Proposed well logging in CSDP hole

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Using Chicxulub Puerto as the center of the crater, the proposed CSDP hole is at ~60 km radius. A projection of the hole onto marine offshore reflection line Chicx-A (SP 2850) places the base Tertiary at ~580 ms. Velocity models place the base Tertiary here at ~820 m depth (Figs 1 & 2).

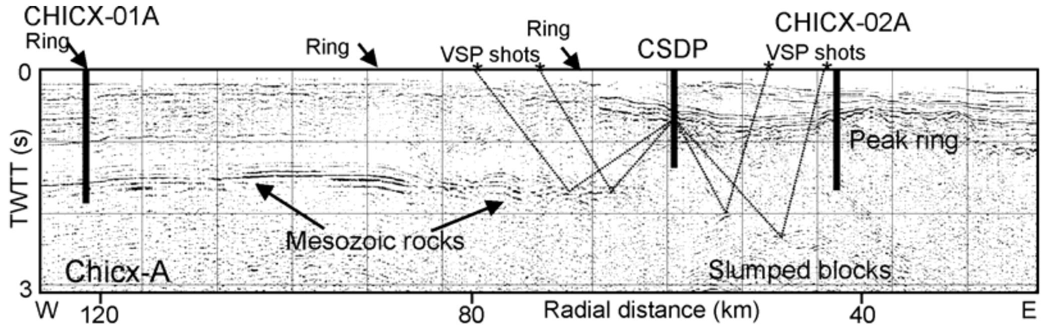
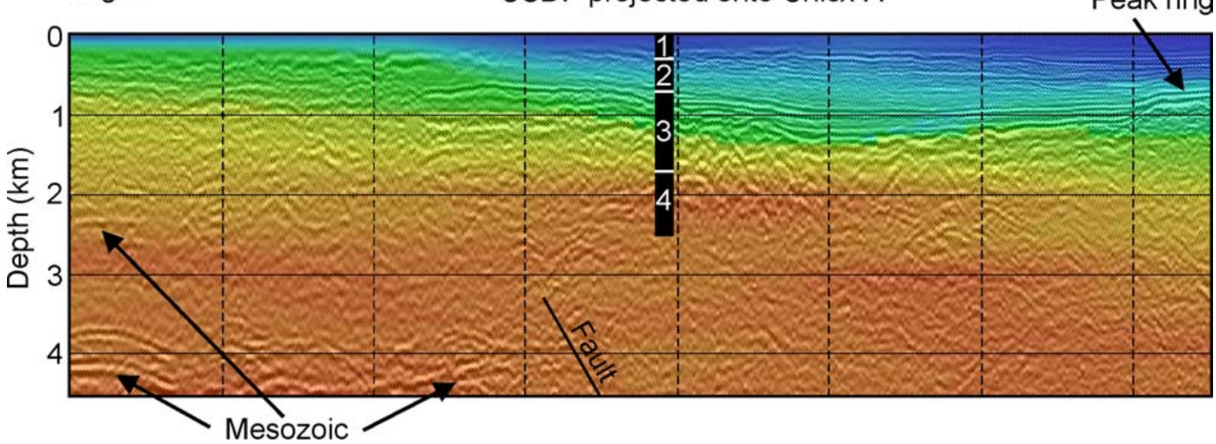


Fig. 1 Location of ODP holes. CSDP is the projected location of the onshore hole onto Chicx-A

Fig. 2



The current drilling schedule is to drill to 18.3m with a bit size of 311 mm, to 305 m at 222 mm, and then to decrease the hole size in three stages from 134, 101 and 76 mm. The most interesting part of the hole will be the section immediately beneath the Tertiary – hence logging this section should probably be given the highest priority. We suggest that the drilling stops just above the base Tertiary, and the hole be logged in four stages. The first two stages will then contain only Tertiary rocks, and the total well logging costs could be kept down by running a basic set of logs in these first 2 stages. However, drilling costs far exceed logging costs so this need not be a major priority.

Stage 1	18.3-305m	(BS 222 mm)	Tertiary
Stage 2	305-750 m	(BS 134 mm)	Probably just Tertiary
Stage 3	750-1750 m	(BS 101 mm)	
Stage 4	1750-TD	(BS 76 mm)	

Stages 1 and 2 can be logged with normal-size or slim-line tools. Some normal-size logging sondes cannot be used for stage 3. Stage 3 could be a logged using a mix of normal-size and slim-line sondes or purely slim-line. The advantage of using slim-line tools is the significantly smaller transport costs. Stage 4 can only be logged with slim-line tools.

