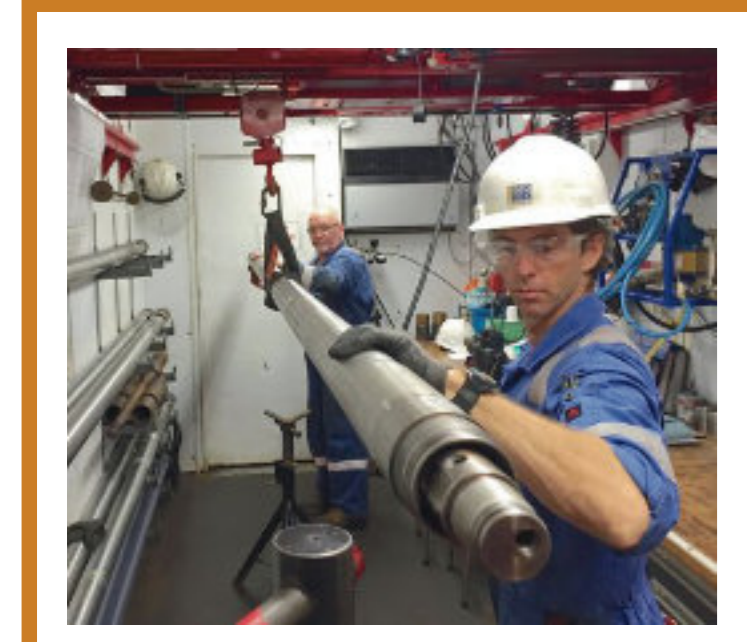


# Pressure Cores: From Borehole to Laboratory

# Recent Expeditions



**PCTB & HPTC:  
Wireline Pressure  
Coring Tools**

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



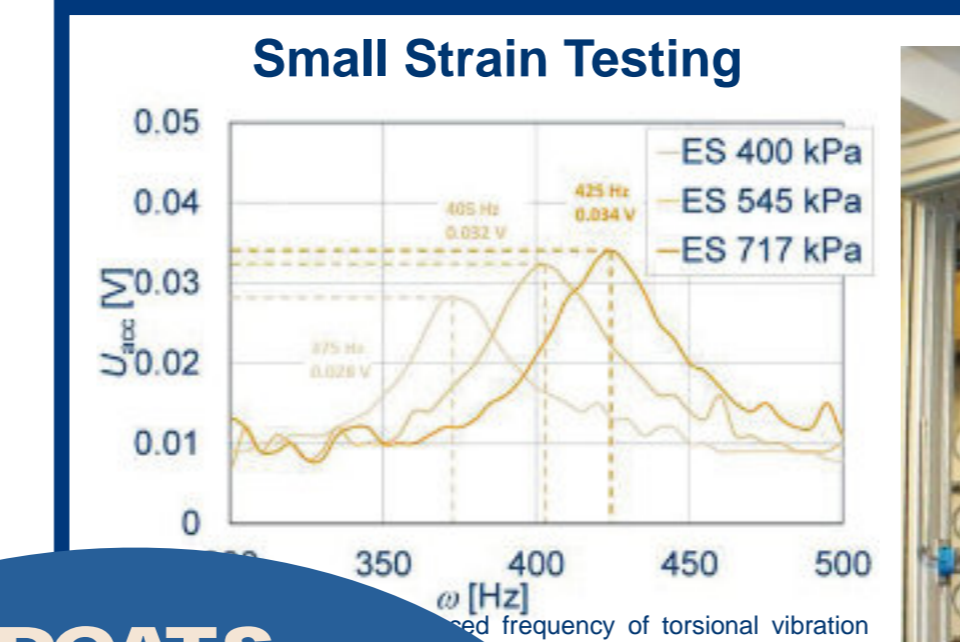
| Corer | Core Diameter    | Drill Pipe ID |
|-------|------------------|---------------|
| PCTB  | 51 mm (2 in)     | 4 1/8 in      |
| HPTC  | 57 mm (2 1/4 in) | 6 5/8 in      |



