

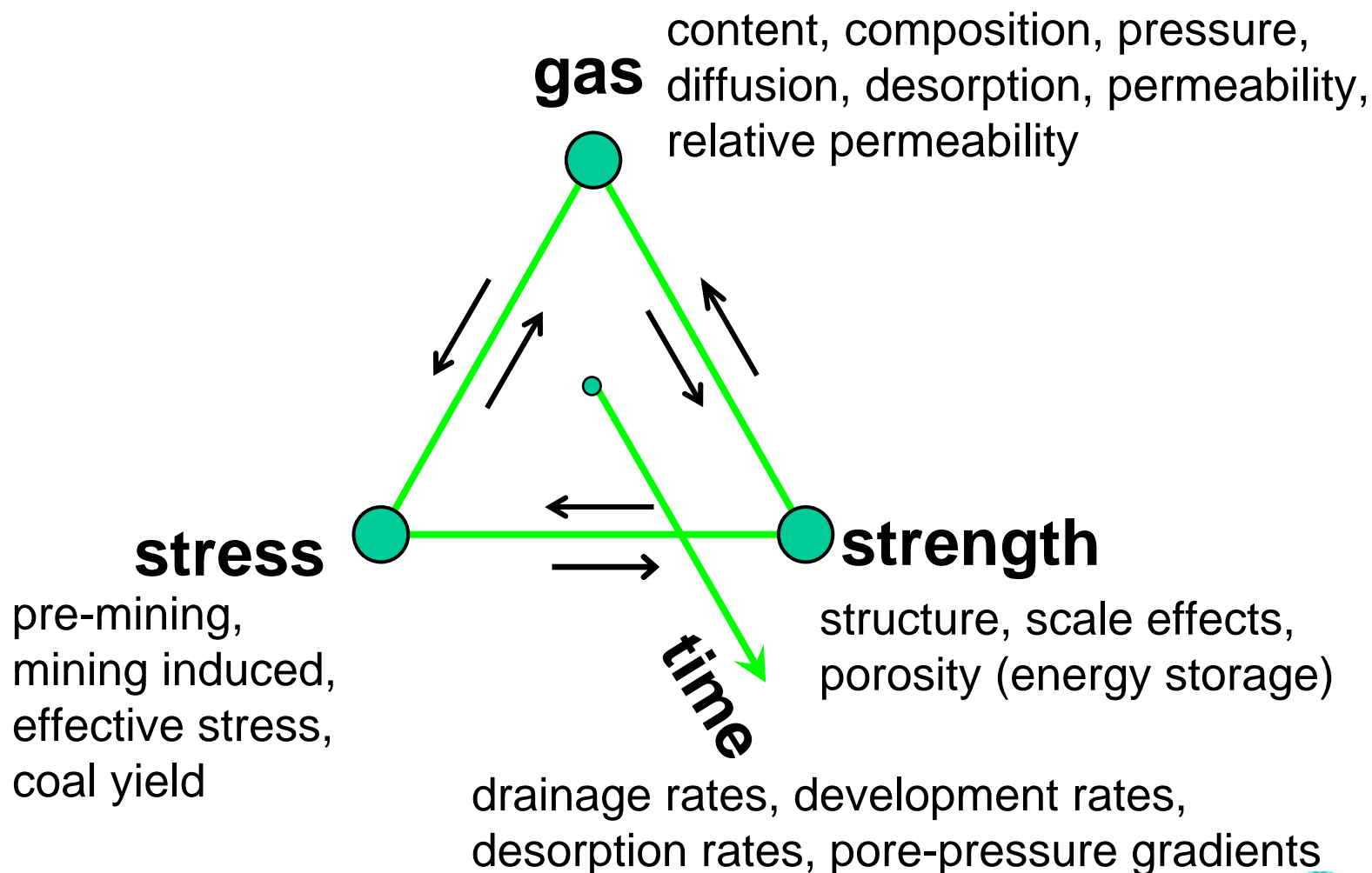
Gas outbursts

processes and properties

Mike Wold, Luke Connell, Xavier Choi
CSIRO Petroleum

Interactive factors in outburst mechanisms

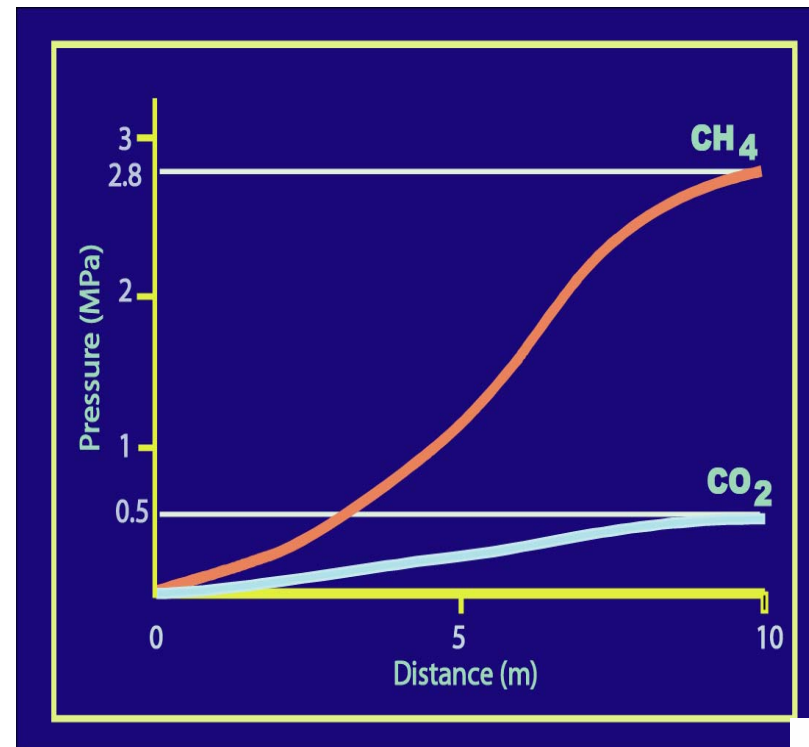
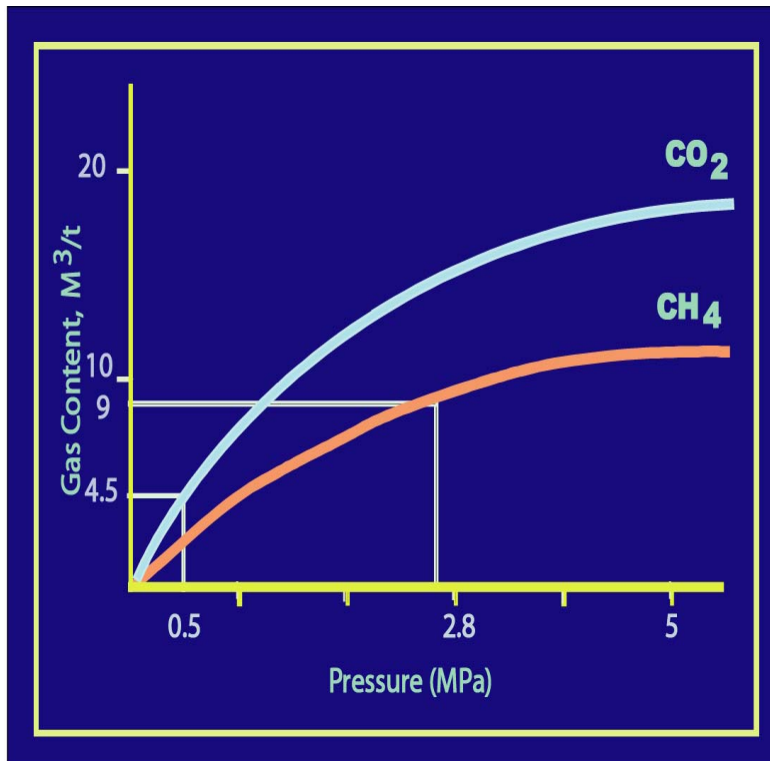
www.csiro.au



Impact of gas composition and drainage on pressure gradient

www.csiro.au

- Main driver for outbursts is gas pressure gradient



- Even with the same gas content the pressure for CO₂ areas will be less than for CH₄ areas

- CSIRO Petroleum developed model for outbursts
 - represents entire process including after the event has commenced
 - **Gas desorption**
 - **Coal deformation and failure**
 - **Coal fragmentation**
 - **Gas dynamics and transport of outburst coal**
 - **Integrated model (initiation + evolution)**
- A means for investigation of outburst processes and parameters

