Present Deformation Field of Silent Strand of Western NAFZ

Haluk OZENER, Asli DOGRU, Bulent TURGUT

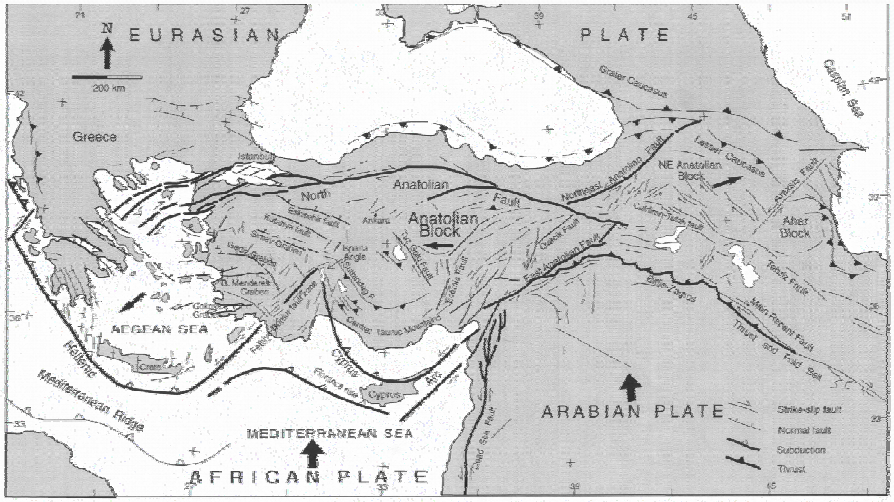
Istanbul Technical University
Geodesy & Photogrammetry Eng. Dept.
Surveying Techniques Division
ISTANBUL / TURKEY
haluk.ozener@itu.edu.tr

Bogazici University
Kandilli Observatory &
Earthquake Research Institute
Geodesy Department
ISTANBUL / TURKEY

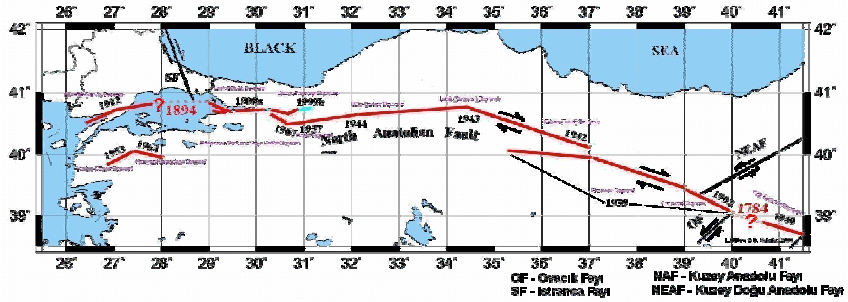
Outline

- Tectonics of Turkey, NAFZ and control networks
- Seismicity of western NAFZ region
- Geodetic studies on NAFZ and their results
- Iznik-Mekece fault segment and Iznik network
- GCM-ITU network and observations
- Results and conclusions

