INDEPTH III

Reflection/Refraction Experiment
Central Tibet

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PASSCAL Data Report 01-001

IRIS DATA
MANAGEMENT
SYSTEM

INDEPTH III reflection/refraction, central Tibet 1998

Project Description

The reflection/refraction (active-source) component of INDEPTH III was carried out to provide new information on the crustal structure of central Tibet. Instruments were provided by PASSCAL and by the GeoForschungsZentrum (GFZ) instrument pool. The 400-km transect ran from the southwest corner of Nam Tso, across the Bangong-Nujiang Suture (BNS), to Longwei Tso (about 80 km north of the town of Shuang Hu). A permanent (one year of teleseismic recording) array of broadband and intermediate-period instruments was deployed at 10-km intervals, with denser (5-km) spacing near the BNS. During shooting, this array was supplemented with 14 short period instruments and a 60-channel Geometrics unit successively deployed at each of 4 locations of dynamite shot groups. Shot groups consisted of (nominally) 40 shots of 50 kg each, in addition to some smaller shots. The array also recorded 11 large (up to 2000 kg) shots which were fired from the ends of the transect, and from the center.

Stations

PASSCAL Broadband stations were equipped with either RefTek 72A-08 of 72A-08/G DAS, 72A-05 4.4 Gb disk subsystems, and Streckeisen STS-2 seismometers. Power at each site was provided by two 60 Ahr gel cell automotive batteries, charged by two solar panels, operating through a V 1.0 Station Power Box. Timing information was provided by RefTek 111A GPS systems (for 72A-08 DAS) or Trimble external GPS antennae (for 72A-08/G DAS). Instruments were deployed in one-meter deep (approx.) vaults, with open-cell foam insulation surrounded by a hard plastic form. Seismometers were placed on granite slabs embedded in concrete oriented to magnetic north (local declination = 1 degree). Data was recorded in two data streams. Stream 1 featured a sample rate of 20 Hz while stream 2 recorded at 100 Hz. Gain was set to 1.

GFZ broadband stations were equipped with RefTek DAS and either Guralp 40T or Guralp 3T seismometers. Intermediate-period stations were equipped with RefTek DAS and intermediate-period seismometers. All GFZ stations were deployed similarly to PASSCAL instruments (vaults, power, timing, etc). The availability of this data to the

Broadband and intermediate-period stations are number sequentially from south to north (00 to 40). Stations labeled with a number followed by 'a' were positioned to the north of the corresponding number, halfway to the next station. (Station 12a is between stations 12 and 13). This naming convention is altered for headers (where the letter 'a' is not allowed). The 'a' is changed to a '1'. Thus station 12a becomes station 121, etc.

Short-period stations were equipped with RefTek DAS, external 1 Gb disk subsystems, and Mark Products L-28 3-component geophones with resonant frequency 4.5 Hz. Timing information was provided by Trimble external GPS antennae. Power was provided by two 50 Ahr automotive batteries operating through a PASSCAL power board. Deployments were of short duration such that the use of solar panels was unnecessary. Geophones were buried approximately 6 inches deep. Data was recorded at 125 Hz with gain of 32. Short period instruments were deployed in three locations, with some overlap between the first two deployments (north of the "southern" shot group, and south of the "middle" shot group). The third deployment was between the "north" and "Shuang Hu" (farther north) shot groups; instruments were left in place for both of these shot groups. Short period instruments were interspersed with instruments in the permanent array to achieve receiver spacing of 1 to 2 km near the shot groups. Stations are numbered with three digit numbers. The first digit refers to the deployment number. The second and third indicate the position of the station relative to the shot group, ascending away from the shots. Thus, station 103 is the fourth short period station away from the southern shot group (north of 100, 101, 102). Some stations from the first deployment were left in place for the second deployment. Thus, station 111 is in the same location as station 207.

Shooting

Shot groups consisted of (nominally) 40 shots of 50 kg each and about 10 smaller (6-kg and 2-kg) shots at 250-m spacing, in line with the seismometer array. 50-kg shots consisted of dynamite at a nominal depth of 20 m below the surface in drilled holes. 6-kg shots were fired in shallower drilled holes. 2-kg shots were fired in hand-dug holes

approximately 1 meter deep. The 2-kg shots were used as refraction test charges for the Geometrics unit and provide little useful signal to the RefTek stations. Shots were fired using Seismic Source Synchronizer System SSS-300 to allow remote firing. The firing pulse was provided by a GPS Master Clock. Shot times in headers and in accompanying files reflect the 600ms delay between trigger pulse ('on the minute') and actual shot time.

Large shots were fired from the ends of the transect and from two shot points in the central transect. These generally consisted of explosive paste in 50-m drill holes (up to three holes per shot) with explosive at least 20 m below the ground surface. Shots were fired directly by an SIE Hi Voltage Blaster shot box, timed by a GPS master clock. Large shots have various delays between nominal trigger time and actual shot time. Variation is due to false triggers, problems with GPS master clocks, etc. Shot times in headers reflect this variation and are thought to be accurate.