**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



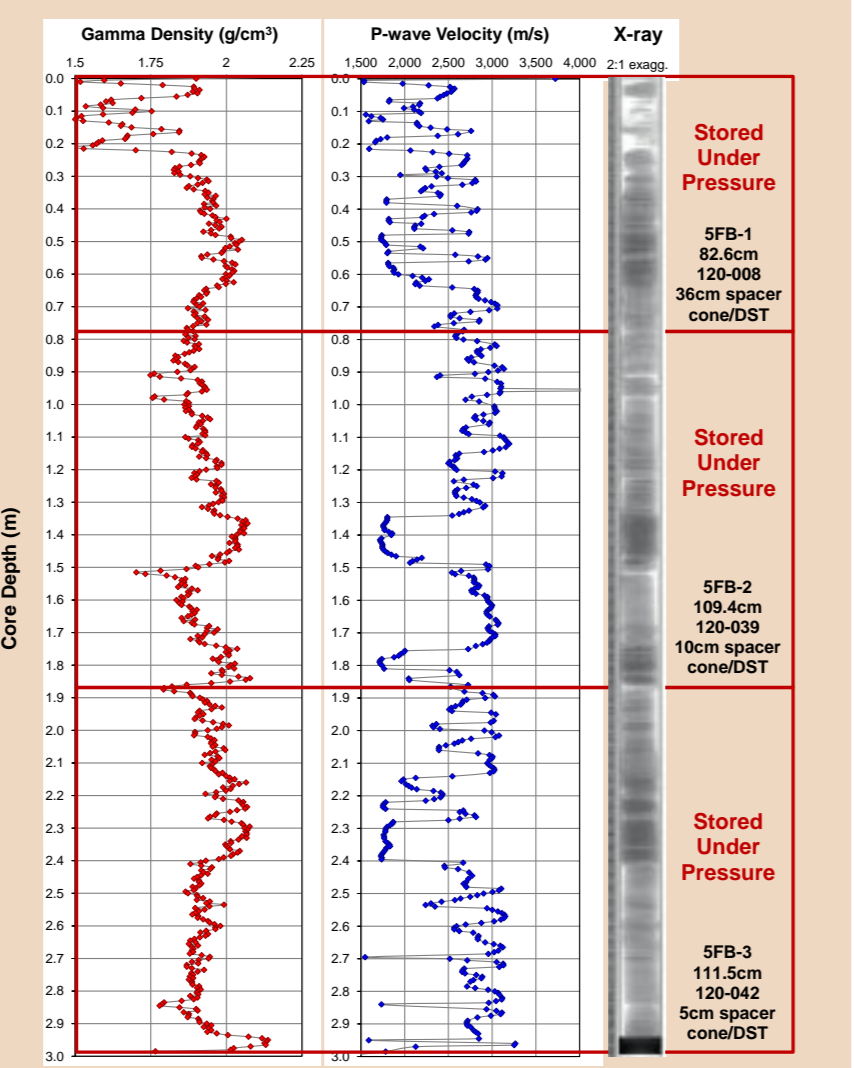
**PCATS  
Triaxial: Small &  
Large Strain Testing  
with Permeability**

- Triaxial stress-strain testing
- Resonant column testing
- Direct flow permeability