Tectonics of Turkey

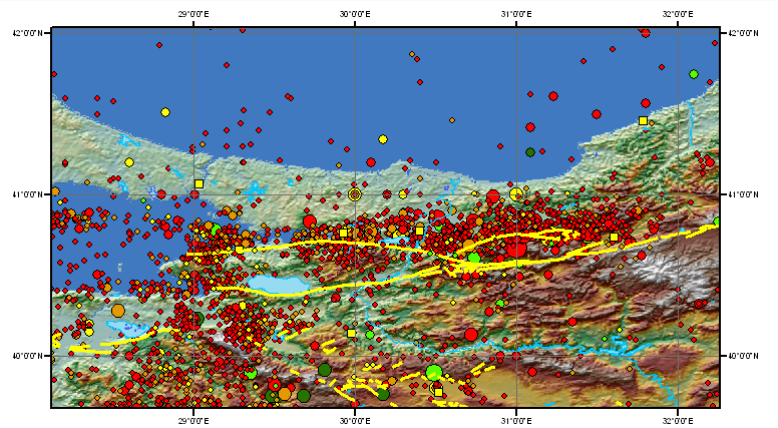


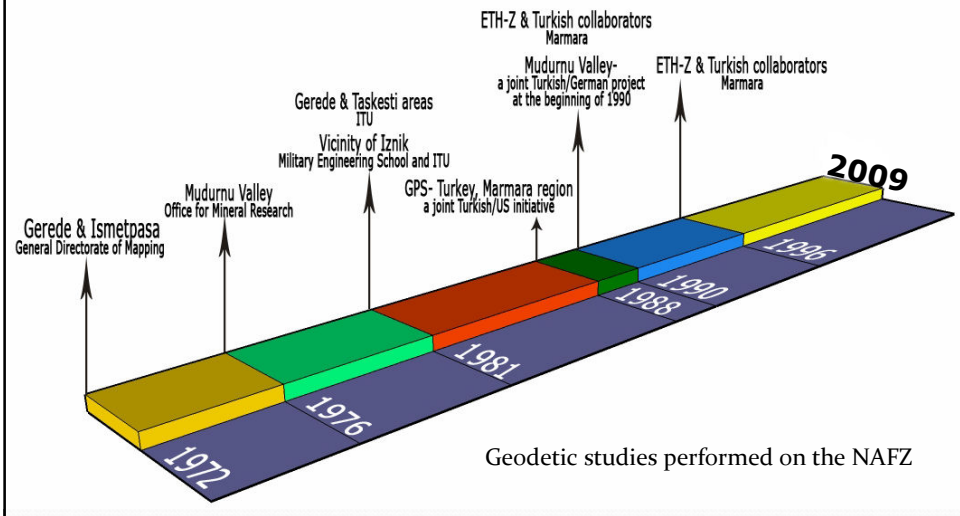
Active Faults in the Anatolian Region (Barka and Reilenger, 1997).



The region is one of the most seismically active regions in Turkey and is capable of generating major earthquakes in every 3-4 years

Seismic Activity
around the Western Part of NAFZ (1900-2009)





Geodetic studies performed on the NAFZ

According to the Geodetic studies performed by various workgroups

20-30 mm/yr from GPS Observations

[Robbins et al., 1995; Noomen et al., 1996; Reilinger et al., 1997; Straub and Kahle, 1995; McClusky et al.,2000, Reilinger et al., 2006; Ergintav et al., 2007]

