4. TECTONICS AND STRESS STATE OF CUKUROVA BASIN

4.1 Tectonics

The Çukurova Basin is bounded by Ecemiş fault in west and Yumurtalık Karataş fault in the east. Ecemiş fault, belonging to Central Anatolian Fault System (CAFS), is a left lateral strike-slip and its strike is along the NE-SW direction (Figure 4.1). Figure 4.2 shows a view of Ecemiş fault at Çiftehan town where it crosses with Tuz Gölü fault of the CAFS. Although this fault is presumed to be an active fault, there is no large event along this fault in written records. The most recent event (M_s=5.3) took place on this fault is located at Kayseri-Develi on Feb. 21, 1940, killing 37 people. The strike of Yumurtalık-Karataş fault is parallel to Ecemiş fault and it is one of southern splays of East Anatolian Fault Zone extending towards the Cyprus. Between these two faults, Çiçekli-Göksu fault zone exists. The Misis-Ceyhan fault, which caused the earthquake, is presumed to be a segment of this fault zone.

Kozlu (1987) states that this fault was initially the front of the Yumurtalık thrust and had developed during the Lower Miosen, and later was transformed into a left-lateral strike-slip fault in the Upper Eocene and Lower Oligocene. this fault is observed on the western side of Cebelinur Mountain (Figure 4.3). All these fault segments are known to be left-lateral strike slip faults. Any movement along these faults results in compressive strain in the direction of N-S and extension strain in the direction of the E-W in view of its strike (Figure 4.4). Therefore, it is very likely to see secondary normal faults along these mountains. Figure 4.5 shows a normal fault scarp behind the Nacarli village on the western side of Cebelinur Mountain.

Yumurtalik thrust is presumed to have taken place before the upper Pliocene according to Kozlu (1987). Harami, Cebelinur and Dede Mountains are assumed to be the products of Yumurtalık thrust. This thrust has a NE-SW strike.

The authors measured some existing fault scarps at the east of Nacarlı village, Mutlu castle and near Çokçapınar village in limestone units (Figure 4.6). The strikes of these faults are shown in Figure 4.7. The strike of one of the fault scarps observed near Çokçapınar village is almost the same as that of fault planes obtained from the solutions by USGS, HARVARD and EMSC as shown in Figure 6.3.

Figure 4.1 Active fault systems in Çukurova Basin

Figure 4.2 A view of Ecemiş fault at Çiftehan town where it crosses Tuz Gölü fault

Figure 4.3 A view of the Misis-Ceyhan fault

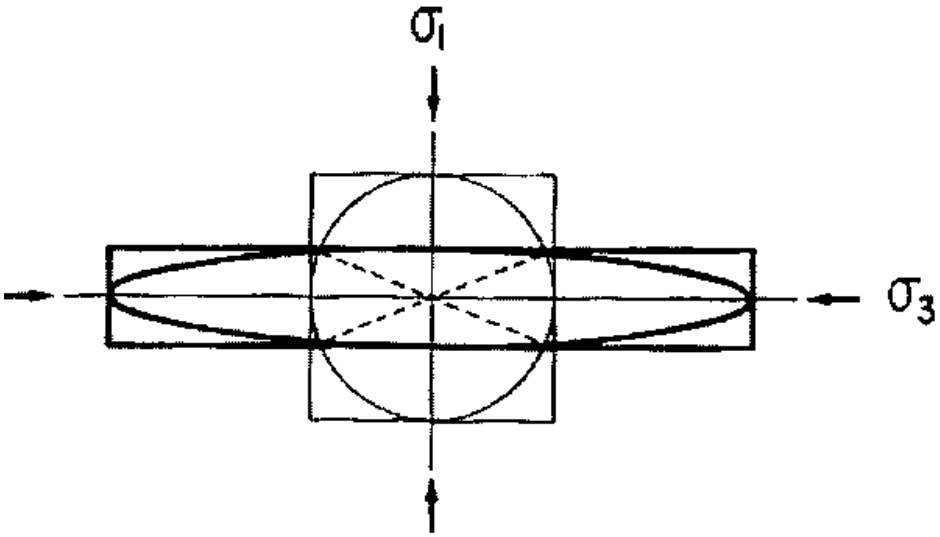

Figure 4.4 Strain elipsoid for Çukurova Basin

Figure 4.5 A view of a normal fault scarp behind the Nacarlı village on the western side of Cebelinur Mountain