Logging priority: 1 - 3 indicates highest to lowest priority

Tool	Purpose	Priority	
		Stage 1 & 2	Stage 3 & 4
Sonic velocity	P-wave velocity/seismic ties/porosity	1	1
Density	Density/porosity/grav. Modeling/acoustic impedance	1	1
Neutron porosity	Porosity/density/fracture characterization	1	1
Electrical resistivity	Permeability	3	2
Natural gamma	Log ties	2	2
SP	Permeability	3	2
4 arm dipmeter, caliper, micro-resistivity and 3D magnetometer	Hole stability (drilling management)/ permeability, fracture analyses/identification break-outs/magnetic modeling	1	1
Acoustic televiewer	Orientation data/fracture analyses	3*	2*
Full-waveform sonic	S-wave velocity/fracture characterisation	3	2
Magn. Susceptibility	Magnetic modeling	3	1
Temperature	Hole stability (drilling management)	2	2

* Depends on whether core is oriented during drilling. If it is, then this tool could be assigned a low priority; if it isn't this tool will be vital to determining the correct orientation of the core.

Proposed combination stage 1 and 2 (within Tertiary)

High priority
1) GFZ slim-hole, gamma/full-waveform sonic/resistivity (TS/BCS/DLL)
2) Gamma/neutron/density (from contractor) #
3) GFZ's slim-hole oriented dipmeter with 4 arm caliper, micro-resistivity, 3D magnetic vector, gamma ray, azimuth and deviation (DIP)

Medium priority
4) GFZ's slim-hole temperature and pressure (T/P) (Includes a gamma ray)
5) GFZ's slim-hole magnetic susceptibility (MS) (Includes a gamma ray)

Plus GFZ borehole televeiwer (FAC40) if core not oriented during drilling.

Cost for running1 and 3: **80,000 DM for each stage**
(Inclusive of transport, insurance, supplies, travel expenses, customs clearance, GFZ personnel, but excluding cost of winch hire and logging unit)
Extra cost for 4 and 5: **3000 DM for each stage**
Cost for running 2 unknown

Proposed combination stage 3 and 4

High priority

1) GFZ slim-hole gamma/full-waveform sonic/resistivity (TS/BCS/DLL)
2) Gamma/neutron/density (from contractor) #
3) GFZ's slim-hole oriented dipmeter with 4 arm caliper, microresitivity, 3D magnetic vector, gamma ray, azimuth and deviation (DIP)
4) GFZ's slim-hole temperature and pressure (T/P) (Includes a gamma ray)
5) GFZ's slim-hole magnetic susceptibility (MS) (Includes a gamma ray)
6) Geochemical log (from contractor)
7) GFZ's slim-hole borehole televeiwer (FAC40)

The neutron porosity, density, and magnetic susceptibility logs could be omitted if physical property measurements (Vp, Vs, density, susceptibility) will be made on the core.

We strongly recommend running a geochemical log, obtaining the bulk chemistry of the impactites is a high-priority drilling objective, and such a continuous log will be invaluable.

Cost for running 1,3,4,5,7: **85,000 DM for each stage**
(Inclusive of transport, insurance, supplies, travel expenses, customs clearance, GFZ personnel, but excluding cost of winch hire and logging unit)
Cost for running 2 and 6 unknown.

After drilling, in cased hole		
Log	Purpose	Priority
Uphole travel times.	Tie well to offshore seismic	1
VSP	Tie well to offshore seismic	1

After drilling and in cased hole:
The minimal requirement is to record uphole times. We strongly recommend an offset VSP with multiple sources, recorded on downhole receivers at a few key intervals. These data offer an excellent opportunity to establish the location of the drill hole relative to the crater-related structures observed on the offshore seismic data (see Fig. 1). The drill hole is located near the edge of a terrace zone (observed on several offshore reflection lines), where the near-horizontal Mesozoic reflectors are seen to be downthrown to form a series of slumped blocks. These data will be used to place the drill hole at its precise structural location, and enable us to accurately map around the crater, onshore to offshore, for the first time. These data are potentially cheaper and more informative than land seismic reflection data.

STILL TO BE DONE
1) Costing of logging not to be done by GFZ.
2) Decision on whether to rent/buy/loan a winch and logging unit (note that GFZ tools can manage with a 4-conductor cable, Schlumberger require 7).