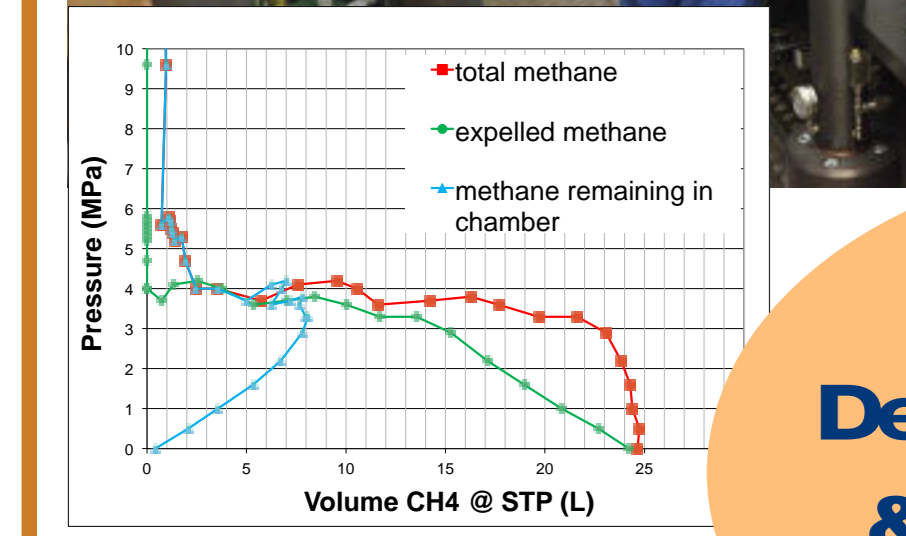
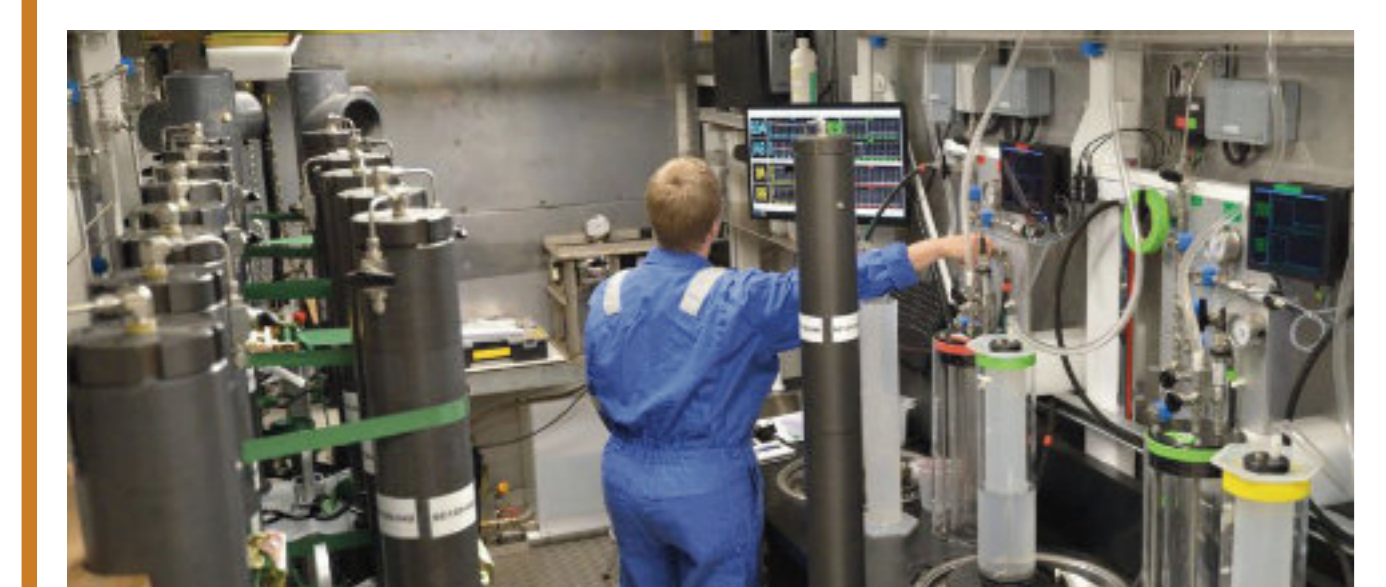


**PCATS:  
Foundation  
Geophysical Data &  
Field Sampling**

- 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
  - field depressurization
  - field liquid nitrogen freeze cell
  - transportation to laboratory



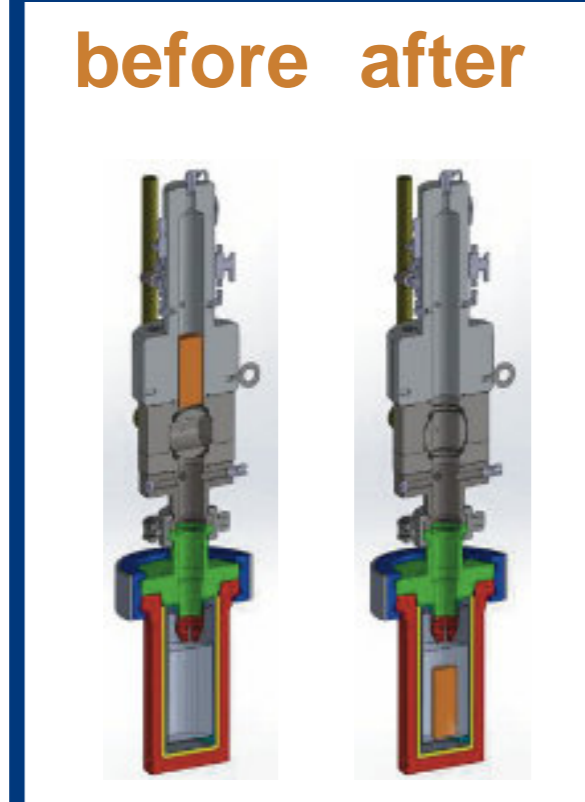
- Quantitative depressurization of samples
- Continuous pressure & temperature records
- Gas & liquid volume measurement
- Gas sampling and composition via GC
- Calculation of hydrate or free gas content



**Field  
Depressurization  
& Hydrate/Gas  
Quantification**



**Freeze  
Cell for Field or  
Lab Preservation  
of Structure**



- 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<sub>2</sub> dry shippers
  - slabbing or freeze-drying prior to description



