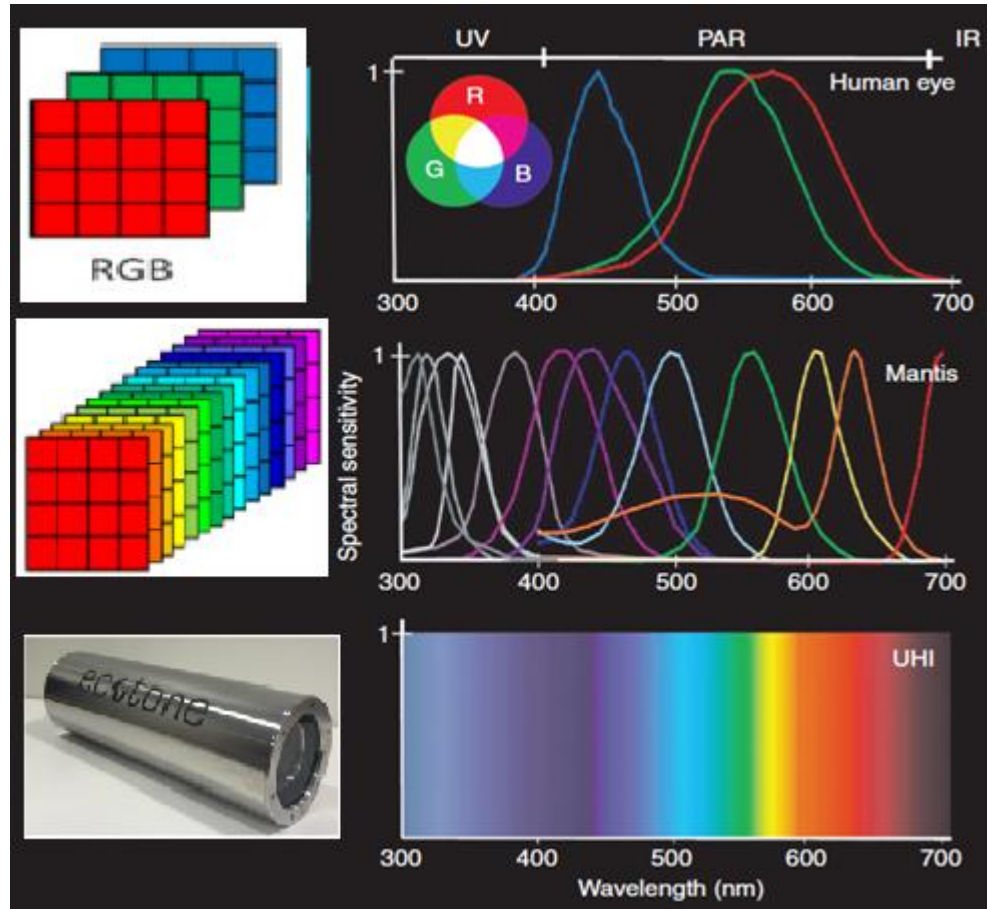
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Contents

- What is Hyperspectral Imaging?
- The UHI sensor
- Demo 2000 project :Hyperspectral imaging for use in Pipeline Inspection services
 - Examples from pilot study
 - UHI potential
 - Project goals

Hyperspectral Imaging

- Widely used in remote sensing from satellites and airplanes
- Utilize information about the reflected light at all wavelengths
- Spectral signature varies with colour and material
- Spectral library is a collection of spectral signatures



The UHI sensor

- Line scanner
- Integrated computer with onboard processing and 2TB data storage
- Ethernet or fiber optic interface
- Integrated video/still camera
- Integrated IMU