All shot locations were determined using hand-held GPS, generally by averaging successive measurements. Elevation values in accompanying spreadsheet are from hand-held GPS measurements. Elevation values in trace headers have been checked against Soviet 1:200,000 topographic maps and are presumed to be more accurate.

Data Processing

Data were converted to PASSCAL SEG-Y format using the utility "ref2segy". Timing corrections have been made using "refrate" and "clockcor". Station locations were determined using a combination of hand-held GPS units and the GPS clocks in the RefTek's. Gathers have been assembled as follows, using a modified version of "segygather" to produce standard SEG-Y output with appropriate information in headers. *Short Period Instruments*: Receiver gathers for each receiver location incorporating any shots (large and small) which occurred during that deployment. Traces are cut with 15.00 seconds "static" before shot time. Total trace length is 120 seconds. Station numbers are used in file names as described above.

Broadband Instruments: Receiver gathers for each receiver location for small shots, and shot gathers for each large shot, including all receivers (broadband and short period). Some traces (short period data of large shots) are in both of two separate gathers. All traces in these two groups of gathers are cut to 120 seconds, including a 14.60-second

"static" before shot time. Station numbers used in file names are described above, with the exception that 'a' is replaced by the numeral '1'. (Station 12a becomes st121 for file naming purposes.)
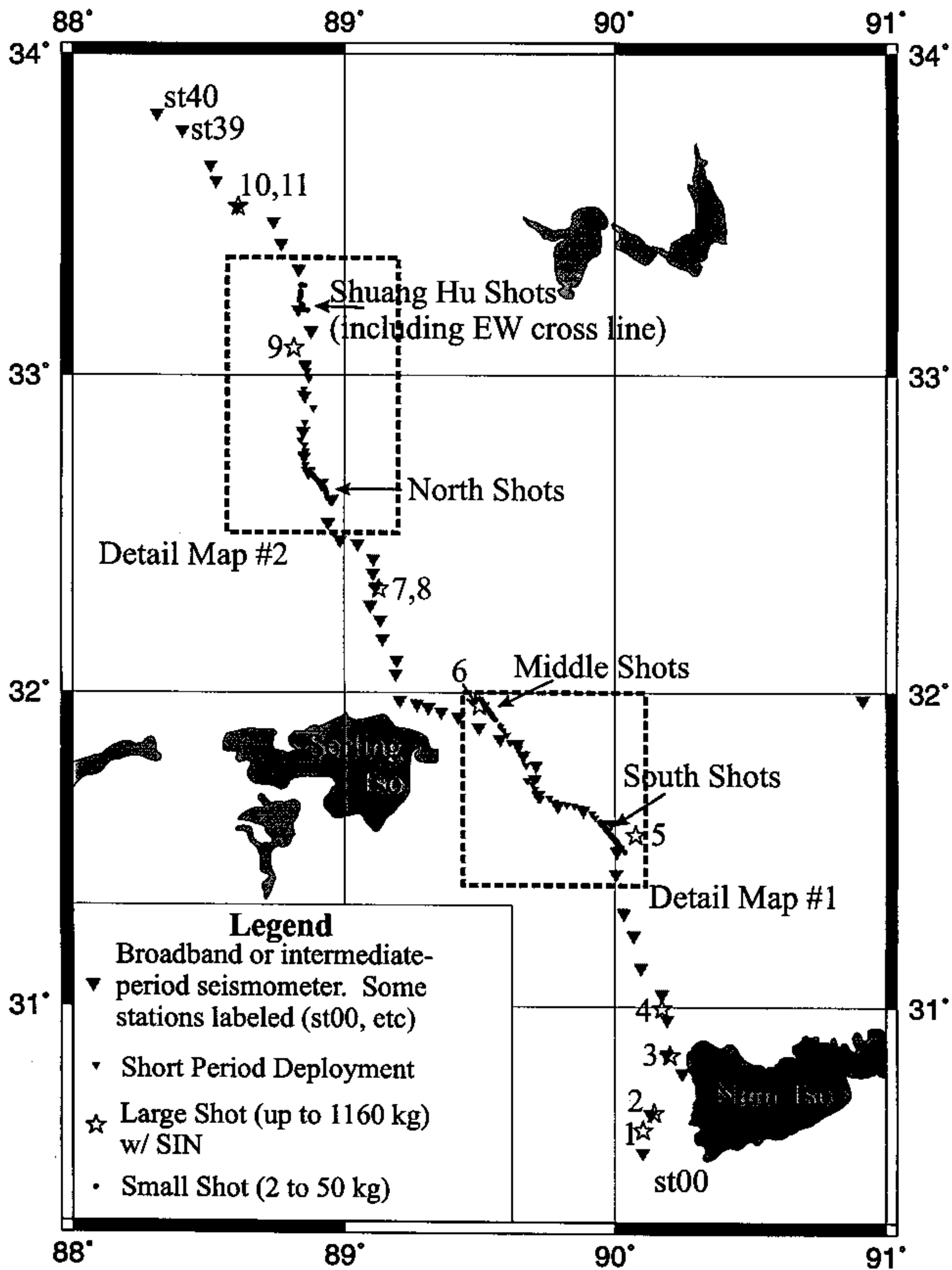
INDEPTH 3
Seismograph Station Locations

