

**17 AUGUST 1999 KOCAELI  
EARTHQUAKE**

**Overview**

The western part of Turkey has suffered the destroying effects of the earthquake that occurred at on August, 17. A region of approximately 40x200 km centred on Gölcük, a sub-province of Kocaeli, has been severely damaged by the strong ground motions leaving behind thousands of casualties and bodily injuries. Provinces Kocaeli, Sakarya, Yalova are all devastated. Istanbul, Bolu, Eskişehir, Bursa, Tekirdağ and Zonguldak received partial damage yet formal reports have announced a total of more than a thousand fatalities within these provinces.

**About Earthquake**

The August 17, 1999 earthquake took place on North Anatolian fault. The time of occurrence was recorded as 00:01:39.80(UTC), 03:01:37 a.m. local time. According to USGS and Kandilli main source parameters of the earthquake are as follows:

Surface Wave Magnitude : 7.8 (USGS)  
Moment Magnitude : 7.4 (USGS, Kandilli)  
Epicentre : 40.702N, 29.987E (USGS)  
Depth : 17 km.(USGS)

Rupture length of at least 125 km and right lateral offset of as large as 5 m have been reported.

**About NAF**

North Anatolian Fault (NAF) is one of the most important geological structures in the region and until present it has generated several large earthquakes. The fault movement is a right lateral strike-slip one and is similar to the San Andreas Fault in California. NAF is approximately 1280 km long fault extending along northern Turkey and splitting into three strands in the west part (Barka and Kadinsky-Cade, 1988). It was on the northernmost strand of this faulting system that the 17 August earthquake took place. This strand passes through İzmit Bay and traversing Marmara Sea reaching the Saros Gulf.

Since 1939 eleven large earthquakes (including this latest one) with magnitudes equal or greater than 6.7 have taken place along the North Anatolian Fault. The 1939 event was of 7.9 magnitude and was located in the eastern Turkey. Since then the seismic activity on the NAF has moved in both directions, more progressively to the west. During the events between 1939 and 1944 an approximately 600 km of the fault ruptured towards west. Then the seismic activity slowed down until the occurrence of the 1957 and the 1967 earthquakes that resulted in an adjacent 100 km rupture along the NAF. However, the 1963 and 1964 earthquakes were located further west leaving an approximately 150 km gap between the 1967 event. The 1999 Kocaeli earthquake is

considered to be filling this gap in the westward mitigation of activities along the NAF.

**About Site Conditions**

In Gölcük, İzmit, Adapazarı and Yalova the effects of 17 August 1999 have been extremely destructive and preliminary reports declare the strong contribution of ground conditions on the distribution of observed damage in these regions.

Adapazarı is located on alluvial valley consisting of silt and silty clay layers with loose sand seams. Ground water table is very near to the to the ground surface. Failures due to liquefaction were observed confirming the contribution of soil conditions on damage distribution.

Izmit and Gölcük are located on İzmit Bay where thick soft clay deposits and loose sand layers are common. Ground water elevation is again very near to the ground surface.

Failures due to ground conditions have also been observed in Yalova. Recent borings in this area have indicated the presence of soft silt, and clay layers as well as loosely arranged sand layers.

**Related Web Sites**

- Istanbul Technical University:  
<http://ciragan.cc.itu.edu.tr/deprem/>
- Bogazici University Special Earthquake Page :  
<http://www.boun.edu.tr/deprem.html>
- Middle East Technical University:  
<http://www.metu.edu.tr/>
- Kocaeli University Web Site :  
<http://www.kou.edu.tr>
- Istanbul University, Department of Geophysics:  
<http://www.istanbul.edu.tr/eng/fjm/jeofizik/deprem/>
- TÜBİTAK MRC Earth Science Research Institute:  
<http://www.nemrut.mam.gov.tr/>
- Earthquake Research Center Web Site:  
<http://www.deprem.gov.tr/>
- Turkish Earthquake Foundation:  
<http://www.ins.itu.edu.tr/tdv/TOV.htm>
- IRIS Web Site: <http://www.iris.washington.edu>
- USGS Web Site: <http://www.usgs.gov/>
- ORFEUS Web Site: <http://orfeus.knmi.nl/>
- CNN Web Site : <http://cnn.com/>
- University of California, Berkeley:  
<http://www.eerc.berkeley.edu/turkey/index.html>
- University St. Cyril and Methodius, Skopje, Republic of Macedonia  
<http://www.izis.ukim.edu.mk/izmit/index.html>
- British Geologic Survey:  
<http://www.gsrq.nmh.ac.uk/turkey.htm>
- Earthquake Engineering Research Institute:  
<http://www.eeri.org/>