(a) Fault striation near Çokçapınar

(b) Mutlu castle

(c) Fault near Tumlu castle

Figure 4.6 Views of fault scarps near Çokçapınar village, Mutlu and Tumlu castle

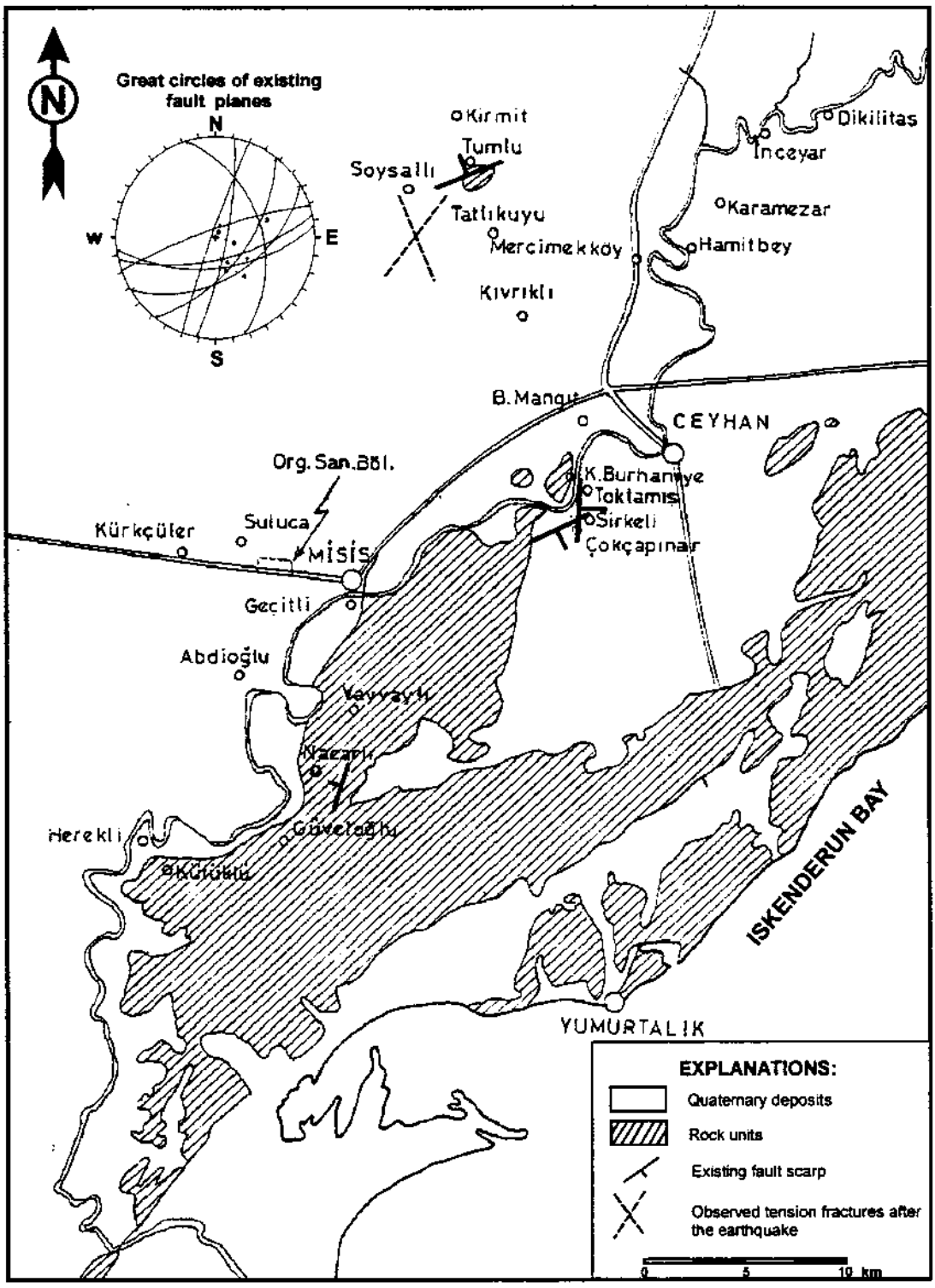

Figure 4.7 Orientations of existing fault scraps and newly occurred tension cracks after the earthquake

4.2 Stress State

The Cukurova Basin and its close vicinity underwent and it is still undergoing a strain regime of compression in NS direction and extension in EW direction as a result of internal deformation of the Anatolian plate, compressed by the northwardly moving African Plate and Arabian Plate in the south against the stationary Euro-asian plate in the north. The Anatolian plate bounded by the NAF and EAF is pushed westward against the Agean plate as a result of relative motion of the Arabian plate with respect to the African plate. These motions resulted in various geological structures in the Cukurova Basin and its vicinity. Figure 4.8 shows the orientations of maximum compressive horizontal stress inferred from geological structures and geophysical events through a methodology proposed by Aydan (Seiki et al. 1997). The maximum compressive horizontal stress inferred from geophysical events are associated with the P-axis directions obtained from fault plane solutions of earthquakes. Although there is no in-situ stress measurement in the Çukurova Basin and its close vicinity, the horizontal maximum compressive stress directions must be almost in the direction of NS.

