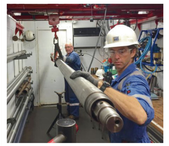
Pressure Cores: From Borehole to Laboratory

PCTB & HPTC: Wireline Pressure Coring Tools



- Core length: 3m (10 ft)
- Max pressure: 35 MPa (5000 psi)
- Ball valve closure & seal

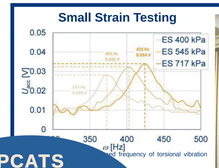
Corer	Core Diameter	Drill Pipe ID
PCTB	51 mm (2 in)	4 1/8 in
HPTC	57 mm (2 1/4 in)	6 5/8 in

Pressurized Storage Chambers

DOT-Approved & International Transport Under Pressure

- Storage chambers:
  - 35cm, 125cm
- Overpack transportation system
  - Explosion-proof refrigerated container
  - Storage chambers inside DOT-approved overpacks
- Dangerous goods procedure
  - Approved for all international shipping

PCATS Triaxial: Small & Large Strain Testing with Permeability

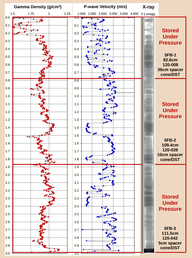


- Triaxial stress-strain testing
- Resonant column testing
- Direct f ow permeability

PCATS: Foundation Geophysical Data & Field Sampling

- Core transfer from corer autoclave
- Geophysical measurements
  - Density via gamma attenuation
  - P-wave velocity
  - X-ray computed tomography
- Temporary storage in full-length 3.5m chambers if required
- Core sectioning and transfer to storage chambers for
  - f eld depressurization
  - f eld liquid nitrogen freeze cell
  - transportation to laboratory

UT-GOM2-1-H005-5FB



miniPCATS: Sub-sampling in the Laboratory

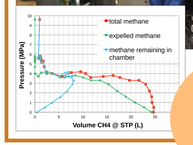
- Sample cutting/preparation in laboratory
- Reciprocating saw for hard samples
- Sample length up to 1.2 m
- Max pressure: 35 MPa (5000 psi)
- Optional X-ray, P Wave, Density
- Compatible with USGS Instrumented Pressure Testing Chamber (IPTC)

This Way to the Pressurized Future

- Horizontal plug "sidewall" coring under pressure
- Miniature pressure chambers for micro-CT
- Raman-compatible windows in testing cells
- Hard sample trimming & preparation for improved mechanical testing

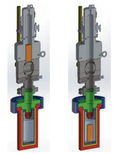
Field Depressurization & Hydrate/Gas Quanti f cation

- Quantitative depressurization of samples
- Continuous pressure & temperature records
- Gas & liquid volume measurement
- Gas sampling and composition via GC
- Calculation of hydrate or free gas content



Freeze Cell for Field or Lab Preservation of Structure

before after



- Freeze cell mates to 35cm storage chamber
- Sample dropped into liquid nitrogen

- Samples expand but sedimentary structures preserved
- Samples ready for
  - transportation around the world in LN_2 dry shippers
  - slabbing or freeze-drying prior to description

K_0 Permeameter: Permeability Under Effective Stress

- Direct transfer from miniPCATS
- Sample extruded from core liner into f exible rubber sleeve
- Sample length 25-30mm, diameter 51mm
- Independent conf ning pressure & pore pressure
- Computer-controlled motor-driven axial loading
- Consolidation properties
- Direct-f ow permeability under ef ective stress

transfer orientation

measurement orientation

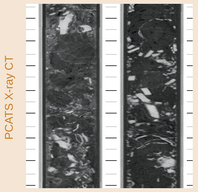
Recent Expeditions

★ Recent pressure coring expeditions

☆ Previous expeditions

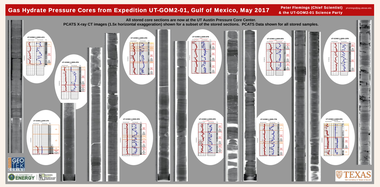
Japan: Meiji U 2015

- Sea of Japan: August to October 2015
- "Gas chimney" structures, pockmarks, & mounds
- GH recovered in conventional & pressure cores
  - 27 PCTB cores
- Massive gas hydrate
- Pressure core sections transported to AIST for analysis



USA: UT-GOM2-01 2017

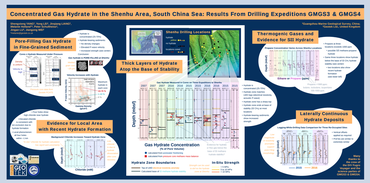
- Gulf of Mexico Green Canyon
- Combined tool testing and science program
- Continuous pressure coring through hydrate reservoir
- Concentrated methane hydrate in silts and f ne sand
- Onshore post-expedition core processing program
- 21 pressure core sections transported to UT Austin



China: GMGS3 2015
China: GMGS4 2016

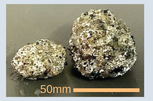
- South China Sea Shenhu area
  - Pore f lling gas hydrate in f ne-grained sediment
  - Thermogenic gas compositions
  - Recent hydrate formation
- 18 samples cryofrozen under pressure using freeze cell
- 36m (GMGS3) & 90m (GMGS4) pressure core recovered

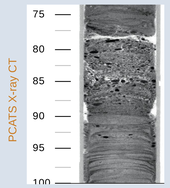
see poster



India: NGHP02 2015

- Bay of Bengal: 3 months
- 10 coring sites
- 75/104 cores at pressure
- 156m pressure core recovered
- 25 1.2m storage chambers to AIST (Sapporo, Japan)





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