Two important questions

www.csiro.au

- The behaviour of coal properties with gas type
 - CH₄ versus CO₂
 - strength, permeability, desorption rate
 - How does gas type affect OB risk
- The role of spatial variability in properties and outburst events
 - How does it affect the risk of OB?
 - How can it be described?
- Developing a case for expanded criteria for OB management
- Two projects currently supported by ACARP
 - ACARP C11030 – Investigating outburst risk through measurement of spatial variability
 - Mike Wold, Luke Connell, Xavier Choi
 - ACARP C12038 – Laboratory study of outburst properties
 - Xavier Choi

- **Statistical model of spatial variability**
 - measure permeability and strength over a coal seam
 - field work at West Cliff, recovery of core samples
 - perm measured through well testing and core measurements
 - sufficient measurements of perm and strength for statistics

- **Sensitivity to variability**
 - apply quantitative models

- **Input to risk analysis**
 - integrate with outburst risk management

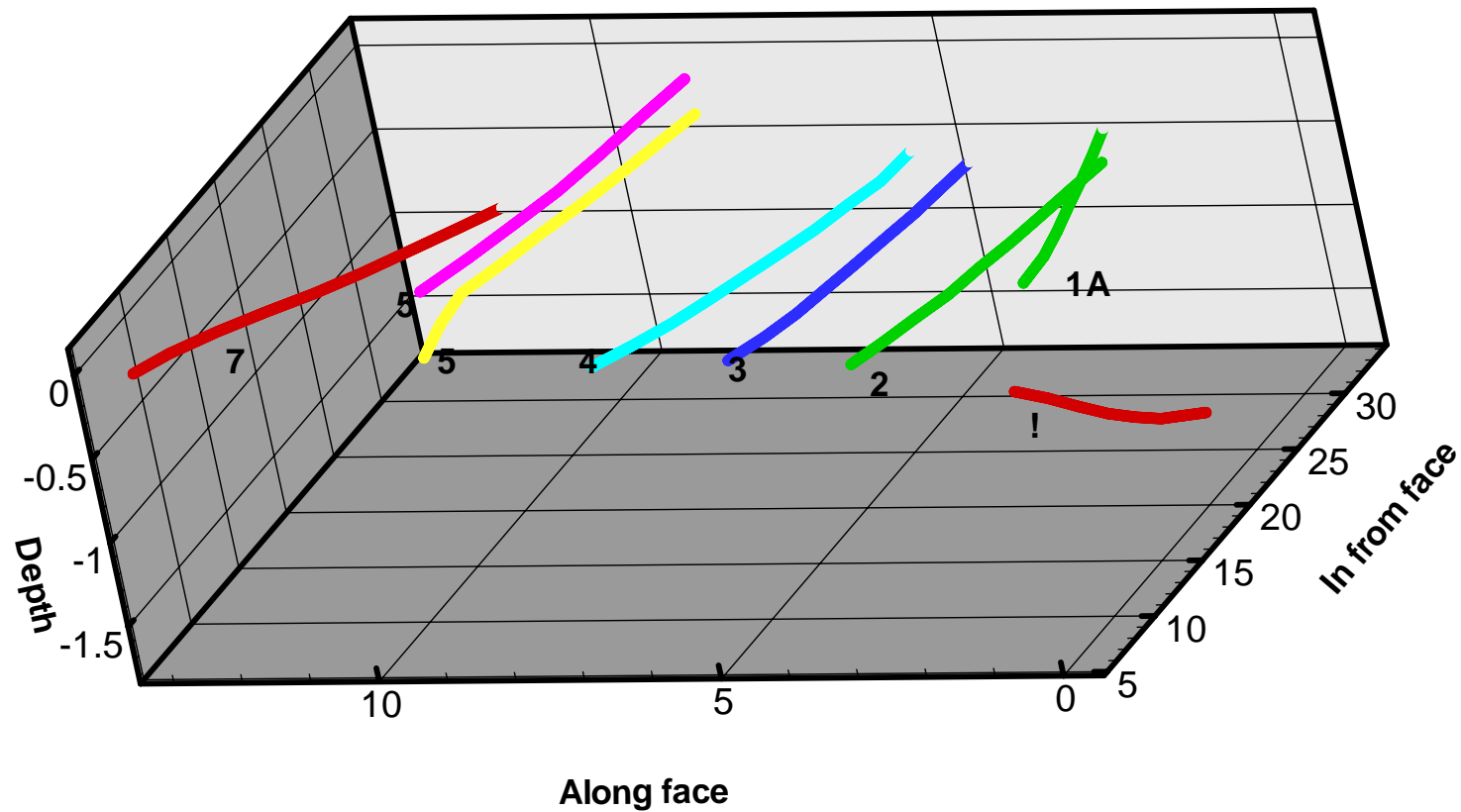
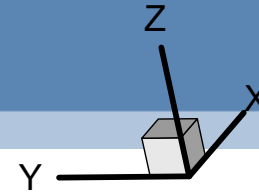
West Cliff well testing and core recovery