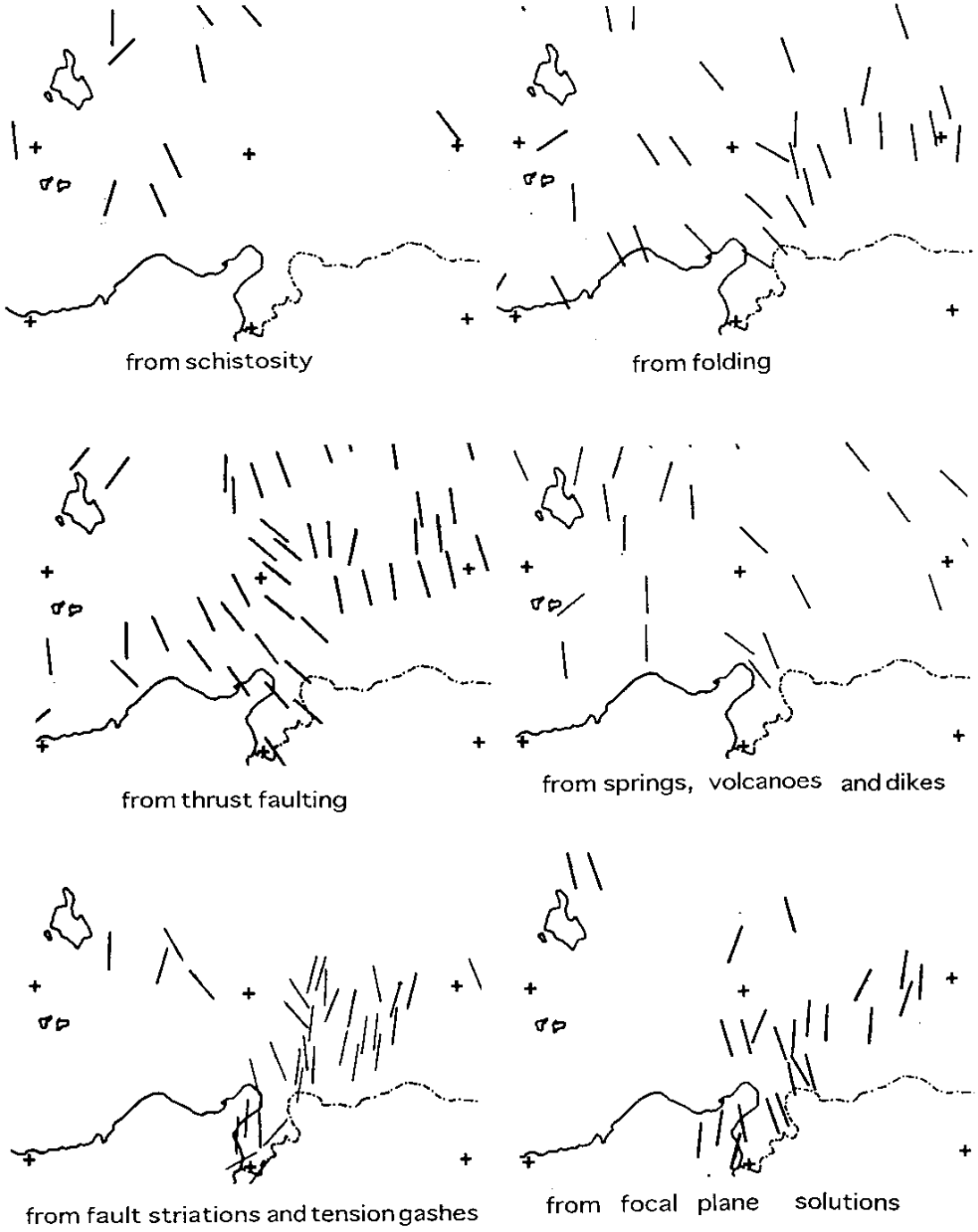

Figure 4.8 Inferred maximum compressive horizontal stress in Çukurova Basin