PCATS: Pressure Core Analysis & Transfer System

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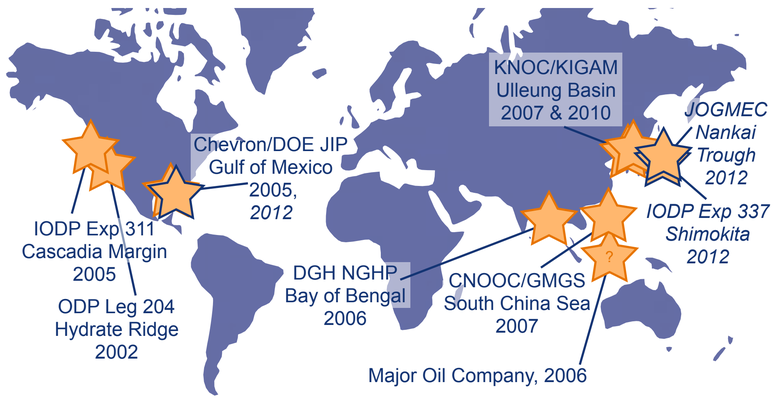
PCATS Specifications

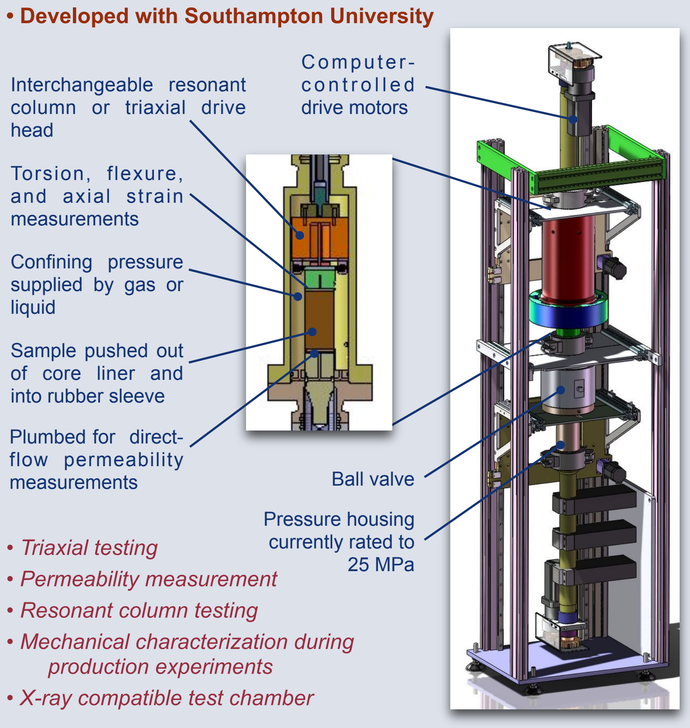
- **Compatible coring tools:** Fugro FPC & FRPC, Aumann HPTC and Hybrid PCS
- **Maximum core length:** 3.5 m lined core
- **Core liner specifications:** Outer diameter up to 63 mm, liner thickness up to 4 mm
- **Maximum operating pressure:** 35 MPa
- **Operating temperature range:** 4-30° C
- **Linear core motion:** ±0.1 mm precision
- **Rotational core motion:** ±0.1° precision
- **Gamma density sensor:** ^{137}Cs 10 mCi source and NaI detector
- **P-wave velocity sensor:** Geotek 250 kHz transducers
- **X-ray imaging:** 130 kV microfocal source & 14-bit digital flat-panel detector (1920 x 1536 pixel); image resolution 100 microns
- **System length:** 18.3 m (3 x 20-foot offshore containers)
- **System weight:** approx 24 tons

PCATS Expeditions



PCATS Triaxial

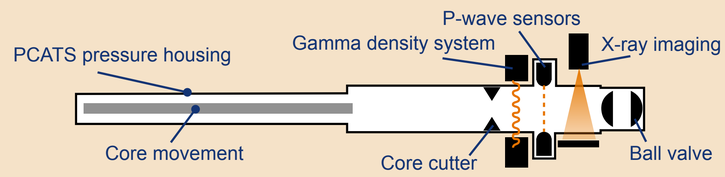
- **Advanced mechanical testing on never-depressurized samples**
- **Standard triaxial testing or resonant column with permeability**
- **Accepts cut sample from PCATS & extrudes into sleeve**
- **Developed with Southampton University**



- *Triaxial testing*
- *Permeability measurement*
- *Resonant column testing*
- *Mechanical characterization during production experiments*
- *X-ray compatible test chamber*

