MENA

MENDOCINO TRIPLE JUNCTION ARRAY EXPERIMENT

Submitted By

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PASSCAL Data Report 96-008

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Array data for the 1994 Mendocino Triple Junction Seismic Experiment

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The fundamental problem addressed by this project is to understand the interactions of tectonic plates at triple junctions (Fig. 1). Our data are providing an unprecedented image of the plate geometry in the region of the Mendocino triple junction (MTJ), California, by mapping the Pacific and Gorda plate offshore and beneath the North American continent.

In June, 1994, 27 3-component IRIS/PASSCAL RefTeks-07G were deployed in a rhomboid grid with nominal instrument spacing of 15 km (Fig. 1). This was a piggyback, or add-on, experiment to a funded NSF Continental Dynamics Mendocino Triple Junction Project (acquisition of 2-D seismics). Approximately 1800 km of MCS data were recorded with airgun shots (8,400 cu. in.) every 50 m (~36,000 shots). The UNOLS vessel R/V Ewing was used for the MCS acquisition and provided us with shot times. Each of our instrument sites was equipped with a 3-component RefTek with a 1 gigabyte internal drive. However, due to our need to continuously record for 15 days and previous experience recording shear-wave data on Franciscan rocks, we only recorded vertical component data. Each instruments was equipped with GPS-receivers affording accurate timing and locations.

Data reduction and archival
Each instrument recorded approximately 800 Mb of data, of which around 600 Mb was actual airgun shots (over 16 Gb of data) totaling 459 receiver gathers (17 ship tracks x 27 receivers) of approximately 2000 traces each. These data are corrected for timing problems that occurred due to occasional loss of GPS lock. Once timing is corrected, the shots are identified and the associated data removed from tape, binned into receiver gathers, and recorded to tape in SEGY format with proper header information.

All geometry information is stored in standard SEGY locations with the following additions/exceptions:

TABLE 1: Non-standard SEGY header locations

Header word	format	location
sou_sloc	4I	181
rec_sloc	4I	185
rec_x (utm)	4I	197†
rec_y (utm)	4I	201†
sou_x (utm)	4I	205†
sou_y (utm)	4I	209†

† also in standard locations + 10

Site location number	*DAS number*	*Longitude (degrees W)*	*Latitude (degree N)*	*Elevation (m)*	*Instrument start time (julday:hr)*	*Instrument stop time (julday:hr)*	*Source of timing**	*Source of location†*
4	7281	123.669500	39.666800	473.66	158:07	174:16	gps	map
5	7282	123.456923	39.688600	737.62	164:18	174:15	gps	gps
8	7296	123.480585	39.862269	926.59	158:07	174:17	gps	gps
9	7287	123.964154	39.971198	441.96	158:07	174:20	gps	gps
10	7293	123.715375	39.953334	661.42	158:07	175:01	gps	gps
13	7304	123.848018	40.054898	152.40	158:07	173:21	gps	gps
14	7279	123.629125	40.077584	335.28	158:07	173:20	gps	gps
15	7306	123.413418	40.102291	886.97	158:07	173:18	pls/gps	gps
16	7280	124.083912	40.125973	893.06	158:07	174:18	gps	gps
17	7286	123.895574	40.209602	146.30	166:18	174:22	gps	gps
18	7291	123.704200	40.190200	993.65	158:07	173:21	gps	map
19	7301	123.527479	40.198104	469.39	158:07	173:18	gps	gps
20	7298	124.349447	40.270775	283.46	158:07	174:16	gps	gps
21	7284	124.054505	40.285307	829.06	158:07	174:15	gps	gps
22	7277	123.881979	40.340445	48.77	158:07	174:21	pls/gps	gps
23	7303	123.667925	40.328842	371.86	158:07	173:21	gps	gps
24	7295	123.435093	40.357259	902.21	158:07	173:16	gps	gps
25	7305	124.120753	40.417475	963.17	158:07	175:16	gps	gps
26	7302	124.291502	40.372568	280.42	158:07	174:16	gps	gps
27	7289	123.768780	40.433552	377.95	158:07	173:20	gps	gps
28	7283	123.594400	40.474100	1002.79	158:07	173:16	gps	map
29	7300	124.294436	40.497683	751.03	158:07	173:16	gps	gps
30	7285	124.102585	40.517473	256.03	158:21	175:18	pls/gps	gps
31	7290	123.907761	40.549152	762.00	158:07	173:21	gps	gps
33	7297	124.240810	40.675723	91.44	158:07	173:16	gps	gps
34	7278	124.066873	40.665613	207.26	158:07	173:15	gps	gps

*gps: gps clock locked hourly during deployment; pls: external pulse used during occasional gps outage.

†gps: location determined from gps readings; map: location digitized from 1:24000 map.