**miniPCATS:  
Sub-sampling in the  
Laboratory**

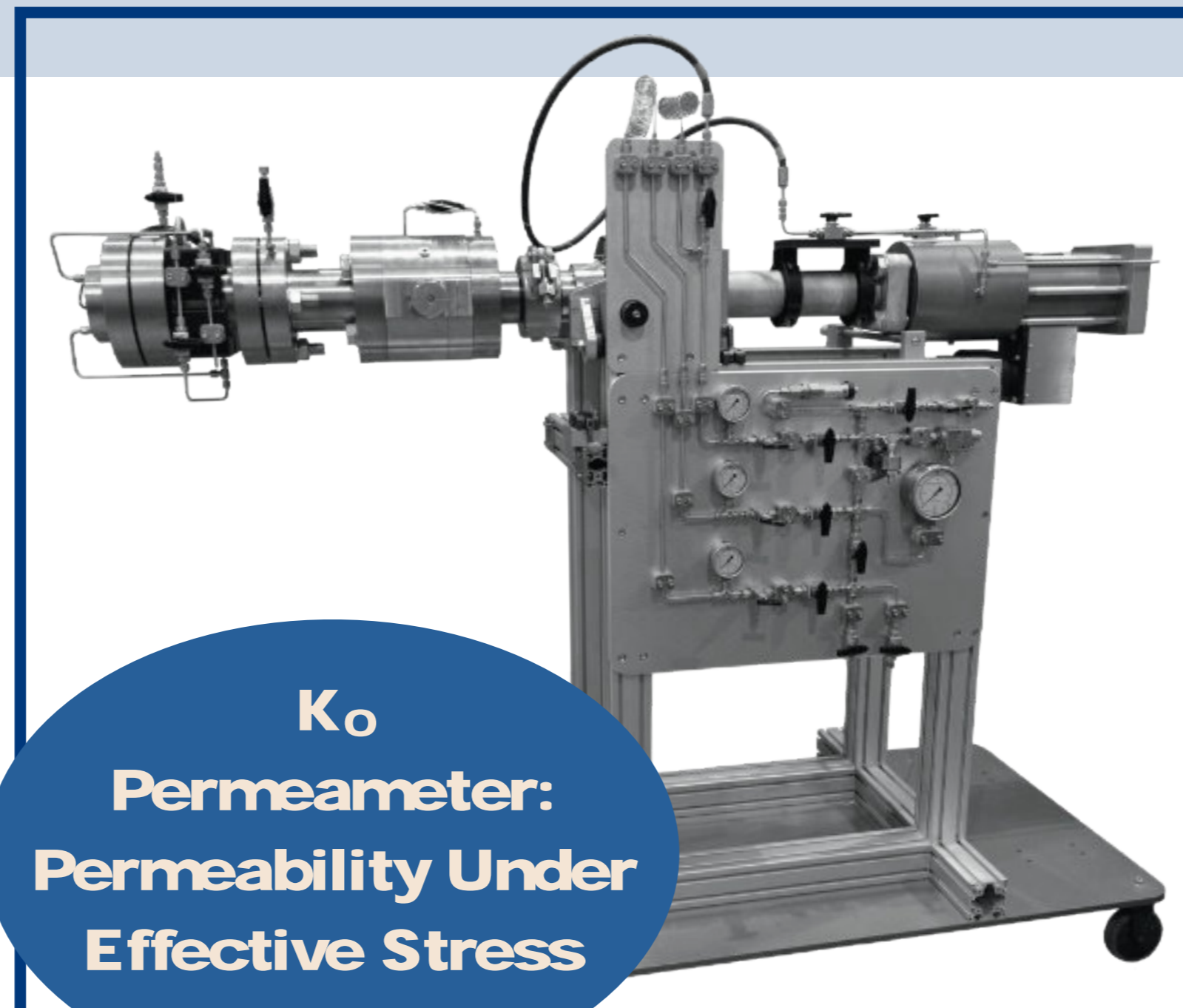


- Sample cutting/preparation in laboratory
- Reciprocating saw for hard samples
- Sample length up to 1.2 m
- Max pressure: 35 MPa (5000 psi)
- Optional X-ray, P Wave, Density
- Compatible with USGS Instrumented Pressure Testing Chamber (IPTC)