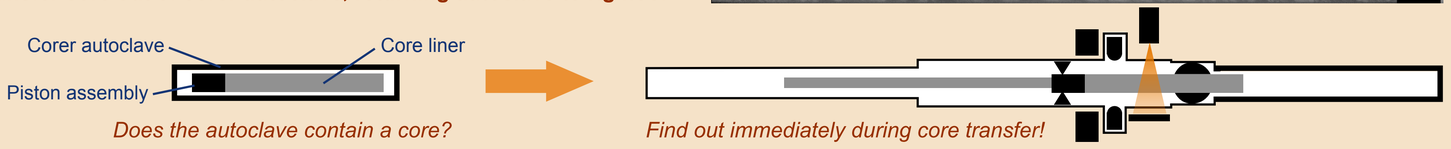
Operations Under Pressure

PCATS provides essential pressure core handling and analysis infrastructure. In situ pressures are maintained while cores are transferred from coring tools, analyzed in detail, cut into subsamples, and transferred into test chambers for advanced laboratory testing.



Core transfer and quality control

- **Check presence and quality of core**
- **Transfer core out of corer autoclave, returning autoclave to rig floor**

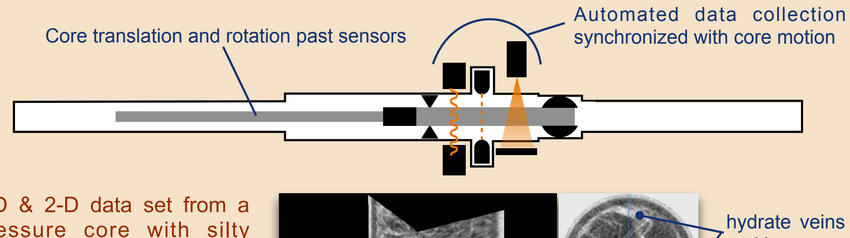


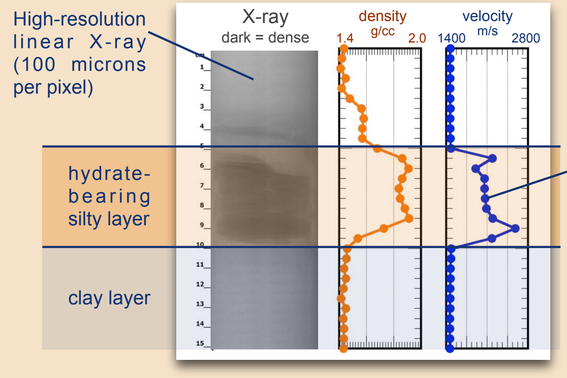
Does the autoclave contain a core?

Find out immediately during core transfer!

Geophysical analyses

- **1-D: Gamma density, P-wave velocity**
- **2-D: X-ray linear scans**
- **3-D: X-ray computed tomography**

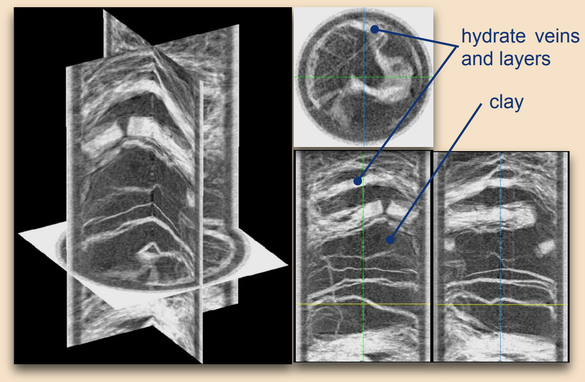




1-D & 2-D data set from a pressure core with silty hydrate-bearing layers in clay.

high velocity indicates hydrate cementation

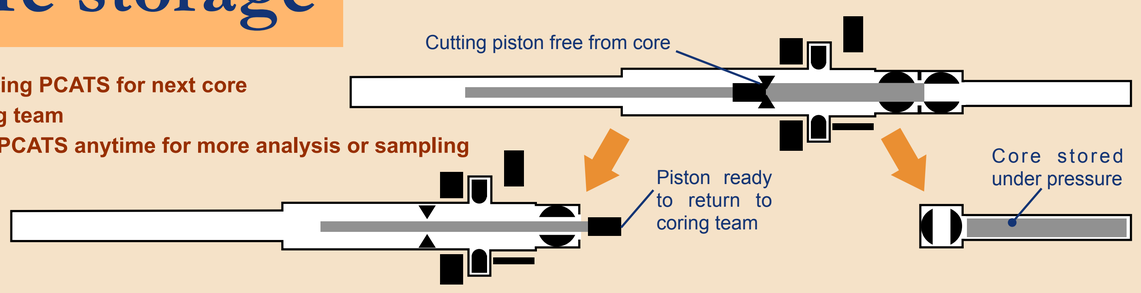
3-D X-ray CT (computed tomography) scan of pressure core containing gas hydrate veins and layers in clay.



