

# CHICXULUB SEISMIC EXPERIMENT

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**PASSCAL Data Report 99-006**



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## Archiving of Chicxulub controlled source land data

Report for PASSCAL  
Jo Morgan, Imperial College  
12 May 1999

The controlled source part of the Chicxulub seismic experiment was shot in September/October 1996. The marine reflection part of the experiment included ~650 km of seismic reflection profile, along four lines A, A1, B, and C. A map of the approximate location of these lines is attached (Fig1.cdr on disk); exact shot locations are included on a UKOA navigation tape. For the reflection data, a total of ~13,000 shots were fired at a 50 m shot spacing. These shots were recorded on 91 PASSCAL land stations and 33 University of Texas (UTIG) Ocean Bottom Seismometers. Data from the PASSCAL land stations are archived here.

The 91 land stations are located along three profiles: D, E, F (see map). Precise locations of the land stations are included as a hard copy at the end of the report, and also on disk (land.txt). Each land station should have recorded all the marine shots. Some shots will be missing if the station was serviced during acquisition. For each land station we have made 12 shot gathers. There are shot gathers for each reflection line (A, A1, B, and C), and for each of three channels.

Channel 1 is the vertical  
Channel 2 is horizontal north-south (magnetic north)  
Channel 3 is horizontal east-west

The receiver gathers are stored in conventional segy files and given appropriate names. For example

D06-B-ch2-segy.gz

contains shots fired along marine line B, recorded on channel 2 of the land station D06. The data have been zipped using the UNIX command gzip. The sample rate is 100 sps. The record length is 80 s. The storage format is IBM floating point. A copy of the output from the tape dump (tape-dump) is included on disk. There are three tar files on a DLT tape, the first contains data from line F, the second is E, the third is D. To access the second and third file you will need to use the unix command mt to skip to the beginning of these files before running a tar command.

Three land stations lie on more than one land line. These stations were given an identity on each line, but the data have been archived under a single name. The three stations are:

E01/F01 (Archived as E01)  
D23/F07 (Archived as D23)  
D17 /E08 (Archived as D17)

Offsets are not in the segy headers, but the co-ordinates of the shots and receivers (rec\_x, rec\_y, sou\_x and sou\_y) are correct, hence offset can be easily calculated. The source and receivers positions are UTM ZONE=16, co-ordinates and the ellipse used is WGS84.

The shot range in FFID's is:

Chicx-A 987-4694 (in segy header written as 10987-14694)  
Chicx-A1 4630-7889 (in segy header written as 24630-27889)  
Chicx-B 1168-4315 (in segy header written as 31168-34315)  
Chicx-C 3649-840 (in segy header written as 43649-40840)

Receiver gathers were originally made by Hamish Macintyre of Imperial College in November 1996. On return to London we encountered some tape reading errors, hence some gathers are missing from the archive. I enclose a list of the land stations (on disk called passcal-archiveD.xls etc), and have indicated which gathers are missing. Gail Christeson of UTIG will visit PASSCAL and attempt to archive some of these missing gathers over summer 1999.

### **The Chicxulub working group**

A working group was set up to design the Chicxulub seismic experiment. They were:

Jo Morgan, Mike Warner, John Brittan and Hamish Macintyre of Department of Geology, Imperial College, London, UK

Dave Snyder and Richard Hobbs, BIRPS, Bullard Laboratories, University of Cambridge, UK

Gerardo Suarez, Luis Marin and Alberto Trejo of Universidad Nacional Autonoma de Mexico, Mexico DF

Richard Buffler, Gail Christeson and Yosio Nakamura of University Of Texas Institute for Geophysics, Austin, USA

Peter Maguire, Paul Denton and Graeme Mackenzie of University of Leicester, Leicester, UK

Virgil Sharpton of Lunar and Planetary Institute, Houston, Texas, USA (now at University of Fairbanks, Alaska)

Alan Hildebrand and Mark Pilkington of Geological Survey of Canada, Ottawa, Canada (Hildebrand now at University of Calgary)

Antonio Camargo of Petroleos Mexicanos, Villahermosa, Mexico

### **Land acquisition party**

The following researchers assisted with the land recordings:

Jo Morgan, Mike Warner, John Brittan, Hamish Macintyre, Graham Hicks, Eric Forgues, Paul Davies, Pui Leng Tay, Alice Gadney, Geoff Wilson of Department of Geology, Imperial College, London, UK

Marcos Alvarez, Russel Sell, and Arturo Soria of PASSCAL

Peter Maguire, Paul Denton and Graeme Mackenzie of University of Leicester, Leicester, UK

Luis Marin, Alberto Trejo, Francisco Velasquez of Universidad Nacional Autonoma de Mexico, Mexico Df

Alan Hildebrand and Mark Pilkington of Geological Survey of Canada, Ottawa, Canada

Anne Rosinski ERM-west, Inc.