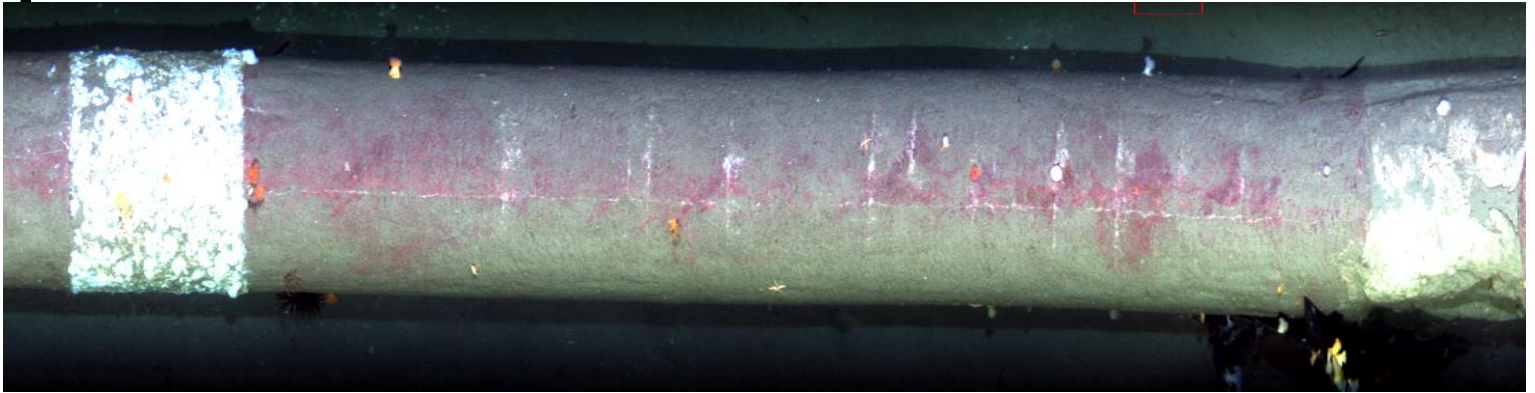


UHI mounted on AUV

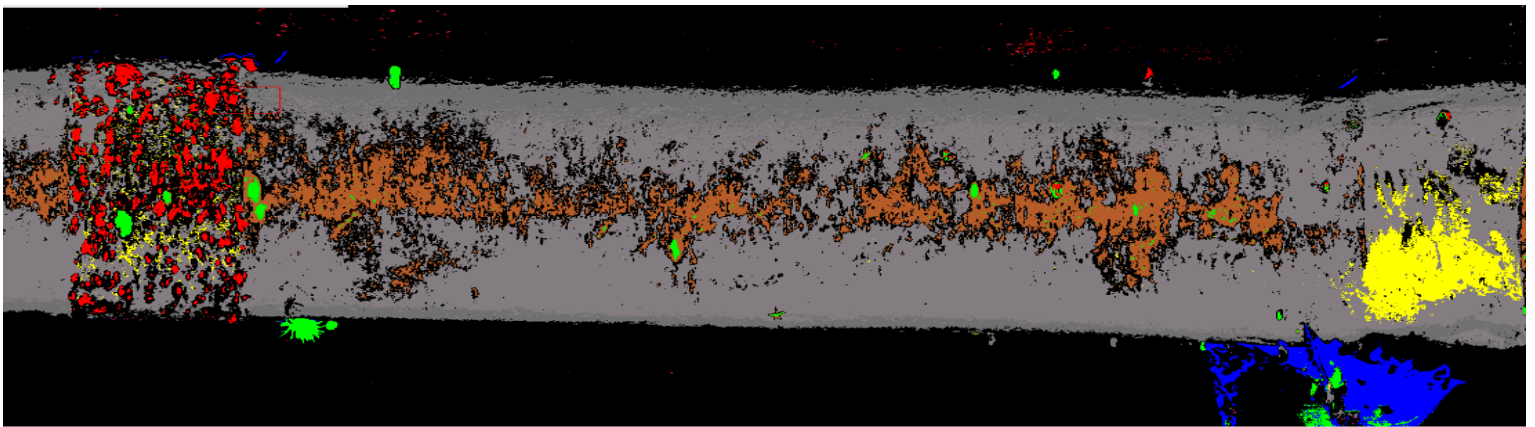


Example1: Anode and Field Joint

UHI RGB



UHI Classified



- Field joint Wrapping
- Seabed
- Concrete coating
- Sediment layer
- Field joint filler