Station	LATITUDE deg	min	LONGITUDE deg	min	ALTITUDE m	INSTR	Comments
LUMP	31	53.940	89	55.920		G-40T	
0	30	31.616	90	6.159		STS-2	
1	30	39.047	90	7.992		STS-2	
2	30	47.200	90	14.950	4880	STS-2	Pulled due to flooding
3	30	50.850	90	11.483	4688	STS-2	Pulled due to flooding
4	30	57.567	90	11.550	4824	STS-2	
5	31	2.400	90	10.450	4882	STS-2	
6	31	7.561	90	5.842	5160	STS-2	
7	31	13.682	90	4.175	5070	STS-2	
8	31	17.940	90	1.892		STS-2	
9	31	25.260	90	0.240		40T	BAIN G
10	31	29.563	90	0.489		STS-2	
"				0.467			
11	31	34.883	89	58.846		40T	G
12	31	37.568	89	53.016		STS-2	
12A	31	38.421	89	47.338	4738	SP	
13	31	40.429	89	43.027		STS-2	Gone due to vandalism
13A	31	43.581	89	42.181	4673	40T	
14	31	46.136	89	42.526		STS-2	Gone due to vandalism
14A	31	48.008	89	39.670	4560	SP deployed	
15	31	50.187	89	38.384	4590	STS-2	Intersection
15A	31	51.062	89	34.605	4710	SP deployed	
16	31	53.300	89	29.878	4620	40T	G
16A	31	55.301	89	25.238	4680	SP deployed	damaged batt cable
17	31	56.386	89	21.467	4740	40T	G
"		56.315		21.451			
17A	31	57.160	89	18.660	4794	SP deployed	Pulled due to flooding
18	31	57.920	89	16.160		40T	G
"		57.904		16.172			
18A	31	58.490	89	12.300	4718	SP deployed	Pulled due to flooding
19	32	3.535	89	11.480	4680	STS-2	
19A	32	6.190	89	11.700	4562	SP deployed	
"		6.206		11.704			
20	32	10.173	89	8.536	4560	STS-2	
21	32	13.753	89	8.007		P+SP	
"		13.765		8.044			
21A	32	16.510	89	5.810	4728	SP deployed	
22	32	20.066	89	6.985		STS-2	DOIMA
22A	32	22.621	89	6.291	4543	SP deployed	
"		22.504		5.983			
23	32	25.395	89	6.437		3T	G
23A	32	28.256	89	2.995	4743	SP deployed	

24	32	28.967	88	59.039		STS-2	
25	32	32.225	88	56.416		P+SP	
25A	32	36.707	88	57.205	4955		
26	32	39.746	88	54.909		STS-2	
"		39.643		54.929			
26A	32	41.907	88	51.990	4880		
27	32	44.726	88	51.037		P+SP	
"		44.639		51.026			
28	32	49.389	88	50.901		STS-2	
29	32	56.074	88	51.182		3T	G
30	33	1.840	88	51.252		STS-2	
31	33	8.139	88	52.612		3T	G
old 32	33	12.117	88	49.733	5044	Broken	dismantled
new 32	33	14.558	88	50.132	4984	40T	G SHU
33	33	19.750	88	49.858	4950	STS-2	
"		19.733		49.883			
34	33	24.517	88	45.883	4932	STS-2	
35	33	28.743	88	44.215	5160	STS-2	now locking
"		28.633					
36	33	31.412	88	36.081	5070	STS-2	
"		30.667		36.222			
37	33	36.454	88	31.399	5160	STS-2	
"		32.454		31.367			
38	33	39.349	88	30.258	5040	STS-2	
"		39.233		30.283			
39	33	45.970	88	23.977	5070	STS-2	
"		45.800		24.000			
40	33	48.989	88	18.439	5100	STS-2	
"		48.867		18.350			

Short Period Instrament Locations

station #	DAS	lon	lat	elev	
south deployment					
100	7281	89.9471	31.58455	4742	
101	7623	89.92578	31.60216	4735	
102	7601	89.91576	31.61427	4731	
103	7297	89.8744	31.63268	4718	
104	7316	89.85064	31.63911	4748	
105	7593	89.82339	31.64242	4691	
106	7612	89.79974	31.6475	4666	
107	7284	89.77874	31.65098	4636	
108	7628	89.75772	31.6631	4606	
109	7610	89.72495	31.66312	4599	
110	7277				no data recorded
111	7295	89.6961	31.70834	4555	
112	7596	89.67492	31.72019	4544	
188	7333	90.02354	31.5054	4640	
middle deployment					
200	7297	89.50436	31.97901	4517	
201	7593				no data recorded
202	7316	89.61339	31.84041	4536	
203	7333				no data recorded
204	7281				no data recorded
205	7601	89.6711	31.7684	4502	
206	7623	89.67492	31.72019	4544	
207	7295	89.6961	31.70834	4555	
208	7277				no data recorded
209	7610	89.72495	31.66312	4599	
210	7628	89.75772	31.6631	4606	
211	7284	89.77874	31.65098	4636	
288	7612	89.57852	31.89237	4505	
north deployment					
301	7277				no data recorded
302	7297	88.85468	32.71856	4869	
303	7281	88.85475	32.76164	4864	
304	7593	88.85111	32.77992	4860	
305	7612	88.8377	32.79628	4848	
306	7333	88.85367	32.85258	4816	
307	7316	88.88391	32.89655	4782	
308	7601				no data recorded
309	7628	88.85404	32.92843	4775	
310	7284	88.8498	32.95645	4821	
311	7295	88.86788	32.98855	4854	
312	7623	88.8637	33.01286	4897	
388	7610	89.72503	31.66305	4891	gather not made