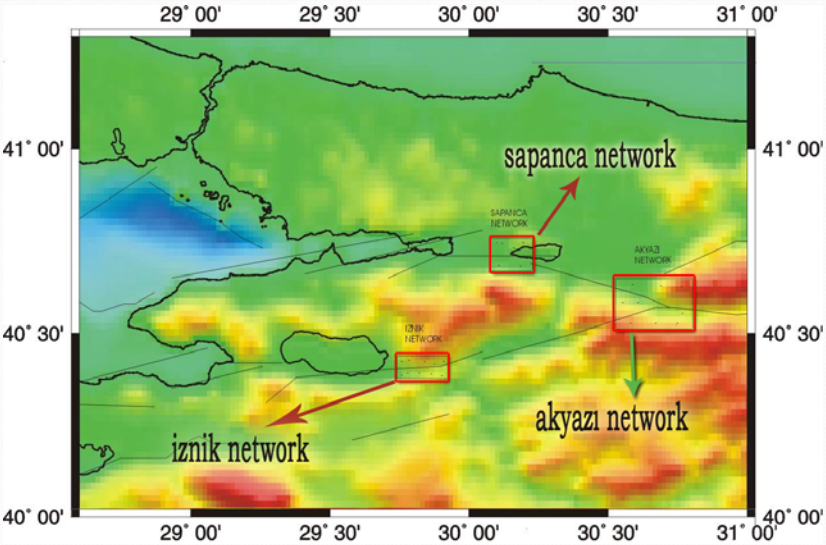
2.7 mm/yr from Terrestrial Observations

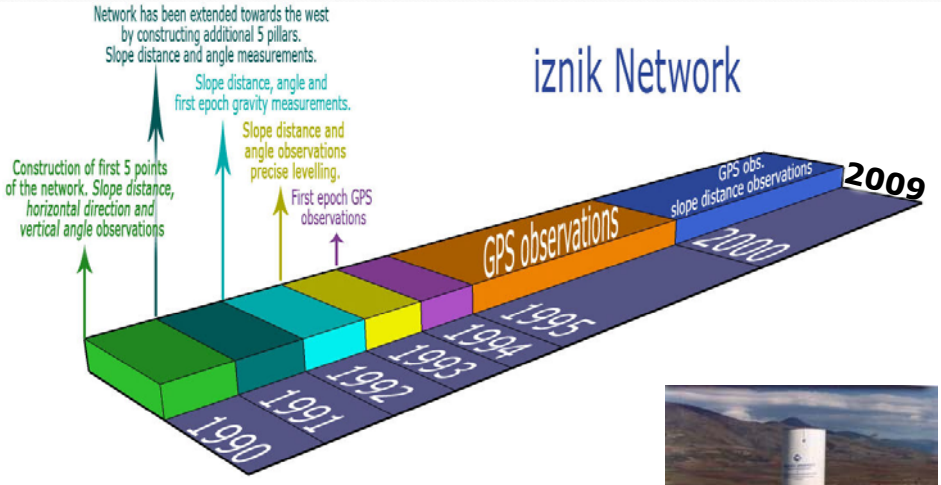
[Aksoy, 1983]

Less than a cm/yr from Terrestrial Observations

[Altiner et al.,1993]