Publications relating to the reflection, wide-angle and earthquake experiment are attached for reference. The land wide-angle data have been worked on by researchers at UTIG in Austin, and Imperial College in London. The earthquake data has been archived separately by Peter Maguire and Paul Denton of Leicester University, England. The BIRPS seismic reflection data is now public and archived in the UK with the British Geological Survey.

## Publications

Brittan, J., Morgan, J. V., Warner, M. R., Marin, L. and the Chicxulub Working Group, 1999, Chicxulub seismic experiment: The first two seconds: Geological Society of America Special Paper 339 (in press).

Christeson, G., Nakamura, Y., Buffler, R., and the Chicxulub Working Group, 1999, Upper crustal structure of the Chicxulub impact crater from wide-angle ocean bottom seismograph data: Geological Society of America Special Paper 339 (in press).

Maguire, P. K. H., Mackenzie, G. D., Denton, P., Trejo, A., Kind, R., and members of the Chicxulub working group, 1998, Preliminary results from a passive array over the Chicxulub impact structure in Mexico: *in* Grady, M. M., Hutchinson, R., McHall, G. J. H., and Rothery, D. A. (eds), *Meteorites: Flux with time and impact effects*, Geological Society, London, Special Publication No. 140, p. 177-193.

Morgan J. V., Warner, M. R., and the Chicxulub Working Group, 1997, Size and morphology of the Chicxulub impact crater: *Nature*, v. 390, p. 472-476.

Morgan, J and Warner, M., 1999, The third dimension of a multi-ring impact basin: *Geology* v. 27, p 407-410.

Morgan, J., Warner, M., and the Chicxulub Working Group, 1999, The Chicxulub seismic experiment: Crater morphology: Geological Society of America Special Paper 339 (in press).

Snyder, D.B. and Hobbs, R.W and the Chicxulub working group, 1999, Deep seismic reflection profiles across the Chicxulub impact crater: Geological Society of America Special Paper 339 (in press).

Snyder, D.B. and Hobbs, R.W and the Chicxulub working group, 1999, Ringed structural zones with deep roots formed by the Chicxulub impact: *Journal of Geophysical Research* (in press).

Chicx-D

	A	A1	B	C	
D00					
D01					
D02					
D03					
D04					
D05					
D06					
D07					
D08					
D09					
D10					
D11	Does not exist				Does not exist
D12					
D13	T.P.	T.P.	No ch 2		Partial data set
D14					
D15	T.P.	T.P.	T.P.	ch 1 only	Partial data set
D16					
D17	not all ch1	No ch 1			Partial data set
D18					
D19					
D20	T.P.	T.P.	T.P.	T.P.	Couldn't read tape
D21			T.P.		Partial data set
D22					
D23	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial data set
D24	T.P.	T.P.	T.P.	T.P.	Couldn't read tape
D25					
D26					
D27	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial data set
D28					
D29					
D30					
D31		T.P.		T.P.	Partial data set
D32	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial data set
D33					
D34					
D35	No ch 2	No ch 2	ch 3 only	ch 3 only	Partial data set
D36					
D37	ch 1 only	ch 1 only	T.P.	ch 1 only	Partial data set
D38					
D38.5					
D39					
D40					
D41					
D42	Does not exist				
D43					
D44					
D45					
D46	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial data set

T.P. Can't read tape

Chicx-E

	A	A1	B	C	
E01	no ch 1				Partial data set
E02					
E03					
E04					
E05					
E06					
E07					
E08	See D17				
E09					
E10					
E11					
E12					
E13					
E14					
E15					
E16					
E17					
E18					
E19					
E20					
E21					
E22					
E23					
E24					
E25					