INDEPTH III area map

Big Shots

Name	SIN	Size (kg)	# holes	Lat deg min	Lon deg min	Elev	Shot Day	Shot Time GMT hr min:sec	comments
Deqen South	1								
Hole 1		180	2	30 35.959	90 6.192	4878	213	07 00:01	top of charge at 9 m
Hole 2		90		30 35.949	90 6.212	4108	213		top of charge at 9 m
Geophone		90		30 35.946	90 6.235				
Deqen North	2								
		180	1	30 39.374	90 8.674	4867	213	09 00:01	
Geophone				30 39.38	90 8.674				
Baoji South	3								
		966	4	30 50.59	90 12.19		214	04 00:01	
Baoji North	4								
Hole 1		825	3	30 59.55	90 10.476	4835	212	11 00:01	
Hole 2		405		30 59.619	90 10.432				
Hole 3		270							
		150							
Geophone				30 59.561	90 10.502				
Bangoin	5								
		1024	4	31 32.701	90 4.565	4650	209	09 00:01	
1 Ton Middle (Lumpola)	6								
Hole 1		578	2	31 57.479	89 30.039	4555	220	10 59:59.910	2 holes 8 m apart 093 deg
Hole 2		78		31 57.472	89 30.049	4527			
		500		31 57.543	89 30.03	4567			
Geophone									geophone 100 m on 352 deg
Extra A (Doima)	7								
		496	1	32 19.651	89 7.667	4680	229	07 00:01.530	manual fire
Geophone				32 19.593	89 7.766				geophone 96 m (48 kg solid. 400 kg paste. 48 kg solid). bottom at 40 m
Extra B (Doima)	8								
		216	1				229	07 15:03.050	manual fire (all solid explosive. 18 m long) bottom @ 34 m
Geophone									115 meters on 295 deg from Extra A same geophone location as Extra A
1 Ton North (Shuang Hu)	9								
Hole 1		1001	2	33 5.039	88 48.773	4957	225	08 00:01.300	top at 15 m. 72 kg solid. 570 kg paste. 72 kg solid)
		731							

Hole 2	270		33	4.985	88	48.735	4901	manual fire. top at 16 m. all paste
			33	4.987	88	48.757	4895	2 holes 14 m apart on 225 deg
			33	4.996	88	48.76	4888	
Geophone			33	5.052	88	48.787	4814	geophone 95 m on 200 deg
226								11 00:00.930 Manual fire
2 Ton North A	10	4	1160	33	31.513	88	36.378	5122
Hole 1	138							holes separated by 16 m (025 deg). 10 m (165 deg;
Hole 2	504							
Hole 3	408		33	31.509	88	36.362	5164
Hole 4	110		33	31.554	88	36.373	5082
Geophone			33	31.57	88	36.273	5114	geophone 125 m on 325 deg from 504 kg shot
Middle of array			33	31.614	88	36.338	4980
227								00 15:01.520 manual fire
2 Ton North B	11	2	762	33	31.529	88	36.35	5095
Hole 1	588							holes 25 m on 330 deg and 9 m on 025 deg from 504 kg hole above
Hole 2	174							geophone as for 2TNorth A. 125 m on 325 deg

