

Hydrate-bearing core processing

Conventional cores that may contain gas hydrate must be rapidly imaged and processed before any remaining gas hydrates—or gas hydrate signatures—disappear. The Geotek whole-core processing van allows rapid infrared imaging of core in a controlled-temperature, shaded environment. Core can be sectioned and measured in a Geotek Multi-Sensor Core Logger in the same container before moving to a storage/archiving facility or on to split-core processing.

Thermal infrared imaging for hydrate detection

Thermal imaging using infrared cameras is accepted by the scientific community as the most pragmatic way to determine the overall hydrate distribution in a sediment core and throughout the sedimentary section. Dissociation/melting of gas hydrate is a strongly endothermic process which

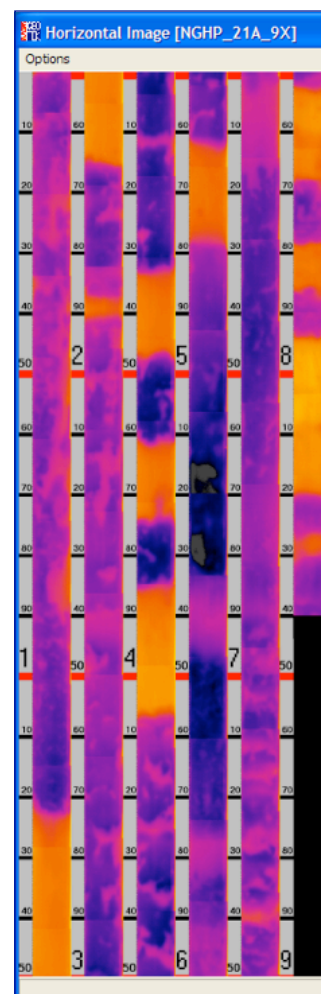
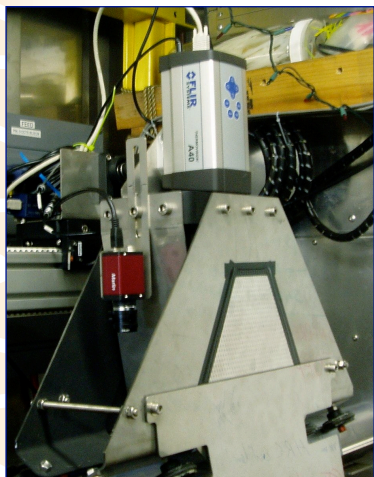
not only provides a self-preserving effect on the hydrate itself, but also cools the surrounding sediment and core liner material. Cool spots created by the unstable gas hydrate can therefore be detected on a thermal image of a fresh core that has been recovered quickly from beneath the seafloor.

The Geotek infrared imaging system consists of a computer-controlled infrared camera mounted on a skate that moves incrementally along the core, rapidly capturing thermal images. Depth-registered thermal images of complete cores are obtained within minutes of the core being recovered. Concatenated images appended with an

electronic ruler are displayed in real time on monitors distributed along the length of the track.

The thermal images allow cold regions to be quickly identified even before the camera has finished moving along the core. The final image remains on the screens, making thermal anomalies easy to locate while the core is marked and sampled. If necessary, the image can be enlarged and manipulated on screen to identify even the smallest details.

All images are saved in the FLIR thermal image format (.img), and after collection these images can be individually examined in FLIR software or manipulated en masse using the Geotek Infrared Imaging software. Concatenated full-core images are exported in JPEG format for ease of use and a companion temperature matrix for the entire core is available as an ASCII file.



Core sectioning & subsampling facilities



The Geotek core processing van is equipped with plenty of core racks for ease of core manipulation. Sampling and core cutting equipment, such as rotary core cutters, puncture samplers for void gas, and plug samplers for headspace gas or porewater are all available. Temperature probes are provided for direct temperature measurement if required, as well as a benchtop to wrap sections of core for storage in liquid nitrogen.

Automated whole-core measurements

The Geotek MSCL-S measurement system makes computer-controlled measurements of gamma density, P-wave velocity, electrical resistivity, and magnetic susceptibility on whole cores. MSCL measurement on whole core provides a reference set of data taken from fresh core prior to splitting. Measurements can be used both intrinsically, for their actual values (e.g., gamma density, P-wave velocity), or as proxies for changes in lithology or formation environment (e.g., magnetic susceptibility).

Self-contained laboratory container

All the equipment described above is installed in a self-contained, transportable 20-foot laboratory container. This laboratory is fully fitted with lights, air conditioning, sink, uninterruptible power supplies, ethernet network, and file server.

Core processing van specifications

- **Core accepted:** Diameter: 5-15 cm If cores are longer than 4 metres, they are cut into 4 metre parts, brought into the container, and infrared-imaged sequentially.
- **Core infrared imaging:** Geotek infrared core imaging system (MSCL-IR) with FLIR A40 thermal imaging camera & AVT Marlin visual camera
- **Automated whole-core analysis:** Geotek MSCL-S with gamma density sensor, acoustic rolling transducers, non-contact electrical resistivity sensor, and Bartington magnetic susceptibility loop sensor (MS2C).

Sample processing speed

Infrared core imaging takes 5 minutes/4 metres of core. Core cutting and subsampling takes 30 minutes for an unremarkable eight metre core; a gas-hydrate-bearing core will take longer. Eight one-metre sections of core can be measured in the MSCL-S in 2 hours. These processing speeds require one dedicated scientist/technician, with three others available for half an hour to a hour when each core is acquired.



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