www.csiro.au



Borehole layout from survey data

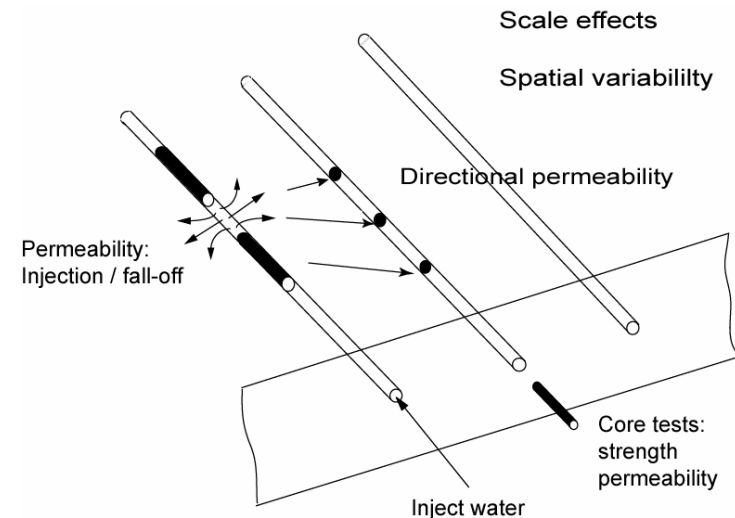
www.csiro.au



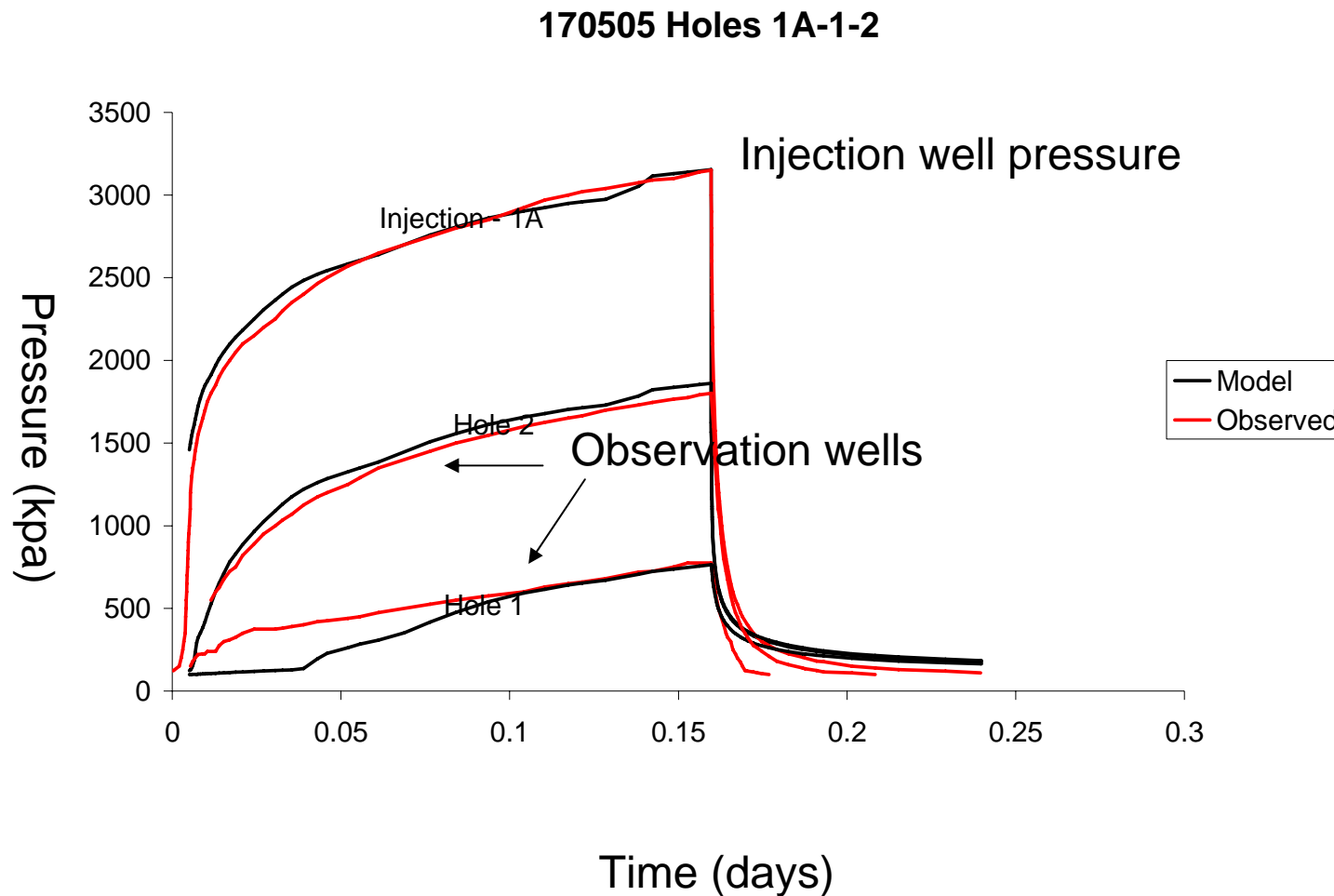
In-situ Permeability testing

www.csiro.au

