The Bahía earthquake is the strongest seismic event occurred in Ecuador during last 19 years. It was recorded by short-period seismographs of the NNS and numerous broad-band stations of the IRIS network. This data set allows a quantitative analysis of the rupture process.

LOCAL DATA

The NNS is operating since 1987. The network consists of 35 1Hz, telemetric stations. Seven of them are located in the coastal area. It allows to record and locate seismic events with magnitudes larger than 3.8. The seismic activity in the region surrounding the epicentral area of the Bahía earthquake is shown in Figure 2. It can be seen that an important number of small earthquakes occurred from May to July 1998 just south to the epicentral zone of the august 4 earthquake. During August–December 1998, 800 aftershocks were recorded by permanent stations of the NNS and two portable seismographs installed in the region of Bahía. Filled circles in Figure 2 show 30 best located aftershocks. It gives us possible limits of the area ruptured by the Bahía earthquake. Large ellipses in Figure 2 show rupture areas estimated for three large earthquakes close to the Ecuadorian coast during last 50 years. It can be seen that the aftershocks of the 1998 Bahía earthquake are located in the southern segment of the zone ruptured by the 1942 earthquake. Therefore, the northern segment remains probably loaded and next large coastal earthquake can be expected in this region. Comparing the affected zones by large events of 1942,1958 and 1979 (Kanamori and McNally, 1982; Mendoza and Dewey, 1985; Swenson and Beck, 1996) is easy to see that there is a zone of relatively quiescence (Figure 2).

TELESEISMIC INVERSION

We used the algorithm proposed by Nábělek (1984) in order to estimate the source mechanism and rupture duration. This method is based on the inversion of teleseismic P and SH waves. We used broadband records of the 19 IRIS stations (Table 1) with epicentral distance lying between 30° and 90°. Original velocity records (LHZ, LHN, and LHE channels) were rotated to the great circle path and integrated to the ground displacement. Time windows of ~50s containing direct P and S waves were selected for the inversion. The results are presented in Figure 3. The obtained fault orientation (ϕ=9, δ=14.5, λ=110) is close to this reported by Harvard. Source mechanism corresponds to a subduction thrust earthquake with a weak dipping angle. Very similar mechanisms were reported for previous strong earthquakes occurred in the Ecuadorian coast region. We have also tried to invert details of the source time function using the broad band records of P waves (BHZ channels, 20 samples per second). However, our tests have shown that source complexity cannot be resolved. Visual analysis of seismograms shows certain directivity toward the north-west.

CONCLUSIONS

The Ecuadorian coast was affected by large thrust earthquakes and now with the local monitoring it is possible to locate and follow the small and medium seismic activity which may be precursor of a great earthquakes. The event of august 4, 1998 is a shallow thrust earthquake with an energy release of 10 s. The source mechanism obtained is consistent with what we know about the subduction in front of the coast and with other large events in the zone. The seismic moment (2.92e26 dyn-cm) differs in a range of 45% this is accepted if we consider that the present analysis was made with the P and SH waves and not with surface waves as Harvard do. This event affected the southern part of the 1942 rupture zone and it is possible to expect other large event in the near future.

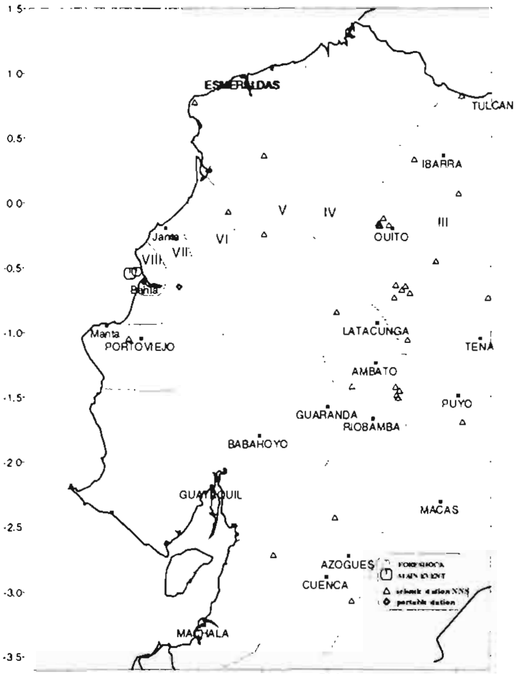
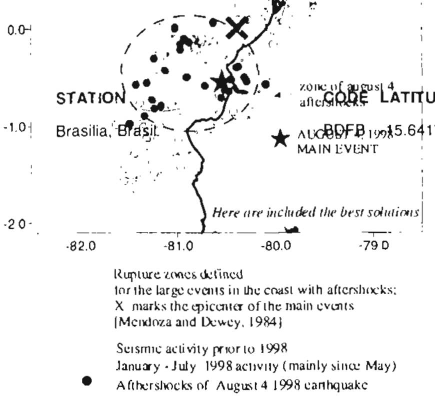