T.P. Can't read tape

Chicx-F

	A	A1	B	C	T.P. Can't read tape
F01	See E01				
F02	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial dataset only
F03	Doesn't exist				
F04	ch 1 only	ch 1 only	ch 1 only	ch 1 only	Partial dataset only
F05					
F06					
F07	see D23				
F08					
F09					
F10					
F11					
F12					
F13					
F14					
F15					
F16					
F17					
F18					
F19					
F20					
F21					
F22					
F23					
F24	Doesn't exist				
F25					

## Land site locations

Note site D38.5 is final name for extra site between D38 and D39.

station	X	Y	Lon	Lat
D00	179744.53	2326583.49	-90.080628	21.012168
D01	181806.58	2328313.92	-90.061133	21.028139
D02	184001.43	2330451.75	-90.040432	21.047807
D03	186814.59	2331485.10	-90.013581	21.057613
D04	189515.68	2331889.94	-89.987690	21.061725
D05	192457.22	2332988.13	-89.959321	21.072135
D06	194170.00	2332355.00	-89.943031	21.066703
D07	198488.44	2333094.65	-89.901644	21.074093
D08	201230.13	2333559.75	-89.875365	21.078739
D09	204994.39	2333696.62	-89.839195	21.080584
D10	206953.46	2334495.63	-89.820494	21.088109
D12	212654.84	2335730.18	-89.765875	21.100154
D13	214118.97	2336083.39	-89.751853	21.103571
D14	218128.58	2337374.54	-89.713502	21.115846
D15	222271.87	2337771.77	-89.673713	21.120065
D16	226170.51	2339307.91	-89.636456	21.134518
D17	228661.64	2339951.31	-89.612592	21.140697
D18	231654.81	2340753.17	-89.583920	21.148377
D19	234662.77	2341133.98	-89.555037	21.152254
D20	237474.99	2341629.23	-89.528053	21.157131
D21	240174.01	2341535.00	-89.502067	21.156667
D22	242543.60	2342947.16	-89.479477	21.169750
D23	245365.41	2344197.82	-89.452506	21.181436
D24	248462.15	2344400.61	-89.422730	21.183697
D25	252264.42	2345193.79	-89.386247	21.191378
D26	256741.15	2345877.75	-89.343251	21.198156
D27	262439.60	2347893.29	-89.288673	21.217105
D28	264385.79	2347858.50	-89.269930	21.217044
D29	266184.12	2348539.94	-89.252708	21.223428
D30	269729.34	2348729.70	-89.218597	21.225594
D31	273146.51	2349756.21	-89.185828	21.235292
D32	276034.01	2350089.83	-89.158065	21.238662
D33	278601.51	2350648.06	-89.133411	21.244017
D34	281770.98	2351549.30	-89.103001	21.252538
D35	284427.19	2352008.65	-89.077475	21.257003
D36	286877.99	2352861.48	-89.053975	21.264993
D37	290311.94	2353081.96	-89.020923	21.267384
D38	292599.27	2352683.96	-88.998840	21.264053
D38.5	294800.83	2354416.38	-88.977841	21.279947
D39	297030.32	2354070.32	-88.956320	21.277073
D40	298873.80	2354675.92	-88.938631	21.282747
D41	302634.45	2355623.46	-88.902508	21.291717
D43	308333.24	2355628.80	-88.847597	21.292377
D44	310344.28	2356059.82	-88.828267	21.296481