SIN	time (GMT)	size (kg)	# holes	lon	lat	elev	depth	
South Shots (Bangoin)								
6	98:208:02:37:00.000	6	1	90.02500	31.50367	4676	20	
7	98:208:02:22:00.000	6	1	90.02383	31.50550	4676	20	
8	98:208:02:45:00.000	6	1	90.02267	31.50733	4676	20	
9	98:208:02:53:00.000	6	1	90.02100	31.50850	4676	20	
10	98:208:02:59:00.000	6	1	90.02133	31.50817	4650	20	
11	98:208:03:05:00.000	6	1	90.01583	31.51150	4601	20	
12	98:208:03:13:00.000	6	1	90.01433	31.51367	4801	20	
13	98:209:02:40:00.000	6	1	90.01433	31.51367	4801	20	
14	98:208:03:30:00.000	50	1	90.01317	31.51583	4631	20	
15	98:208:03:42:00.000	50	1	90.01183	31.51667	4631	20	
16	98:208:03:55:00.000	50	1	90.01033	31.51867	4631	20	
17	98:208:05:33:00.000	50	1	90.00883	31.52150	4983	20	
18	98:208:05:41:00.000	50	1	90.00800	31.52233	4983	20	
19	98:208:05:50:00.000	50	1	90.00650	31.52683	4936	20	
20	98:208:06:04:00.000	50	1	90.00417	31.52567	4873	20	
21	98:208:06:13:00.000	50	1	90.00217	31.52783	4873	20	
22	98:208:06:22:00.000	50	1	90.00050	31.52967	4873	20	
23	98:208:06:54:00.000	30	1	89.99917	31.53167	4732	20	partial misfire
24	98:208:07:25:00.000	50	1	89.99667	31.53367	4704	20	
25	98:208:07:32:00.000	46	1	89.99550	31.53500	4709	20	partial misfire
26	98:208:07:51:00.000	48	1	89.99367	31.53700	4709	20	partial misfire
27	98:208:08:02:00.000	50	1	89.99200	31.53850	4674	20	
28	98:208:08:10:00.000	50	1	89.99100	31.54017	4742	20	
29	98:208:08:26:00.000	50	1	89.98900	31.54167	4796	20	
30	98:208:08:35:00.000	50	1	89.98683	31.54367	4796	20	
31	98:208:08:52:00.000	50	1	89.98333	31.54300	4764	20	
32	98:208:09:03:00.000	50	1	89.98517	31.54800	4722	20	
33	98:208:09:13:00.000	50?	1	89.98183	31.54933	4799	20	partial misfire
34	98:208:09:27:00.000	50	1	89.98000	31.55017	4732	20	
35	98:208:09:37:00.000	50	1	89.97817	31.55217	4759	20	
36	98:208:09:44:00.000	50	1	89.97617	31.55383	4764	20	
37	98:208:09:52:00.000	50	1	89.97533	31.55600	4764	20	
38	98:208:10:01:00.000	50	1	89.97333	31.55717	4764	20	
39	98:208:10:10:00.000	50	1	89.97117	31.55883	4764	20	
40	98:208:10:20:00.000	50	1	89.97100	31.56117	4764	20	
41	98:208:10:30:00.000	50	1	89.96867	31.56183	4764	20	
42	98:208:10:39:00.000	50	1	89.96650	31.56450	4764	20	
43	98:208:10:49:00.000	50	1	89.96583	31.56583	4764	20	
44	98:208:10:56:00.000	50	1	89.96283	31.56583	4764	20	
45	98:208:11:05:00.000	50	1	89.96217	31.57150	4764	20	
46	98:208:11:13:00.000	50	1	89.96050	31.57200	4764	20	
47	98:208:11:20:00.000	50	1	89.95817	31.57750	4764	20	
48	98:208:11:26:00.000	50	1	89.95817	31.57833	4764	20	
49	98:209:03:27:00.000	50	1	89.95550	31.57650	4792	20	
50	98:209:03:45:00.000	50	1	89.95383	31.57833	4792	20	
51	98:209:04:00:00.000	50	1	89.95200	31.58000	4792	20	
52	98:209:04:12:00.000	50	2	89.94967	31.58100	4792	20	
53	98:209:04:25:00.000	50	1	89.94850	31.58283	4600	20	

54	98:209:10:17:00.000	50	1	89.94500	31.58767	4709	20	
55	98:209:01:46:00.000	2	1	90.02383	31.50550	4764	20	
56	98:209:02:09:00.000	2	1	90.03650	31.49150	4601	20	

Middle Shots (Lumpola)

61	98:218:09:36:00.000	50	1	89.56058	31.91365	4560	20	
62	98:218:09:18:00.000	50	1	89.55907	31.91550	4560	20	
63	98:218:06:36:00.000	50	2	89.55763	31.91695	4560	20	
64	98:218:06:22:00.000	50	2	89.55630	31.91910	4650	20	
65	98:218:06:09:00.000	50	2	89.55382	31.92005	4650	20	
66	98:218:05:53:00.000	50	2	89.55200	31.92168	4710	20	
67	98:218:05:44:00.000	50	1	89.55070	31.92373	4560	20	
68	98:218:05:35:00.000	50	1	89.54893	31.92618	4560	20	
69	98:218:05:28:00.000	50	1	89.54767	31.92695	4590	20	
70	98:218:05:05:00.000	50	1	89.54653	31.92948	4590	20	
71	98:218:04:58:00.000	50	1	89.54392	31.93153	4500	20	
72	98:218:04:48:00.000	50	1	89.54307	31.93323	4620	20	
73	98:217:11:25:00.000	50	1	89.54162	31.93500	4620	20	
74	98:217:11:17:00.000	50	1	89.53977	31.93673	4590	20	shallow hole
75	98:217:11:09:00.000	50	1	89.53808	31.93802	4590	20	
76	98:217:10:59:00.000	50	1	89.53727	31.94043	4260	20	
77	98:217:10:47:00.000	50	1	89.53515	31.94238	4500	20	
78	98:218:04:35:00.000	50	1	89.53432	31.94348	4620	20	
79	98:217:10:32:00.000	50	1	89.53183	31.94518	4650	20	
80	98:217:10:21:00.000	50	1	89.53070	31.94667	4650	20	
81	98:217:10:13:00.000	50	1	89.52882	31.94913	4665	20	
82	98:217:10:04:00.000	50	1	89.52682	31.95247	4680	20	
83	98:217:09:54:00.000	50	1	89.52568	31.95282	4380	20	
84	98:217:09:46:00.000	50	1	89.52248	31.95390	4380	20	
85	98:217:09:38:00.000	50	1	89.52180	31.95620	4400	20	
86	98:217:09:27:00.000	50	1	89.52132	31.95953	4400	20	
87	98:217:09:17:00.000	50	1	89.51935	31.96055	4770	20	
88	98:217:08:50:00.000	50	1	89.51825	31.96242	4590	20	
89	98:218:09:59:00.000	50	1	89.51590	31.96290	4590	20	
90	98:218:10:05:00.000	50	1	89.51548	31.96702	4650	20	
91	98:218:10:15:00.000	50	1	89.51417	31.96897	4650	20	
92	98:218:10:21:00.000	50	1	89.51273	31.96948	4650	20	
93	98:218:10:27:00.000	50	1	89.51140	31.97072	4560	20	
94	98:218:10:36:00.000	50	1	89.51045	31.97400	4560	20	
95	98:218:10:41:00.000	50	1	89.50927	31.97532	4500	20	
96	98:218:10:47:00.000	50	1	89.50733	31.97773	4410	20	
97	98:218:10:52:00.000	50	1	89.50473	31.97808	4530	20	
99	98:218:08:56:00.000	6	1	89.57738	31.89543	4530	20	
100	98:218:08:48:00.000	6	1	89.57892	31.89227	4541	20	
102	98:218:08:23:00.000	2	1	89.59017	31.88015	4541	20	