	Number added to FFID to create unique source numbers	*Traces in receiver gather*	*Last-trace tape-sequence number for receiver gather*
mcs-1b equals shot sequences:	10000	1439	1439
mcs-1c equals shot sequences:	20000	627	2066
wa-1 equals shot sequences:	30000	747	2813
mcs-11 equals shot sequences:	40000	755	3568
mcs-10a equals shot sequences:	50000	768	4336
mcs-2 equals shot sequences:	60000	1904	6240
mcs-10 equals shot sequences:	70000	1167	7407
mcs-7 equals shot sequences:	80000	436	7843
mcs-7a equals shot sequences:	90000	3353	11196
er-bna equals shot sequences:	100000	1014	12210
mcs-12 equals shot sequences:	110000	1224	13434
mcs-3 equals shot sequences:	120000	4124	17558
mcs-4 equals shot sequences:	130000	1325	18883
mcs-5 equals shot sequences:	140000	1511	20394
mcs-8 equals shot sequences:	150000	1808	22202
er-ana equals shot sequences:	160000	1791	23993
wa-6a equals shot sequences:	170000	952	24945
mcs-6a equals shot sequences:	180000	2469	27414
er-as equals shot sequences:	190000	2103	29517
rand-1 equals shot sequences:	200000	237	29754
er-bs equals shot sequences:	210000	2988	32742
mcs-7b equals shot sequences:	220000	473	33215
mcs-13 equals shot sequences:	230000	819	34034
mcs-14 equals shot sequences:	240000	1816	35850

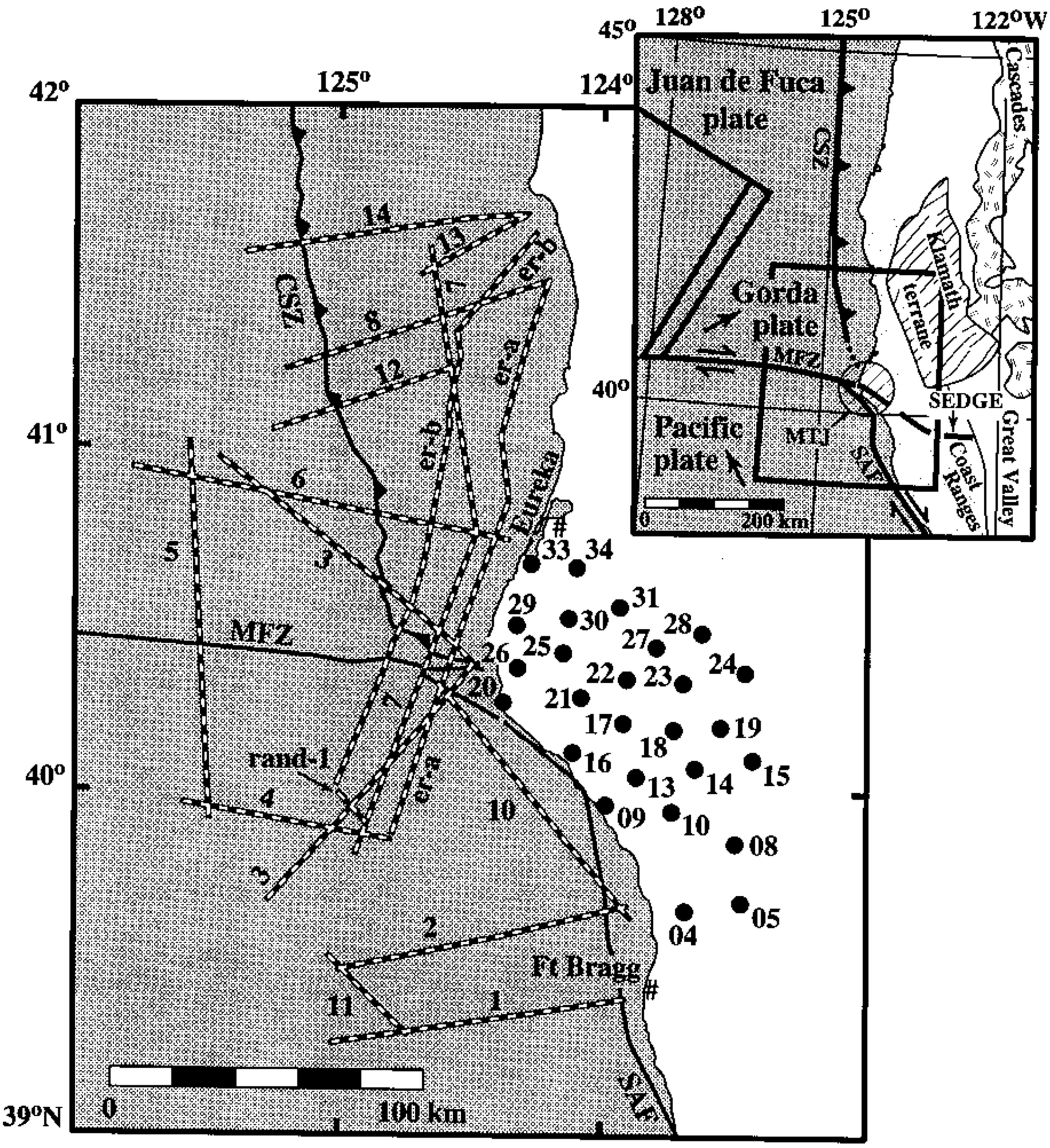

Fig. 1 Location of our seismic array designed to image the lithosphere in the vicintity of the Mendocino triple junction. Solid circles denote location of the seismic stations. Dashed lines denote ship tracks with airgun shots every 50 m. Inset map shows plate geometry and motion (large arrows) relative to North America. Abbreviations: CSZ, Cascadia subduction zone; MFZ, Mendocino fracture zone; MTJ, Mendocino triple junction; SAF, San Andreas fault; SEDGE, projected southern edge of the Gorda slab.