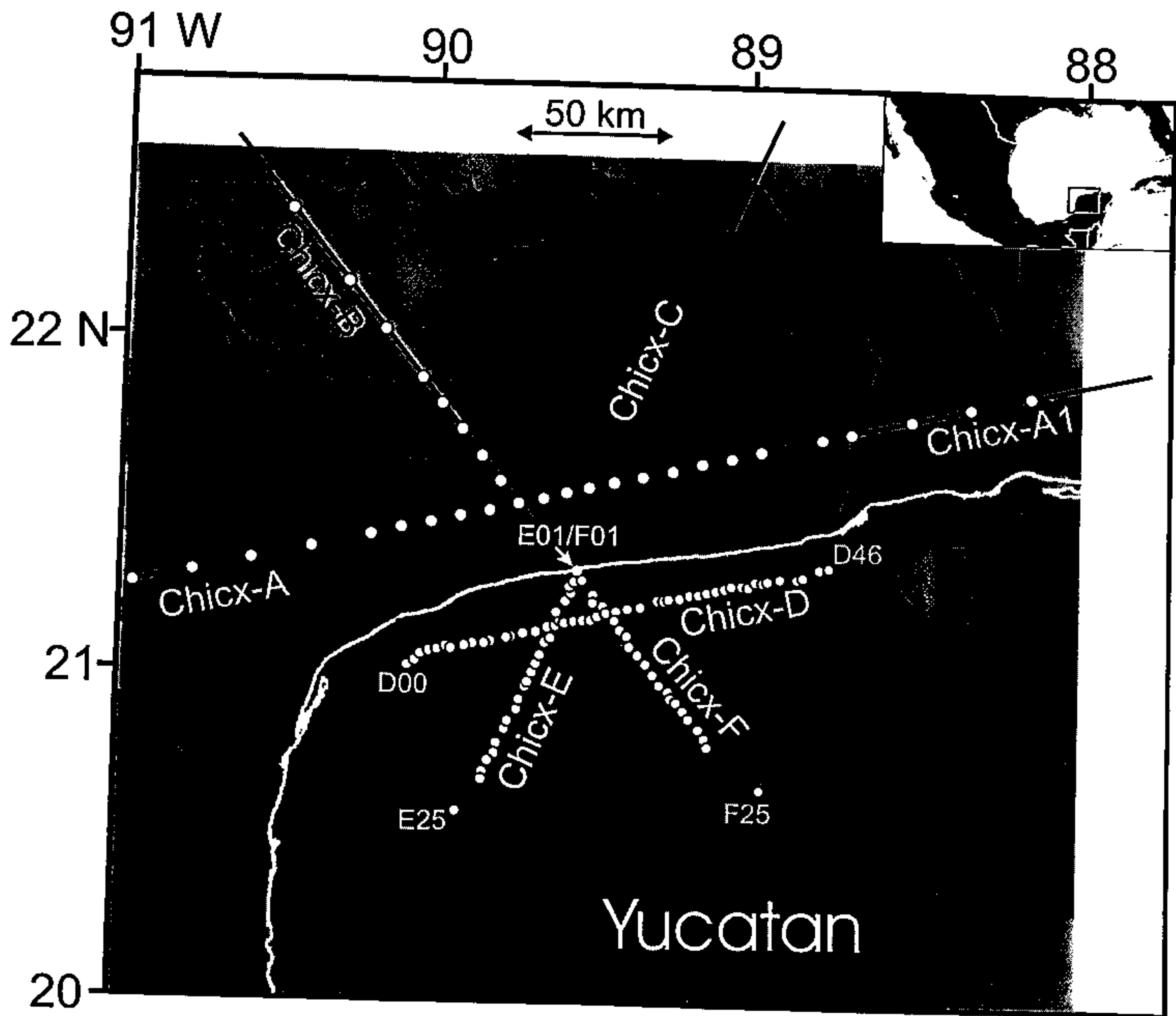


D45 316079.77 2358563.05 -88.773269 21.319679  
D46 318887.44 2359055.21 -88.746261 21.324407

E01 235839.51 2358022.95 -89.546331 21.304872  
E02 234577.67 2354148.98 -89.557880 21.269720  
E03 233340.30 2352525.54 -89.569541 21.254885  
E04 233670.59 2350518.79 -89.566047 21.236820  
E05 232264.63 2348023.01 -89.579191 21.214086  
E06 229147.67 2344167.63 -89.608583 21.178826  
E07 230291.93 2341387.64 -89.597133 21.153903  
E09 227156.37 2335744.58 -89.626405 21.102503  
E10 225237.40 2334104.42 -89.644600 21.087412  
E11 223527.45 2330152.33 -89.660410 21.051484  
E12 222573.72 2327262.59 -89.669115 21.025258  
E13 221036.09 2324481.72 -89.683447 20.999926  
E14 219576.28 2321030.08 -89.696918 20.968551  
E15 218974.14 2319525.22 -89.702460 20.954877  
E16 216498.94 2315228.67 -89.725540 20.915720  
E17 216202.74 2311950.59 -89.727850 20.886088  
E18 213044.64 2308132.25 -89.757550 20.851140  
E19 212159.08 2305653.16 -89.765643 20.828628  
E20 209162.17 2300347.78 -89.793530 20.780280  
E21 208525.04 2297294.56 -89.799136 20.752625  
E22 206418.27 2294983.82 -89.818963 20.731440  
E23 204771.69 2291178.74 -89.834120 20.696840  
E24 204303.25 2289138.15 -89.838270 20.678350  
E25 195859.76 2278048.39 -89.917328 20.576920