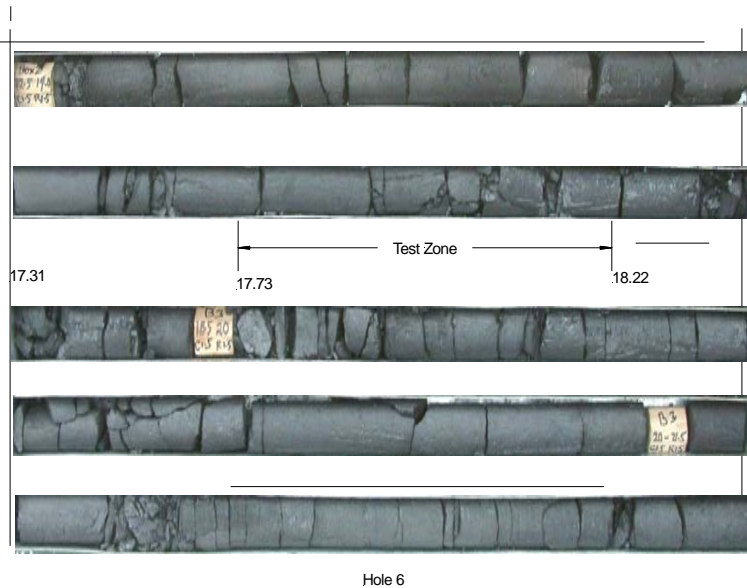
- Tests were injection-falloff
- Seven tests were carried out
- Three saw a pressure response in monitoring wells
- Need for an intrinsically safe datalogger