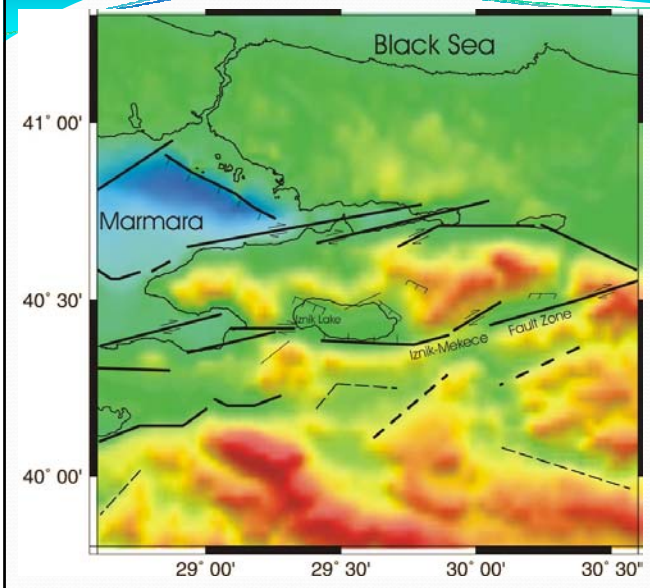
Micro-geodetic networks on Western NAFZ





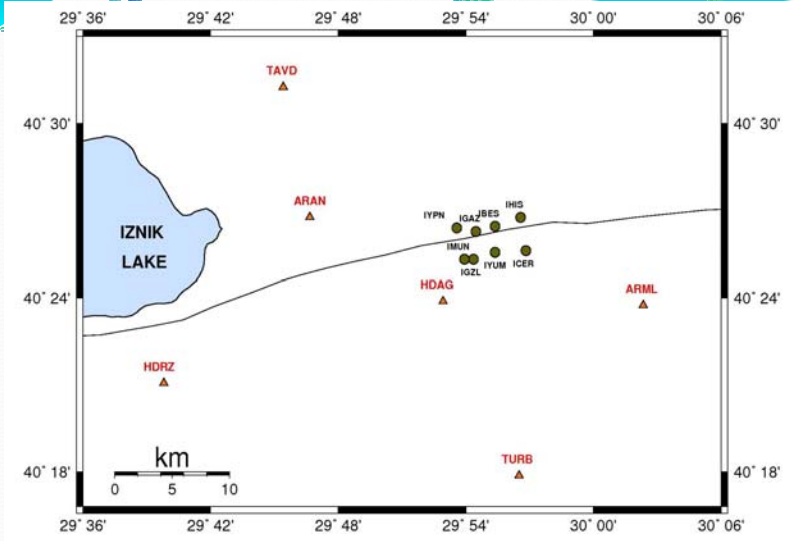
10km² with 10 points

Iznik-Mekece fault segment of NAFZ



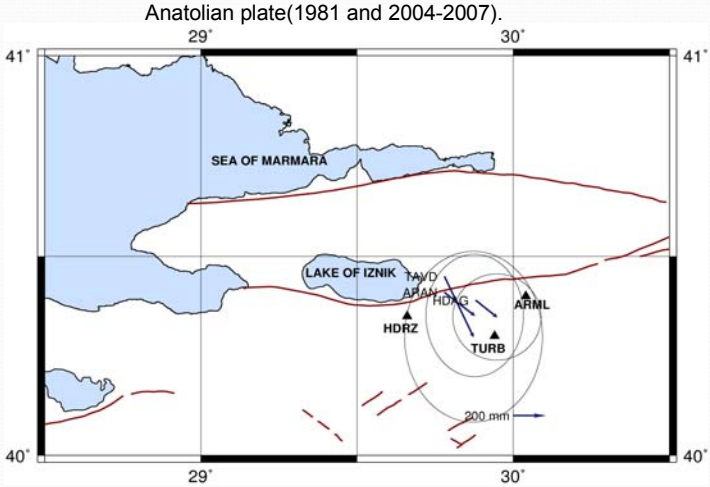
- seismically low active branch
- recurrence interval of large earthquakes is 2000 years
- seismic gaps in the area implies potential sites for future large earthquakes

GCM-ITU (General Command of Mapping-Istanbul Technical University) Network



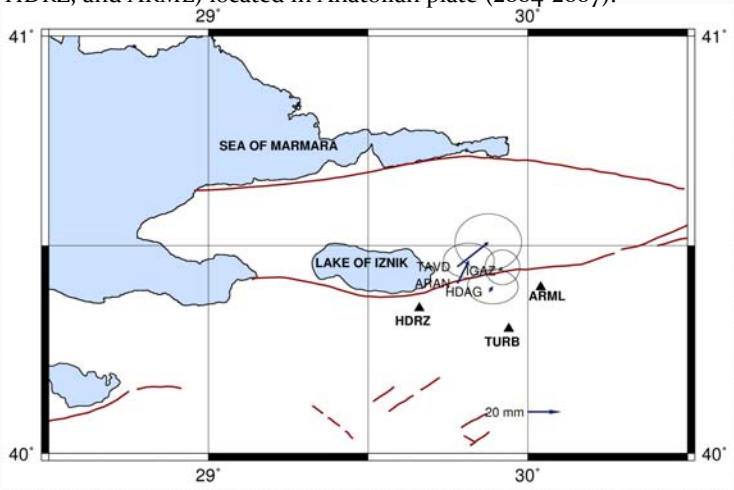
- 9 pillars around south and north of fault
- conventional techniques in 1941, 1963 to 1981
- GPS campaigns in 2004 and 2007

The displacements of TAVD, ARAN, and HDAG stations were estimated relative to the fixed stations (TURB, HDRZ, and ARML) located in the Anatolian plate(1981 and 2004-2007).