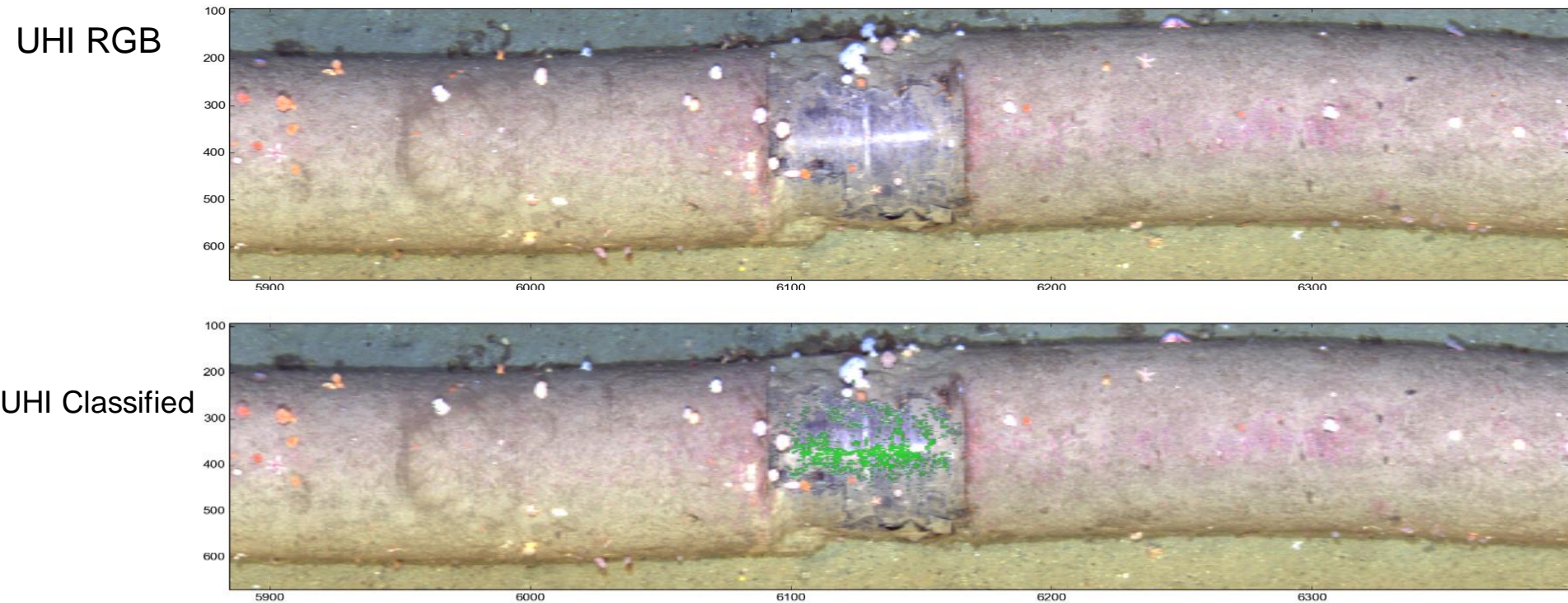


- Organic material (Anemone etc.)
- Anode

Example 2: Bare metal at field joint, ROV video

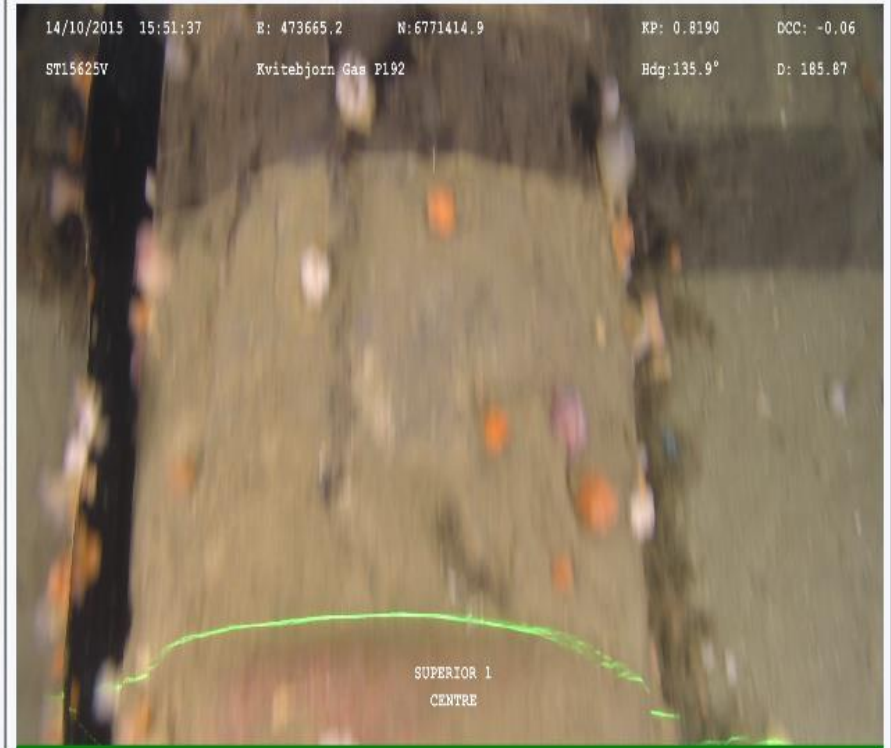


Example 2: Bare metal at field joint



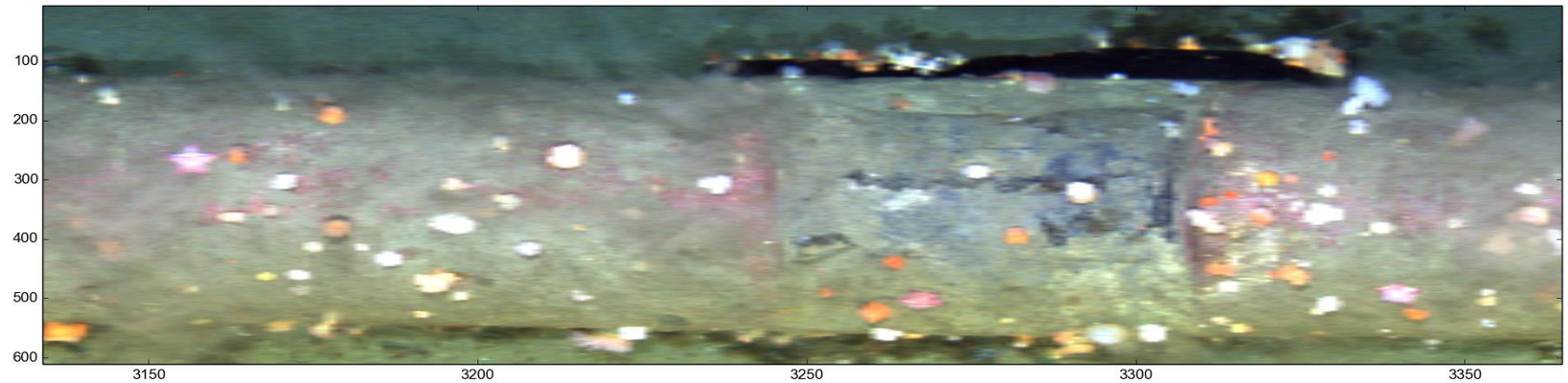
■ Bare metal

Example 3: Bare metal not visible on video

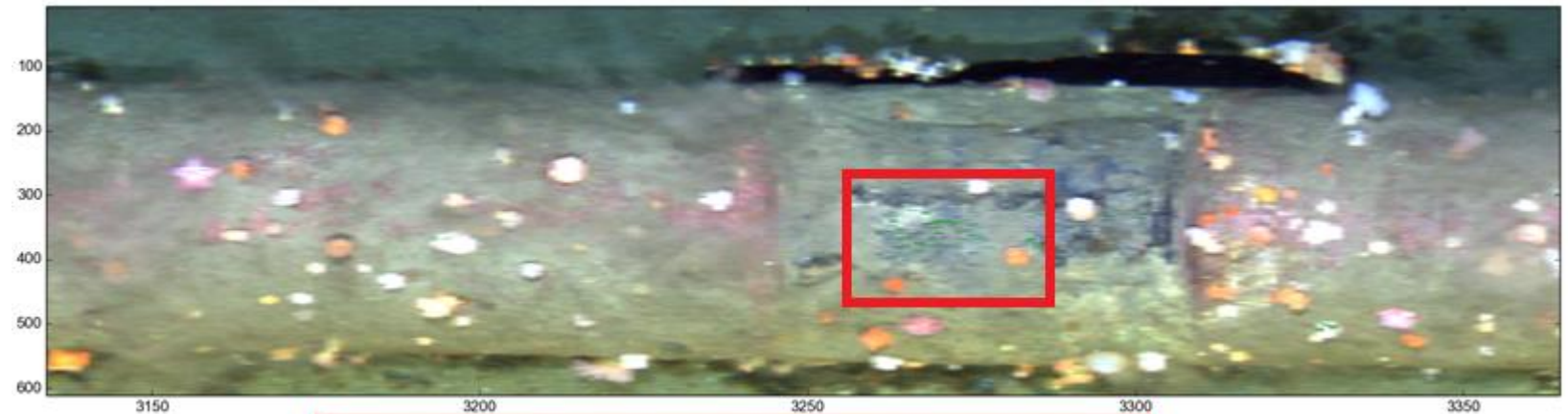


Example 3: Bare metal not visible on video

UHI RGB



UHI
Classified

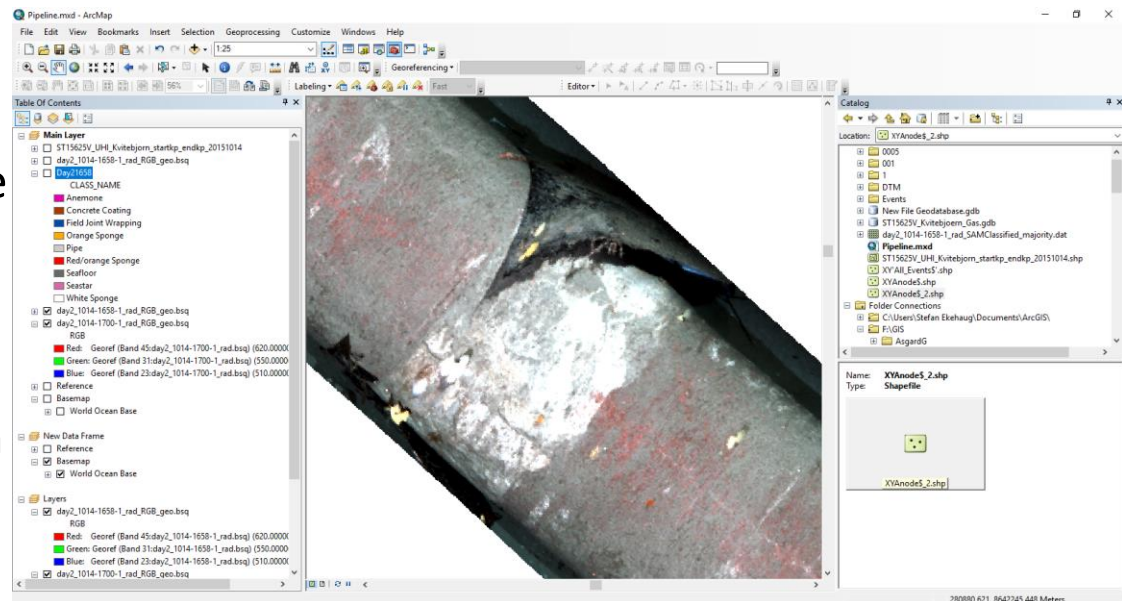


■ Bare metal



Delivery of UHI-data in GIS format

- Together with Statoil's map division, Ecotone have developed a template for delivery of UHI-data.
- Finished UHI-data is stored in a **geodatabase** (an archive for geographic datasets)
- Symbology (colours, naming etc.) is stored alongside the geodatabase, and will visualize the data
- Classification results exported as shapefiles
- Attribute table generated with SSDM-style metadata



UHI potential:

- Detecting small damages or material exposures
- Reduce the number of unsecure events:
 - “Possible bare metal exposure” -> “Bare metal exposure”
- More objective data, not dependent on operator
- Reduce post-processing of data by automatic eventing
- Automated monitoring over time and change detection
- Online classification and eventing on ROV or AUV

Demo2000 project:

Pipeline inspection with UHI

Overall goals

- Verify use and benefits of UHI methodology for pipeline inspection
- Demonstrate UHI technique on most common issues and situations
- Validate methodology by extensive testing (accuracy, speed, repeatability etc.)
- Integration with existing systems (GIS, NAVIPac etc.)
- Technology acceptance (TRL) program