North Shots (north of Doi Ma)

105	98:223:07:53:00.000	50	2	88.93475	32.62672	4890	20	
107	98:223:06:49:00.000	50	2	88.93410	32.62928	4950	20	
108	98:223:06:40:00.000	50	2	88.93263	32.63128	4830	20	
109	98:223:06:26:00.000	50	2	88.93275	32.63395	4950	20	

110	98:223:06:14:00.000	50	1	88.93150	32.63603	4770	20	
111	98:223:04:29:00.000	50	2	88.93137	32.63723	4860	20	
112	98:223:04:21:00.000	12	1	88.93025	32.63990	5070	20	
113	98:223:04:07:00.000	50	1	88.92702	32.64970	4800	20	
114	98:223:03:49:00.000	50	1	88.91200	32.66200	4890	20	
115	98:223:03:37:00.000	50	1	88.91002	32.66195	4830	20	
116	98:221:09:46:00.000	50	1	88.90837	32.66547	4980	20	
117	98:222:04:04:00.000	50	1	88.90757	32.66565	4830	20	
118	98:222:04:23:00.000	50	2	88.90437	32.66780	4920	20	
119	98:222:04:36:00.000	50	1	88.90213	32.66987	4830	20	
120	98:222:04:44:00.000	50	1	88.90153	32.67155	4920	20	
121	98:222:04:50:00.000	50	1	88.89938	32.67338	4860	20	
122	98:222:04:56:00.000	50	1	88.89643	32.67412	4590	20	
123	98:222:05:05:00.000	50	1	88.89407	32.67593	4860	20	
124	98:222:05:13:00.000	50	1	88.89303	32.67757	5130	20	
125	98:222:05:23:00.000	50	1	88.89097	32.67932	4890	20	
126	98:222:06:10:00.000	50	1	88.88970	32.68097	4710	20	
127	98:222:06:20:00.000	50	1	88.88842	32.68248	4830	20	
128	98:222:06:30:00.000	50	1	88.88635	32.68390	4980	20	
129	98:222:06:37:00.000	50	2	88.88460	32.68605	4860	20	
130	98:222:06:42:00.000	50	1	88.88273	32.68765	4950	20	
131	98:223:02:14:00.000	50	1	88.88067	32.68892	4860	20	
132	98:223:02:31:00.000	50	1	88.87905	32.69077	4890	20	
133	98:223:02:40:00.000	50	1	88.87517	32.69265	4830	20	
134	98:223:02:50:00.000	50	2	88.87485	32.69410	4920	20	
135	98:223:03:04:00.000	50	4	88.87345	32.69552	4920	20	
136	98:223:08:01:00.000	50	2	88.93450	32.62367	4864	20	
137	98:223:08:12:00.000	50	1	88.93450	32.53683	5217	20	
138	98:223:08:20:00.000	20	3	88.93683	32.61983	4832	20	partial misfire
139	98:223:08:33:00.000	50	3	88.93750	32.61733	4705	20	
140	98:223:08:38:00.000	0	1	88.93867	32.61533	4858	20	misfire
142	98:223:08:54:00.000	2	1	88.93933	32.61333	4799	20	
143	98:223:09:20:00.000	2	1	88.95133	32.60017	4872	20	