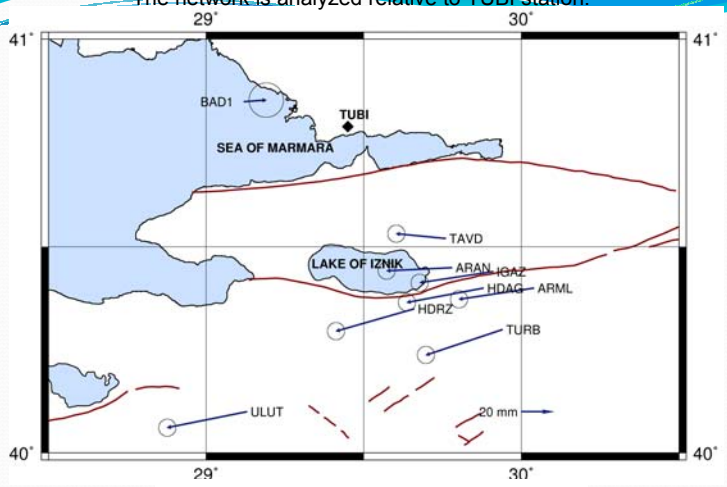
Station	Station coordinates		Observation periods		Displacements		Uncertainties	
ID	Latitude	Longitude	First	Last	North mm	East mm	dn mm	de mm
TAVD	40.522	29.7574	1981	2004–2007	−391	183	89	113.8
ARAN	40.4472	29.7782	1981	2004–2007	−150	191	63	81
HDAG	40.3992	29.8826	1981	2004–2007	−109	134	57	62
TURB	40.2988	29.9421	1981	2004–2007	–	–	–	–
HDRZ	40.3512	29.6638	1981	2004–2007	–	–	–	–
ARML	40.3969	30.0394	1981	2004–2007	–	–	–	–

Displacements of TAVD, ARAN, HDAG, and IGAZ stations relative to the fixed stations (TURB, HDRZ, and ARML) located in Anatolian plate (2004-2007).



Stations	Station coordinates		Observation periods		Displacements		Uncertainties	
ID	Latitude	Longitude	First	Last	North mm	East mm	dn mm	de mm
TAVD	40.521	29.7569	2004.32	2007.122	15	19	4.2	3.6
ARAN	40.4462	29.7778	2004.32	2007.122	14	7	3.2	2.2
HDAG	40.3982	29.8822	2004.32	2007.122	3	1	3.2	2.2
IGAZ	40.438	29.908	2004.32	2007.122	2	2	2.2	2.2
TURB	40.2978	29.9417	2004.32	2007.122	–	–	–	–
HDRZ	40.3511	29.6634	2004.32	2007.122	–	–	–	–
ARML	40.3959	30.039	2004.32	2007.122	–	–	–	–

Displacement between 2004 and 2007 on the extended network.
The network is analyzed relative to TUBI station.



Stations	Station coordinates		Observation periods		Displacements		Uncertainties	
ID	Latitude	Longitude	First	Last	North mm	East mm	dn mm	de mm
TAVD	40.521	29.7569	2004.32	2007.122	3	−31	1.14	1.14
ARAN	40.4462	29.7778	2004.32	2007.122	−2	−41	1.14	1.14
HDAG	40.3982	29.8822	2004.32	2007.122	−9	−48	1.14	1.14
IGAZ	40.438	29.908	2004.32	2007.122	−7	−46	1.14	1.14
TURB	40.2978	29.9417	2004.32	2007.122	−16	−48	1.14	1.14
HDRZ	40.3511	29.6634	2004.32	2007.122	−14	−49	1.14	1.14
ARML	40.3959	30.039	2004.32	2007.122	−7	−47	1.14	1.14
ULUT	40.0975	29.1314	2004.32	2007.122	−10	−50	1.14	1.14
BAD1	40.8512	29.1179	2004.32	2007.122	1	14	2.23	2.23
TUBI	40.7867	29.4507	2004.32	2007.122	–	–	–	–

Conclusions

- Data analyzed between 1941 and 2007.
- Stations move same direction (Both GPS&Terrestrial).
- Mean displacements ranging between 7 and 18 mm/yr.
- Consistent with the earlier studies 18 mm/yr. for 1994-1999 period (Ozener., 2000), McClusky at al., 2000)

Conclusions

- The velocity rates of IGAZ and ULUT stations were obtained as 23.50 mm/yr and 23.17 mm/yr relative to the Eurasian-fixed reference frame in the study Ergintav et al. (2007).
- No significant horizontal displacements have been detected in the Iznik network.

Conclusions

- No significant movement between the northern and the southern part of fault.
- There is not any strain accumulation in the region which results basically no tectonic activity.
- In addition, this region has low seismic activity .
- Hence, this fault is still inactive as claimed in Barka's earlier studies.
- There will not be any possible tectonic activity in a short time.

Thank you
For Your Attention