**This Way to  
the Pressurized  
Future**

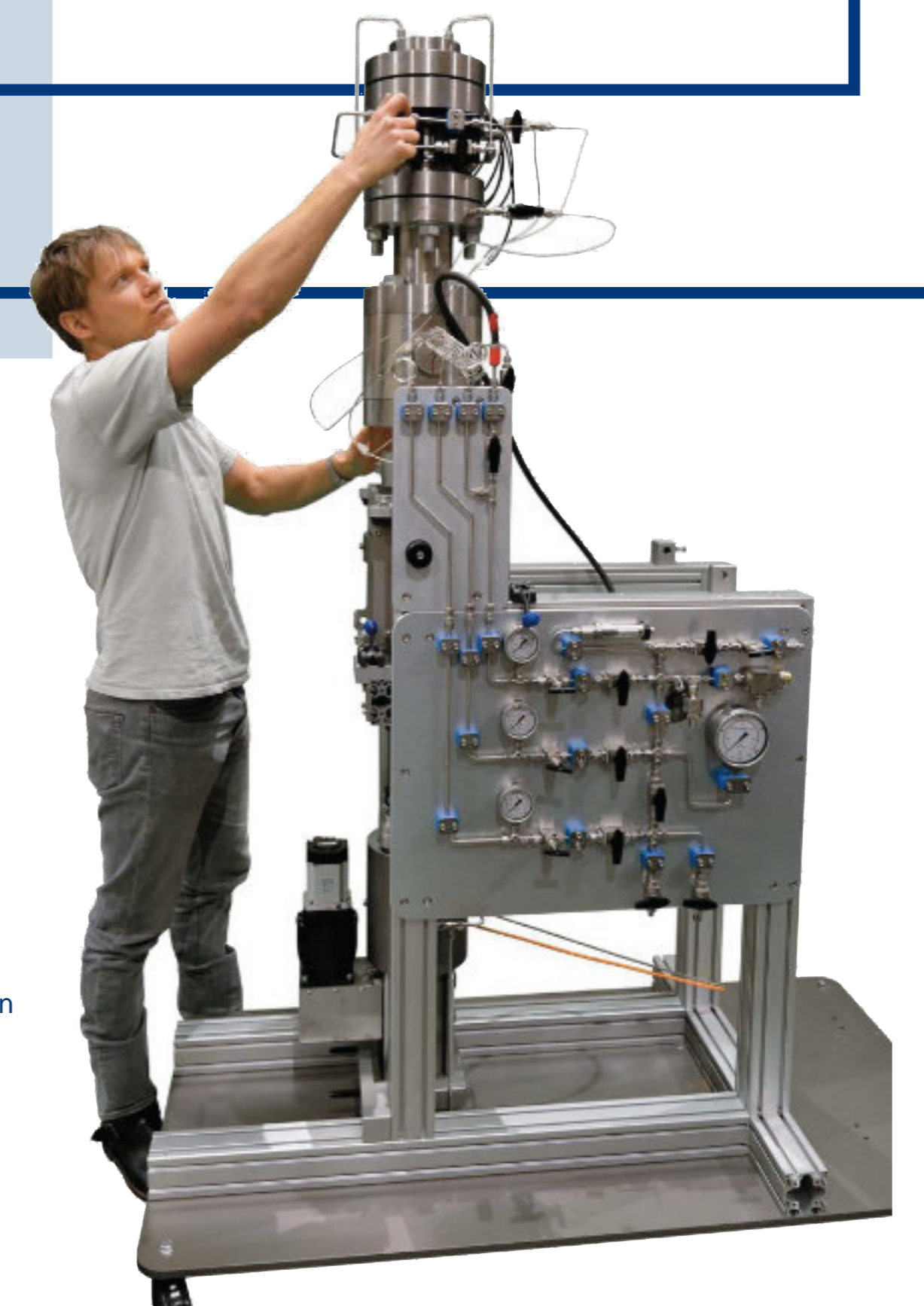
- Horizontal plug "sidewall" coring under pressure
- Miniature pressure chambers for micro-CT
- Raman-compatible windows in testing cells
- Hard sample trimming & preparation for improved mechanical testing

