

Consideration for Logging at NanTroSEIZE

Prepared for Lamont Logging
Symposium

Important things

- We want to check out the original data
 - We do NOT let Schlumberger do QC
- Help from LDEO-BRG is essential
 - BRG specialist(s) needs onboard the LWD expedition.
- Effective cooperation between CDEX/TAMU/BRG. How?
- Kuroshio may not be a problem for LWD...

LWD expedition discussion

- 53 days for 6 sites: TD yet to be discussed.
- Seismic Vision: checkshot can be done during the pipe connection. It should be done with LWD if we do not plan same thing with WL.
- Sonic: Quality for slow formation (Vs)
- Provision: not satisfactory? JOGMEC says good.
- StethoScope:

- EcoVision is a superset of Adn
 - CDEX will do eone of these.
- Who pays the cost?

Stage1 Logging plan

		NT1-1	NT1-7	NT1-3	NT3-1	NT2-4**	NT2-1A
LWD	Resistivity imaging	Yes SED section only	Yes SED section only	Yes	Yes	Yes	Yes
	NMR porosity, permeability estimation, etc	^	^	^	^	^	^
	MWD (GR)	^	^	^	^	^	^
	CDN (density, neutron porosity)	^	^	^	^	^	^
	ISONIC (P-wave)	?	?	?	?	?	?
Wireline Logging	FMS	YES - Basement only at both of these sites <i>(If basement is done in Stage 1)</i>		Maybe Likely to be difficult	Yes Attempt Whole Interval	Yes Only through BSR interval	Maybe Likely to be difficult
	DSI						
	GR						
	CMR (NMR log)	-	-	-	Down to BSR	Down to BSR	-
VSP	Checkshot (vertical)		YES-	Yes	Yes	-	Yes
	Offset	-	-	?	YES	-	-
	LWD (SeismicVision)	Yes	Yes	Yes	Yes	Yes	Yes
Downhole Measurement	Temp, Pore pressure in soft sed section	Yes	Yes	Yes	Yes	Yes	Yes
	PackerExp. with OBS obs.	-	YES?	Yes	-	-	Yes

Objectives of LWD Expedition

- Systematic logging of common properties throughout all 6 holes from the reference sites to the forearc basin – reference to the coring expeditions
- Detection and identification of fault zone, basement, BSR, etc.
 - No casing
 - Hole abandon procedure for hydrologic problem
- Fault architecture characterization
 - fracture density, orientation, and conductivity
- Stress Orientation through borehole breakout
- Vp and density of old accretionary prism
- Core-Log-Seismic Integration
- Lithostratigraphic properties (Logging UNITS)

- History of landslides
 - RAB / Sonic (Mexico gave a good example)
- Methane Hydrate study

- Basalt will NOT be drilled, to preserve hydrological condition
- Accurate positioning of hole trajectories
- In-situ T&P will be estimated during later expeditions, not this?

Scientific Application for LWD

Objectives / Properties	Site	NMR pore distribution	Vp,Vs	Checkshot	Porosity/ Density/ Caliper	Resistivity Image
Fault zone detection	1-3 / 2-1	@	@	@	@	@@
Fault architecture characterization	1-3 / 2-1					
Stress Orientation through borehole breakout	ALL				@	@@
CLS Integration	ALL		@	@@	@	
Evolution of accretionary complex	ALL		@	@	@	
Vp and density of old accretionary prism	3-1 +		@		@	
Lithostratigraphic properties (Logging Units)	ALL	@	@	@	@	@
Excess Pore Pressure	ALL				@	
History of landslides	1-3 / 2-1		@	@		
Hydrate detection / Saturation	3-1 / 2-1	@	@		@	@@
Fluid flow regime in the accretionary prism	ALL					
Permeability	ALL	@@	@		@	
Poisson ratio	ALL		@			
Anisotropy ??	ALL					
Diagenesis / Cementation	ALL	@				
Compressibility / Shear strength	ALL	@	@		@	

LWD Tools and properties

- geoVISION: Five different resistivity measurements and image (RAB).
- adnVISION: Porosity/Density/Caliper
 - Neutron porosity values strongly fluctuate at high porosity
 - Gamma-ray density is stable
 - Density image (16 sectors) is obtained by rotary density sensor
 - Standoff can be measured by Ultrasonic Caliper - computed
- SonicVISION: Vp and Vs (only faster formation)
 - Vp quality in slow formation significantly improved from ISONIC
 - SeismicVISION do the checkshots simultaneously (will not take time but costly; hydrophone at bit)
- ProVISION: Magnetic resonance (MR) measurements
 - Total porosity, free-fluid, and bound-fluid volume measurements
 - Permeability can be estimated
 - No radioactive sources but very expensive
- Ecoscope:
 - Multisensors in one collar (NP, D, US-Caliper, induction resistivity, APWD, Az-GR, elemental capture spectroscopy)
 - All sensors located at less than 20 ft from the bit
 - Low risk: weaker source than ADN

Scenarios for tool selection

- **A)** geoVISION / adnVISION / SonicVISION / SeismicVision / ProVISION / Ecoscope
 - Best scenario. ADN is not necessary if Ecoscope can be done.
- **B)** geoVISION / adnVISION / SonicVISION / SeismicVision / ProVISION / Ecoscope
 - Alternate for scenario A).
- **C)** geoVISION / adnVISION / SonicVISION / SeismicVision / ProVISION / Ecoscope
 - If we cannot afford Provision.....
- **Scientific Priority**
 - 0) MWD+APWD
 - 1) adn/Eco? + geoVision (Porosity/Density/Caliper + Res. Image)
 - 2) SonicVision and/or (Vp, Vs)
 - 3) SeismicVision (VSP checkshot) – alternate for wireline VSP
 - 4) ProVision (NMR pore distribution)

Homework on LWD

	NT1-1	NT1-7	NT1-3	NT2-1	NT2-3	NT3-1
TD Obj.	Top of Basement	Top of Basement	Frontal thrust at 400m, TD to 600m	1000m	1000m	300m below reflector
Casing		*		*	*	**
Seq.	6	1	3	5	2	4
MWD/APWD	*	*	**	**	**	**
adn/Eco	*	*	*	*	*	*
geoVision	*	*	*	*	*	*
SonicVision	*	*	*	*	*	*
SeismicVision	?	*	*	*	*	**
ProVision	?	?	*	*	*	?