Example of SIMED well test analysis



Recovered core

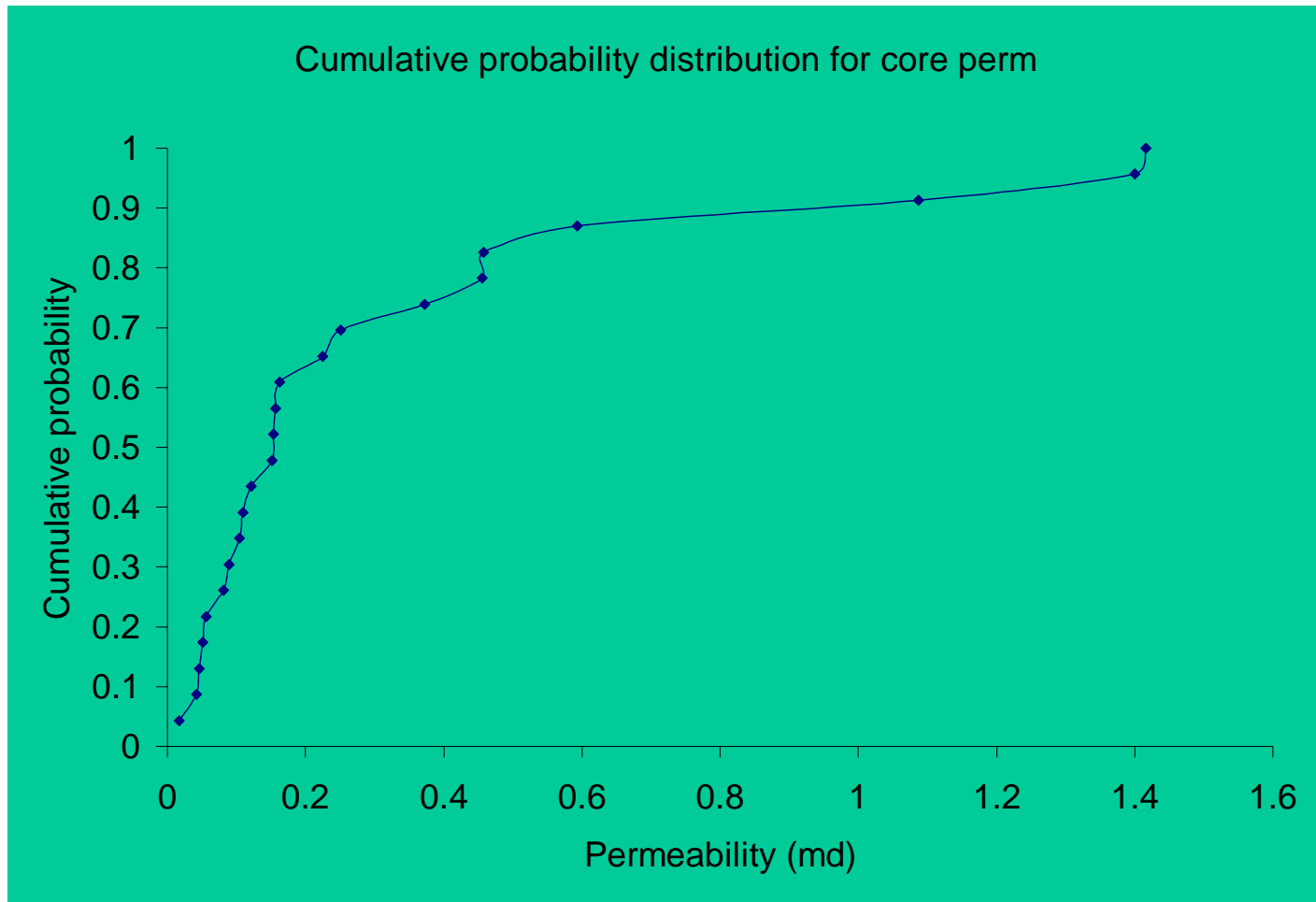


Core prepared for lab perm measurement



- Fragile, a lot of core unsuitable for testing
- Measurements biased to coherent material – large fractures not included
- Perm measured along axis only – 1 direction

Core perm distribution



Core block work

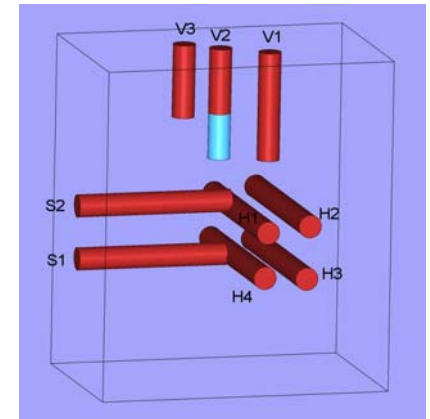
- Core recovered from large block from West Cliff
- Determine perm along principal cleat directions



Large block



Encased in plaster



Core recovered

Summary of Analyses to Date

www.csiro.au

	Number of measurements
In-situ perms	7
Lab core perms	30
Block core perms	5
Coal strength	30

Summary of perm measurements

- Large variation in measurements
- Typically core measurements are significantly less than well tests
- Block recovered core close to well test results

Directional perm in md			
	block	core	well testing
x	5.6	0.43	7.56
y	4		3.14
z	0.94		0.89

- Measurement phase of project complete
- Next steps
 - using statistical properties with dynamic outburst model to examine risk
 - sensitivity to various properties and their spatial distribution