F02 237546.92 2354754.77 -89.529380 21.275620  
F04 241116.26 2349918.09 -89.494270 21.232473  
F05 241069.76 2347298.48 -89.494320 21.208820  
F06 244387.57 2346286.82 -89.462230 21.200157  
F08 248316.00 2341310.39 -89.423682 21.155780  
F09 250100.77 2338180.70 -89.406050 21.127772  
F10 252220.31 2336544.55 -89.385420 21.113290  
F11 253276.34 2332644.78 -89.374700 21.078227  
F12 256028.90 2329938.16 -89.347840 21.054160  
F13 258556.37 2326994.66 -89.323120 21.027920  
F14 260743.69 2323625.68 -89.301620 20.997790  
F15 263085.27 2320307.89 -89.278653 20.968138  
F16 265898.68 2318164.95 -89.251320 20.949150  
F17 266896.92 2315581.39 -89.241378 20.925950  
F18 268874.90 2314378.74 -89.222210 20.915340  
F19 270993.52 2311383.54 -89.201457 20.888560  
F20 272571.95 2308847.72 -89.185960 20.865858  
F21 276259.59 2305422.73 -89.150095 20.835382  
F22 277881.05 2302136.68 -89.134103 20.805905  
F23 279003.80 2299552.72 -89.122995 20.782707  
F25 296628.64 2285550.99 -88.952138 20.658272

— Marine reflection lines  
○ Wide-angle receivers



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### **Addendum - Recovery of missing Chicxulub PASSCAL data**

Gail L. Christeson, University of Texas Institute for Geophysics  
30 June 1999

I made a visit to the PASSCAL instrument center at New Mexico Tech the week of June 21, 1999, and with help from the PASSCAL group was able to recover the receiver gathers listed on Table A1. The receiver gathers were written in the same format as in the original processing: record length of 80-s, sample rate 100 sps, co-ordinates of shots and receivers in headers. The receiver gathers were produced separately for each reftek. Locations where more than one reftek was located during the experiment may have more than one file associated with each line (e.g., D22 has both a D22\_6052\_A\_1.segy and a D22\_6119\_A\_1.segy) if the refteks were switched during the shooting of the line. The DAT tape contains the data zipped using the UNIX command gzip and written to tape using the tar command.

**Table A1: Recovery of missing Chicxulub PASSCAL data**

Instrument	Reftek	Comments
D02	6064	Chicx-A - fixed timing problem
D15	6119	Chicx-B - recovered all channels Chicx-C - recovered channels 2,3 Chicx-A, Chicx-A1 - timing problems and missing data on reftek 6088, so these lines could not be recovered.
D17	7433	Chicx-A, Chicx-A1 - recovered channel 1
D20	7338	recovered all lines, all channels
D21	7079	Chicx-B, Chicx-C - recovered all channels
D22	6052, 6119	fixed possible timing problem
D23	6024, 6092	recovered channels 2,3 on all lines
D24	6114, 7100	recovered all lines, all channels Note: There was no second clock fix on reftek 6114, so the 6114 receiver gathers have no drift rate correction.
D27	6088, 7099	recovered channels 2,3 on all lines
D32	6030, 6047	recovered channels 2,3 on all lines
D35	6058,6065	Chicx-A, Chicx-A1 - recovered channel 2 Chicx-B, Chicx-C - recovered channels 1,2 Note: There does not appear to be a clear signal at this location from the shots.
D37	6101, 6108	Chicx-B - recovered all channels Chicx-A, Chicx-A1, Chicx-C - recovered channels 2,3
D46	7429	recovered channels 2,3 on all lines
E01	7365	Chicx-A - recovered channel 1
F02	7428	Note: The reason channels 2&3 are missing is because this reftek only recorded the vertical channel.
F04	6027, 6114	Recovered channels 2,3 on all lines
F11	6127	Chicx-A - recovered missing shots
F18	7450	Chicx-A, Chicx-C - recovered all channels Chicx-A1, Chicx-B - recovered channels 2,3
F25	6103	Chicx-A - recovered missing shots