Shuang Hu Shots

145	98:228:03:30:00.000	50	2	88.83933	33.24517	4999	20	
146	98:228:03:47:00.000	50	2	88.83517	33.23717	4951	20	
147	98:228:04:01:00.000	50	2	88.83350	33.23200	4983	20	
148	98:228:04:12:00.000	50	1	88.84217	33.21850	4813	20	
149	98:228:04:20:00.000	50	1	88.84300	33.21767	5186	20	
150	98:228:04:26:00.000	50	1	88.84667	33.21317	4842	20	
151	98:228:04:34:00.000	50	1	88.84667	33.21317	4842	20	
152	98:228:04:40:00.000	50	1	88.85100	33.20133	4917	20	
153	98:228:04:49:00.000	50	1	88.86433	33.20067	5307	20	
154	98:228:11:13:00.000	50	2	88.85200	33.27800	4923	20	E-W cross line
155	98:228:02:46:00.000	6	1	88.83733	33.25983	5006	20	
156	98:228:02:55:00.000	6	1	88.83733	33.25800	4863	20	
157	98:228:03:01:00.000	6	1	88.83750	33.25517	4870	20	
158	98:228:03:07:00.000	6	1	88.83733	33.25400	4894	20	
159	98:228:03:13:00.000	6	1	88.83717	33.25100	5033	20	
160	98:228:03:19:00.000	6	1	88.83750	33.24917	4941	20	