Temporary core storage

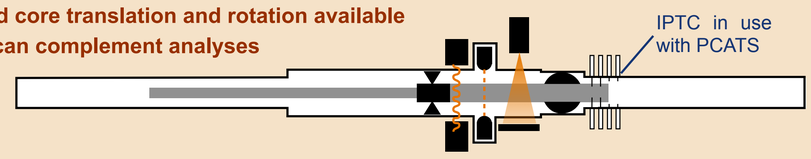
- **Store core for later analysis, freeing PCATS for next core**
- **Return piston assembly to coring team**
- **Stored cores can be returned to PCATS anytime for more analysis or sampling**

Storing cores allows time to develop sampling plans using geophysical data



Precise motion for third-party analyses

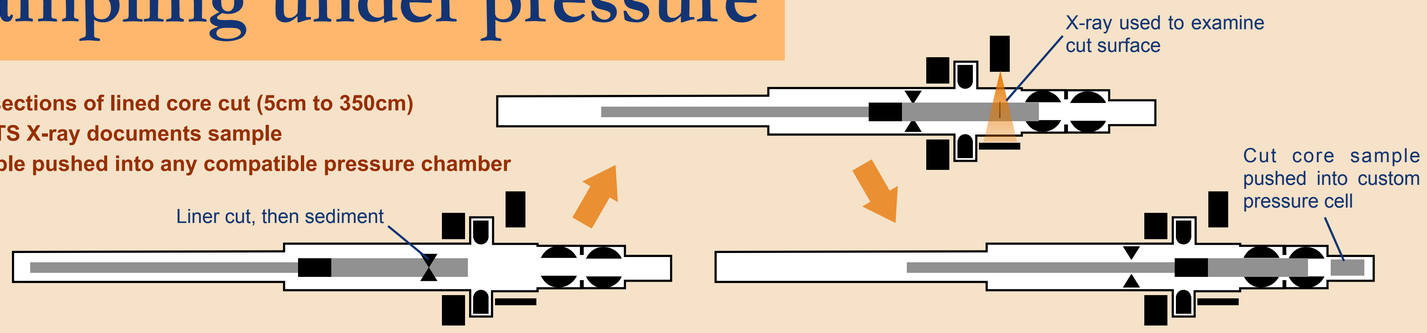
- **PCATS computer-controlled core translation and rotation available**
- **PCATS X-ray and sensors can complement analyses**



PCATS used with Georgia Tech IPTC (Instrumented Pressure Testing Chamber) during US DOE JIP I, India NGHP1, Korea UBGH1

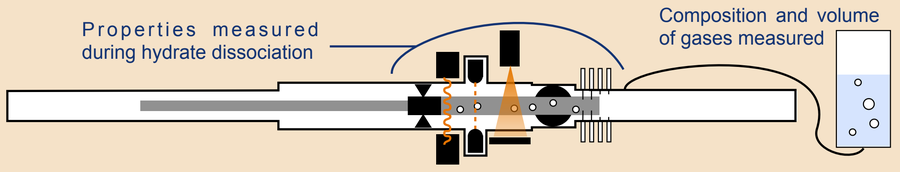
Subsampling under pressure

- **Subsections of lined core cut (5cm to 350cm)**
- **PCATS X-ray documents sample**
- **Sample pushed into any compatible pressure chamber**



Depressurization experiments

- **"Mini-production tests" of natural samples monitored in PCATS, with optional third-party equipment**
- **Gas collection and mass balance is "gold standard" for gas hydrate quantification**



PCATS Containerized System

The PCATS 3-container layout houses all the necessary equipment for PCATS operations, including cold storage for autoclaves & storage chambers and equipment for mini-production tests.

Pressure & temperature infrastructure

PCATS maintains in situ pressures and temperatures while cores are analyzed or cut. Both temperature and pressure are maintained through the PCATS hydraulic fluid (seawater or fresh water) and monitored continuously.

Central control laboratory

Core handling & cold storage (4˚C)

All equipment to scale. Each box represents a 20-foot offshore container laboratory.