DESIGN OF GEODETIC CONTROL NETWORKS WITH FAULT PARAMETERS FOR DISASTER MANAGEMENT

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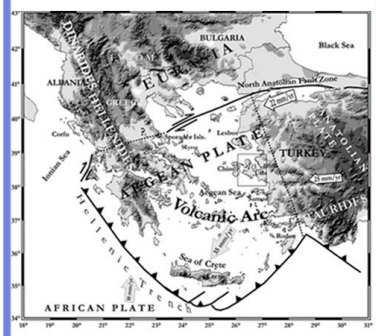
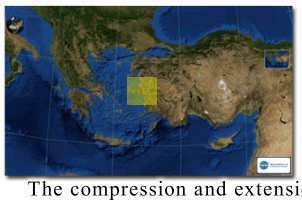
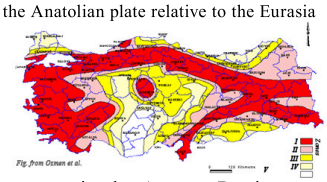
Fault based large scale studies needs to be optimized in terms of certain parameters. Optimizations, in general, are realized to achieve a desired precision in termf observation techniques, selected equipment and surveying interval. One should trust not only the results but also the reliability of a network which can be expressed as mathematical relations. The precision, reliability and economical parameters in a geodetic network can be arranged in order to achieve the optimum solution which is defined as the optimization of geodetic networks. The aim of the optimization on a geodetic network is related with the design geodetic survey to achieve the desired accuracy, reliability and low cost. On the other hand there is no systematic and formulated solution about the number of stations that the network should include although there are some approaches on that topic. The number of stations in a geodetic network and their locations are directly concerned with the phenomenon understanding fault mechanics seismological features of the region of interest. Western Anatolia is a valuable laboratory for Earth sciences because of its complex geological structure. Izmir as a big metropolitan city in Turkey with a 2.5 million population has a great risk about big earthquakes. Unfortunately, geodynamics studies which were performed in this region are insufficient or cover large areas instead of specific faults. This paper aims to perform a large scale investigation focusing on Tuzla Fault and its vicinity for better understanding of region tectonics. In order to investigate the crustal deformation on Tuzla Fault and Izmir Bay, a geodetic network has been designed and optimizations were performed. Results of geodetic observations should be processed together with the disasters management strategies. Deformation rates and strain analysis results for a particular region should be evaluated as model parameters of management approaches for urban areas.

Aegean Region comprises the Hellenic Arc, Greek mainland and western Turkey

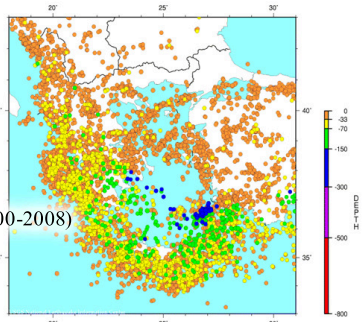




The convergence of Eurasian and African lithospheric plates forces a westward motion on the Anatolian plate relative to the Eurasia



The compression and extension zones in the Aegean Region



Seismicity map of the Aegean Region, M>4 (USGS 1900-2008)

The Aegean Region and Western Anatolia are one of the most seismically active and deforming parts of Alpine-Himalayan orogenic belt. A high seismic activity has been observing in this region.

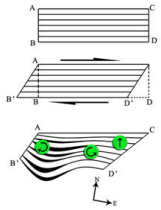
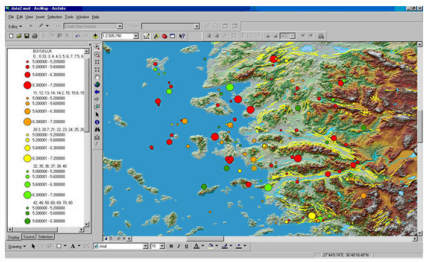
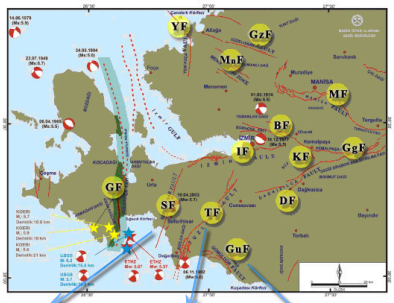


Illustration of a simple analogue deformation in the Aegean Region

Faults and earthquakes, M>5 in 1900-2006 KOERI





Seferihisar Fault
lineament trending of N20E
23 km long
right-lateral strike slip

Tuzla Fault
lineament trending NE-SW
42 km long through the land side
(>50 km with under water segments)
has 3 segments
right-lateral strike slip

Gümüldür Fault
lineament trending of N55W
potentially active fault

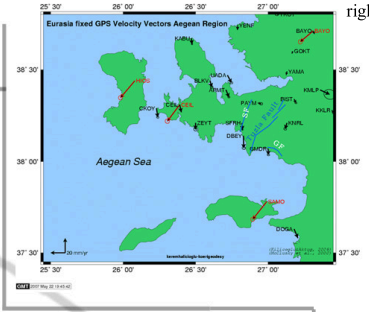
Seismicity of the Region of Interest

Collecting and evaluating available information

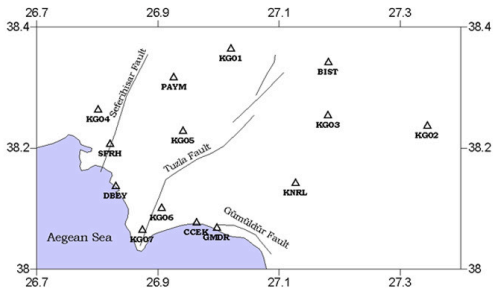
Network Desing and Optimization Strategies
Considering Geophysical Parameters

Data Analysing Strategies

Preprocessing Strategies



Locations of the sites of Izmir microgeodetic network



desired level of accuracy
reliability
low cost

The model in the study
A one-dimensional fault model with two parameters standard strike-slip model of dislocation theory in an elastic half-space

$$d(x) = -\frac{V}{\pi}\arctan\left(\frac{x}{H}\right)$$

x is the distance perpendicular to the fault
H locking depth
V slip rate

to estimate H
the stations were located *near* the fault trace

to estimate V
stations were located *far* from the fault trace

two fault systems
stations were located between faults

At least 3 GPS campaigns are planning

The study as a large scale investigation of the region contribute to geodynamic studies

The study area will be extended to E-W considering the high seismic risk of the city