**K<sub>0</sub>  
Permeameter:  
Permeability Under  
Effective Stress**



- Direct transfer from miniPCATS
- Sample extruded from core liner into flexible rubber sleeve
- Sample length 25-30mm, diameter 51mm
- Independent confining pressure & pore pressure
- Computer-controlled motor-driven axial loading
- Consolidation properties
- Direct-flow permeability under effective stress

transfer orientation



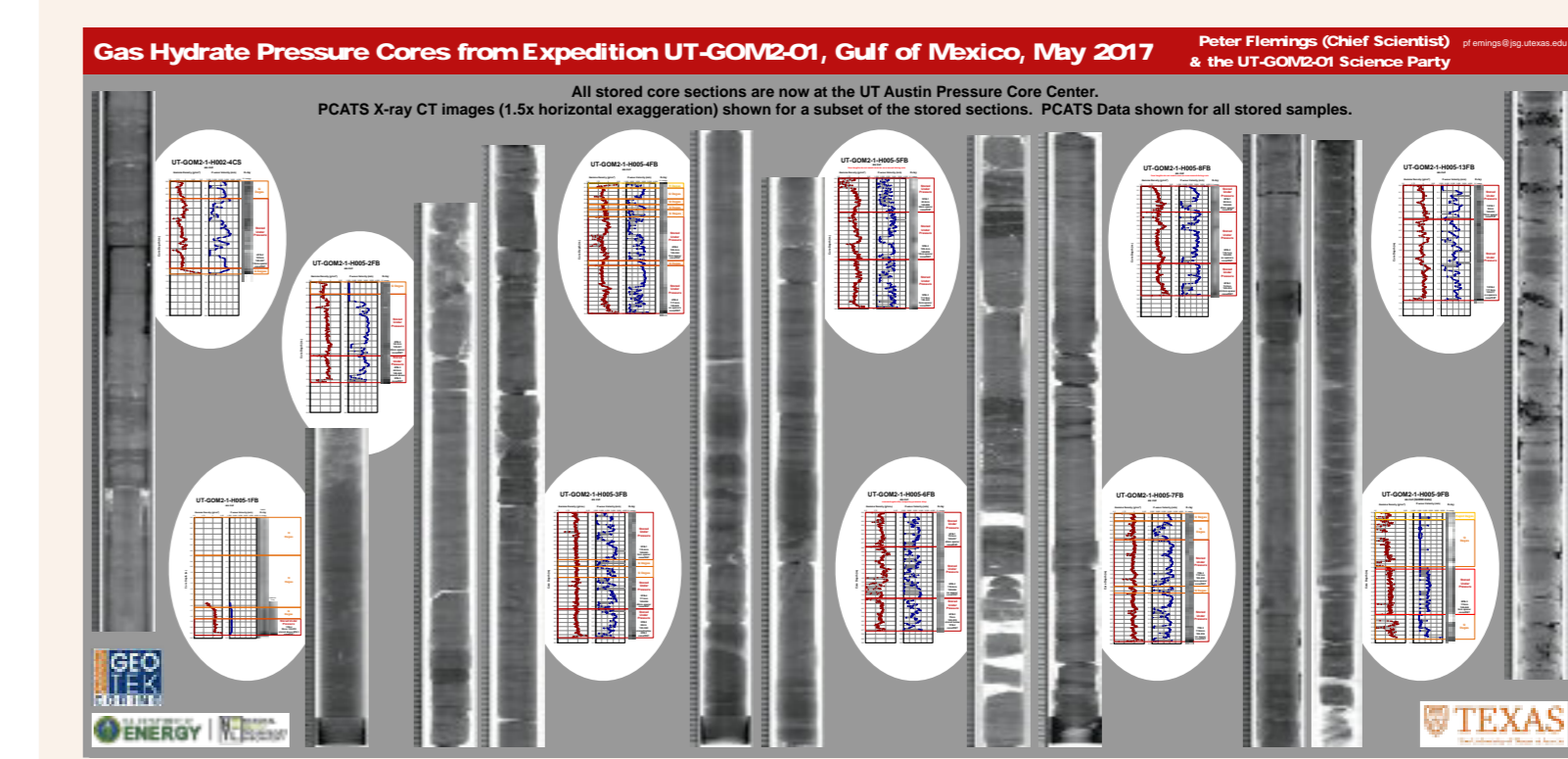
measurement orientation



- ★ Recent pressure coring expeditions
- ☆ Previous expeditions

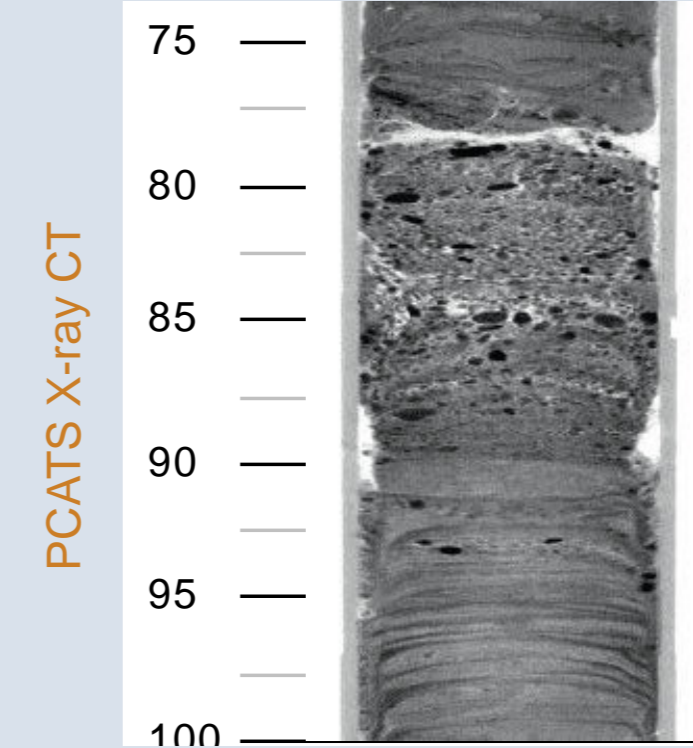
**USA: UT-GOM2-01 2017**

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



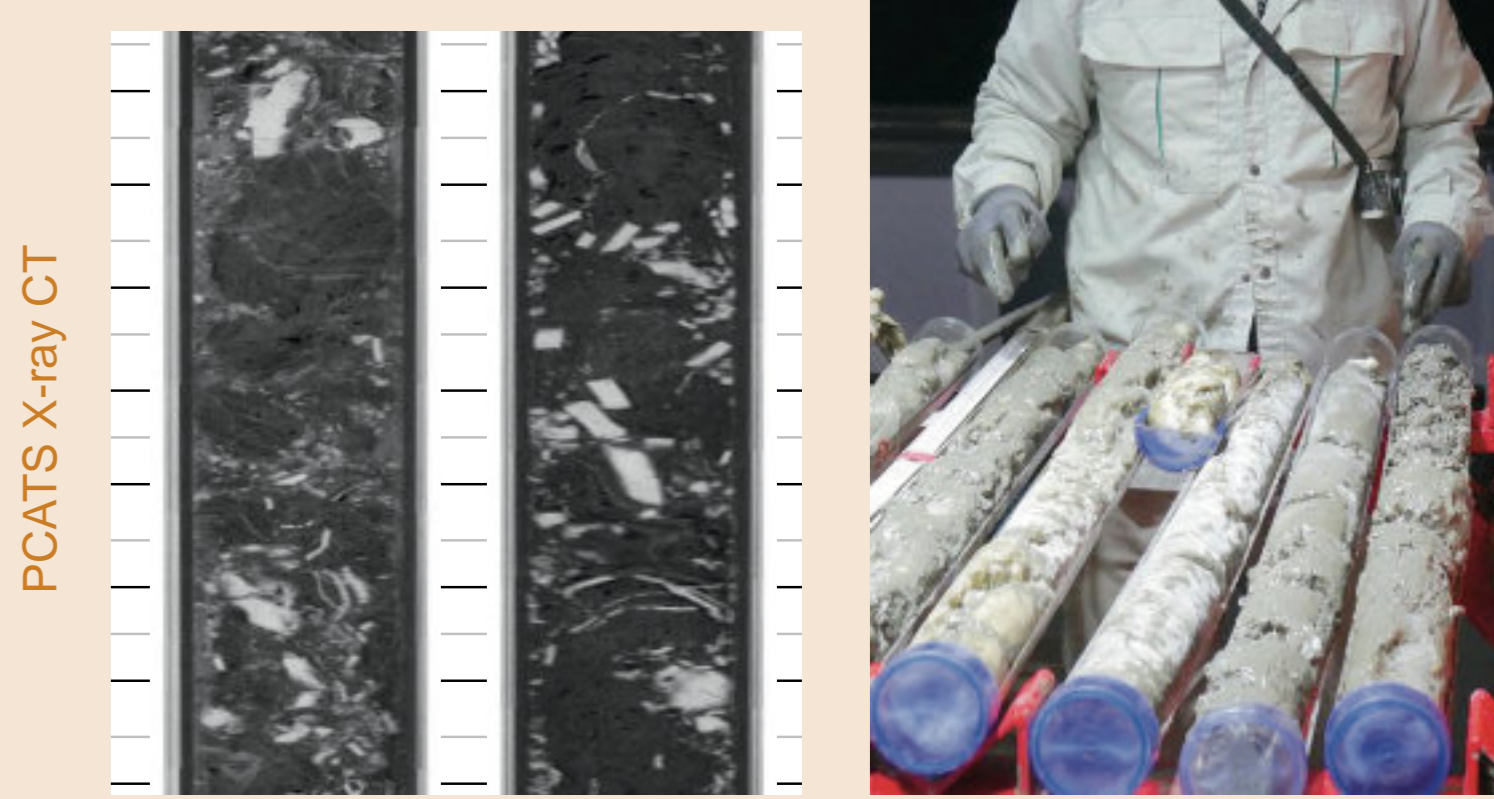
**India: NGHP02 2015**

- 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)