Figure 1. Epicentral locations of the foreshock and main event and isosists map. Stations, cities and main villages are included.



STATION	CODE	LATITUDE	LONGITUDE
Brasilia, Brasil	BDFB	-15.64176	-48.01478

Figure 2. Relation between the past events and the instumental seismicitu

Cathedral Cave, Missouri, EU	CCM	38.0557	-91.2446
Standing Stone, Pennsylvania, EU	SSPA	40.6401	-77.8914
Paso Flores, Argentina	PLCA	-40.73277	-70.55083
Alburquerque, New Mexico, EU	ANMO	34.9462	-106.4567
Harvard, Massachusetts, EU	HRV	42.506	-71.558
Tucson, Arizona, EU	TUC	32.3096	-110.7846
Columbia College, California, EU	CMB	38.035	-120.385
Mount Kent, East Falkland Is.	EFI	-51.6753	-58.0637
Flin Flon, Canada	FFC	54.725	-101.9783
Corvallis, Oregon, EU	COR	44.5857	-123.3032
Butt Crater, Ascension Is.	ASCN	-7.9397	-14.3601
Dimbokro, Costa de Marfil	DBIC	6.67016	-4.8565
San Pablo, España	PAB	39.5458	-4.3883
Hawaii, Kipapa, EU	KIP	21.4233	-158.015
Kodiak Is., Alaska, EU	KDAK	57.7828	-152.5835
Eskdalemuir, Scottland, UK	ESK	55.3167	-3.205
College Outpost, Alaska, EU	COLA	64.8738	-147.8511

Table 1. Seismic stations used in the present analysis

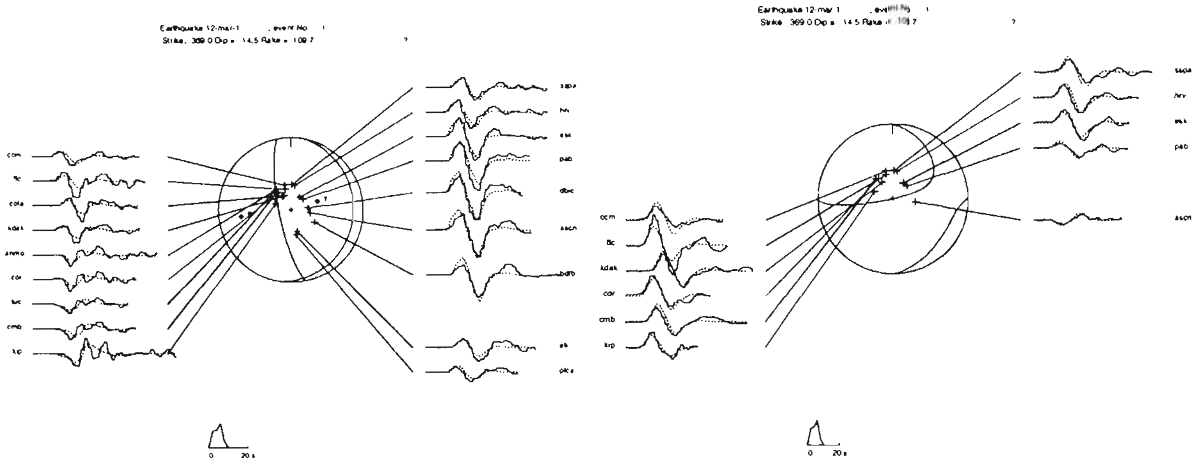


Figure 3. Comparison between the observed (solid lines) and theoretical seismograms (dashes lines) for the best fit model obtained by the simultaneous inversion of P and SH waves.

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ACKNOWLEDGMENTS

The work performed in the Laboratorio de Geofísica in the UNAM, Mexico was supported by IRD-Quito.