161	98:228:03:23:00.000	6	1	88.83767	33.24683	4929	20	
162	98:228:10:57:00.000	6	1	88.83867	33.27933	4969	20	E-W cross line
163	98:228:11:00:00.000	6	1	88.84200	33.27933	4942	20	E-W cross line
164	98:228:11:03:00.000	6	1	88.84350	33.27917	5044	20	E-W cross line
165	98:228:11:06:00.000	6	1	88.84617	33.27867	4963	20	E-W cross line
166	98:228:11:09:00.000	6	1	88.85017	33.27800	5144	20	E-W cross line
169	98:228:05:58:00.000	2	1	88.93933	32.61333	4799	20	
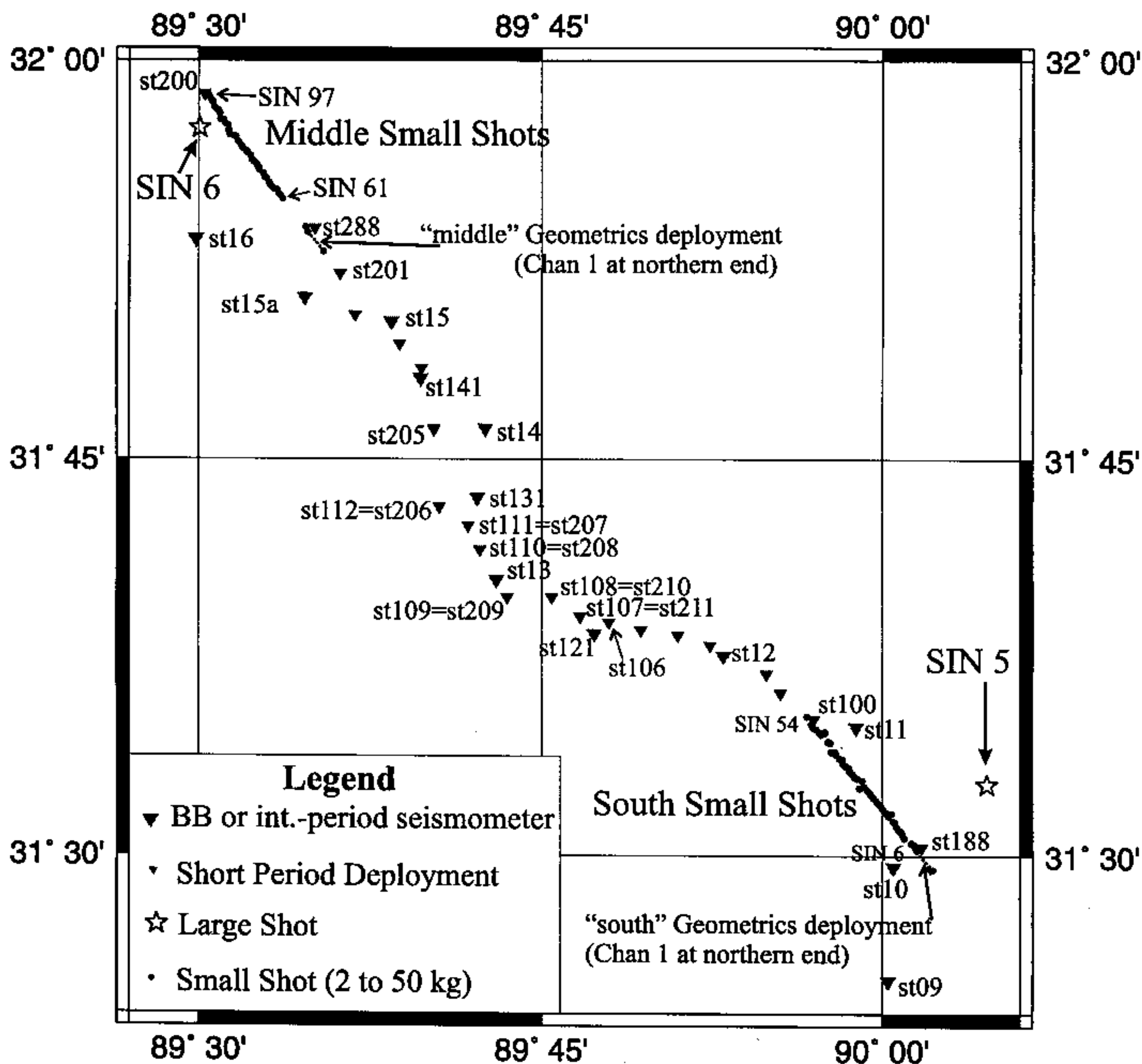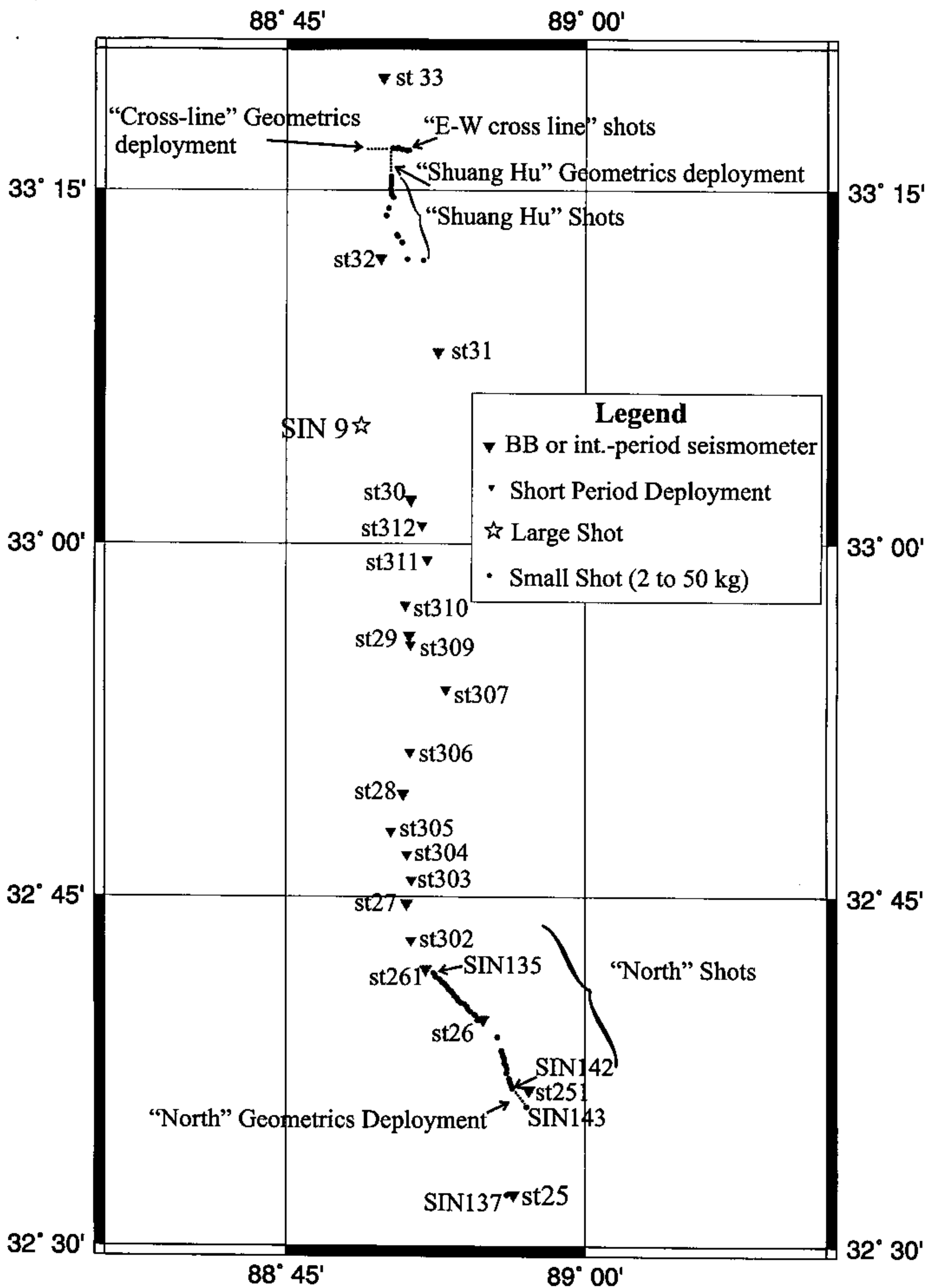
Format Description

1. Data in SAC format are stored on 8mm data cartridge as a Tar archive into two directories: 'records_94' and 'records_96'.

Description of directory structure:

- records_94/DATA_SAC/Julian_Day/Station_code-component.sac

  Example: records_94/DATA_SAC/235/7060-1.sac

- records_96/Julian_Day/Station_name/Year. Julian_Day
  .hour.min.sec.station_code.component.sac

  Example: records_96/217/An13/96.217.13.23.01.7287.3.sac