**Japan: Me i 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

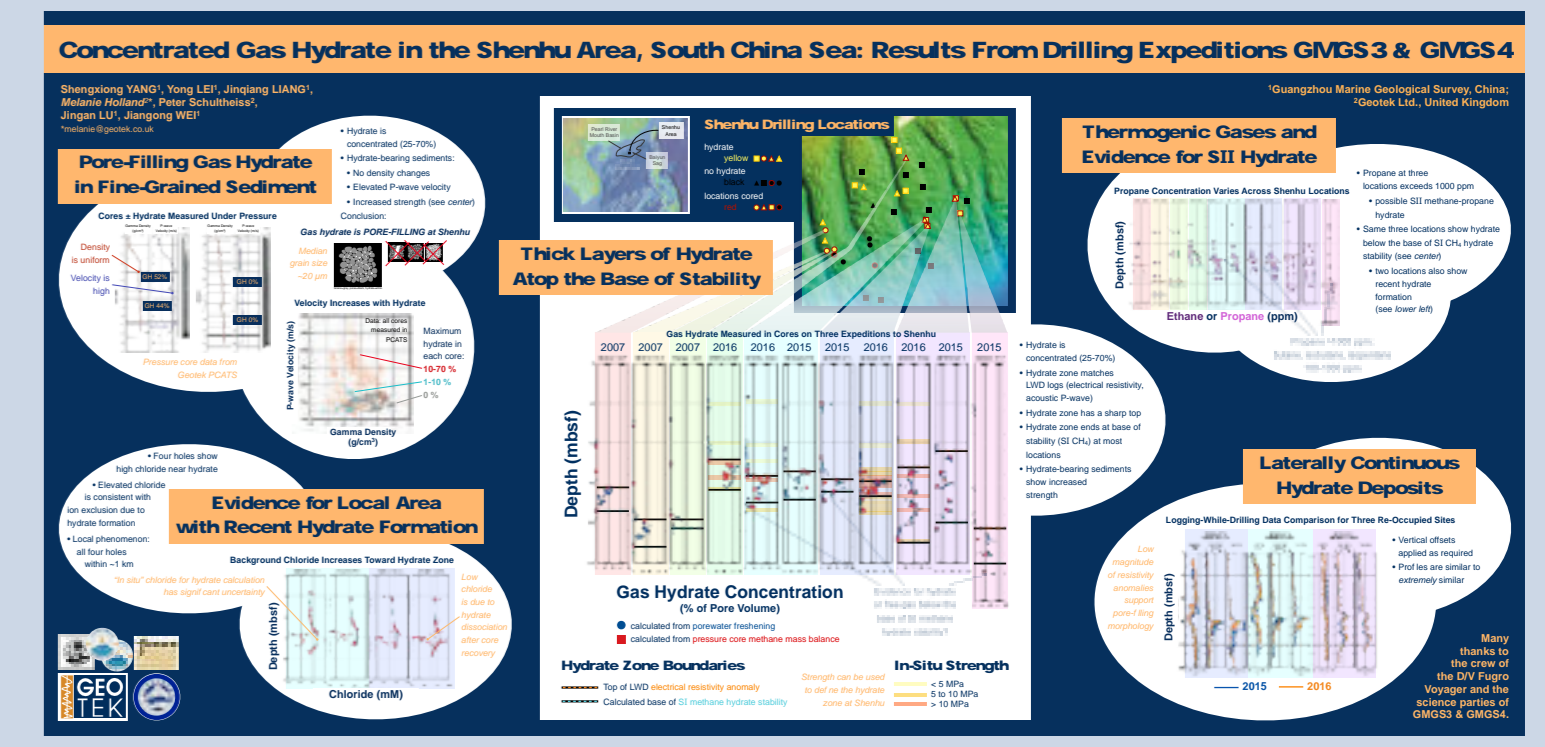


**China: GMGS3 2015  
China: GMGS4 2016**

- South China Sea Shenhu area
  - Pore filling gas hydrate in fine-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



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