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ANTAKYA BASIN STRONG GROUND MOTION NETWORK

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Objectives

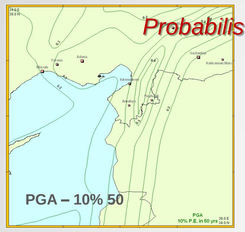
- monitor the earthquake response of the Antakya Basin
- improve our understanding of basin response
- help to determine the effects of local and regional earthquakes on the urban environment of Antakya
- contribute to earthquake risk assessment of Antakya marked with high earthquake hazard and historical and cultural significance.

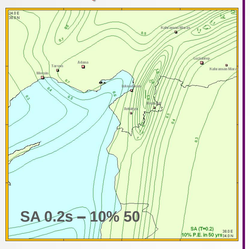
Earthquake Hazard

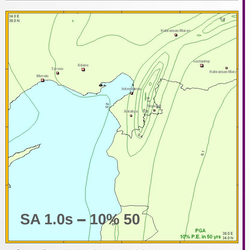
Turkey is located in one of the most active earthquake zones of the world. The cities located along the North Anatolian and East Anatolian faults are exposed to significant earthquake hazard. The Hatay province near the southern terminus of the EAF has always experienced a significant seismic activity, since it is on the intersection of the northernmost segment of Dead Sea Fault Zone coming from the south, with the Cyprean Arc approaching from south-west. Historical records extending over the last 2000 years indicate that Antakya founded in the 3rd century B.C., a town in the Hatay province and moreover near the edge of a basin called after its own name, is affected by intensity IX-X earthquakes every 150 years. In the region, the last major earthquake occurred in 1872. Destructive earthquakes should be expected in the region in the near future similar to the ones that occurred in the past.

Regional QTM Map

Probabilistic Earthquake Hazard

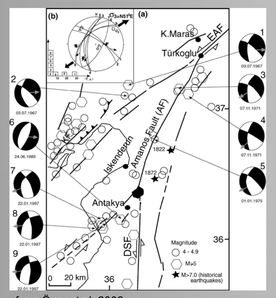






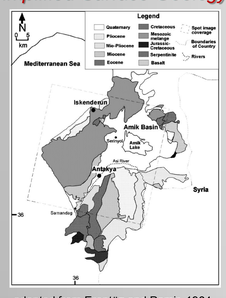
from Demircioğlu et al, 2009

Seismotectonics



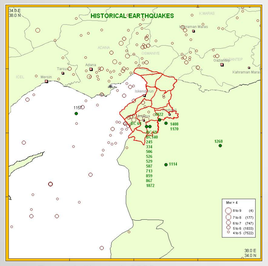
from Over et al. 2002

Simplified Surface Geology



adopted from Erentöz and Pamir, 1964

Instrumental and Historical Seismicity



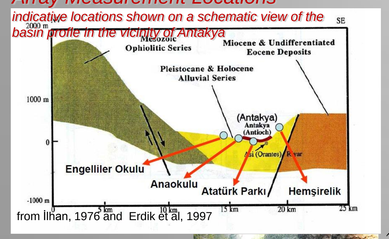
from Demircioğlu et al, 2009

Station S-wave Properties

The soil properties beneath the strong motion stations (S-Wave velocity structure and dominant soil frequency) are determined by array measurements.

Array Measurement Locations

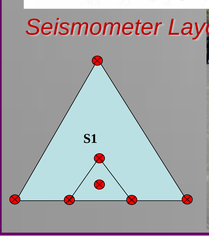
indicative locations shown on a schematic view of the basin profile in the vicinity of Antakya

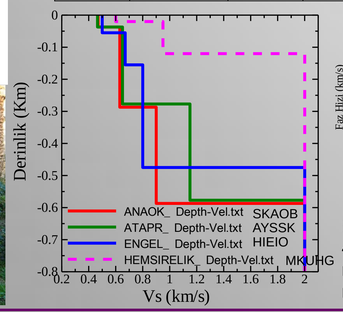


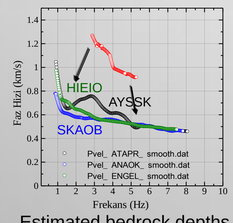
from İlhan, 1976 and Erdik et al, 1997

Anaokulu, SKAOB		Atatürk Parkı, near AYSSK		İşitme Eng. Okulu, HIEIO	
Depth	S-wave vel.	Depth	S-wave vel	Depth	S-wave vel
37 m	0.470 km/s	37 m	0.465 km/s	55 m	0.500 km/s
250 m	0.630 km/s	240 m	0.650 km/s	100 m	0.670 km/s
300 m	0.900 km/s	300 m	1.150 km/s	320 m	0.800 km/s
	2.000 km/s		2.000 km/s		2.000 km/s

Seismometer Layout







Estimated bedrock depths (Svel=2km/s) are 475 m at HIEIO, 477 m at SKAOB and 487 m near AYSSK. Engineering bedrock (Svel 760 m/s) is at about of 250 m to the west of Asi.

Network Description

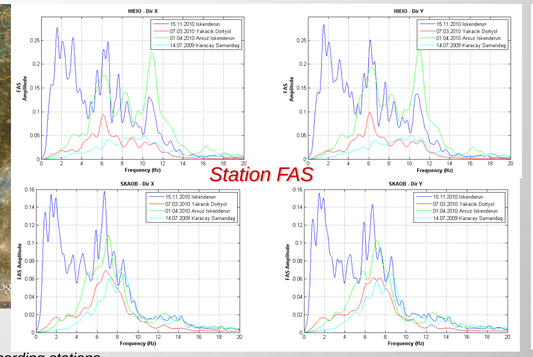
The strong motion monitoring system consists of six instruments installed in small buildings. The stations form a straight line along the short axis of Antakya basin passing through the city center. They are equipped with acceleration sensors, GPS and communication units and operate in continuous recording mode.

Typical Instrument

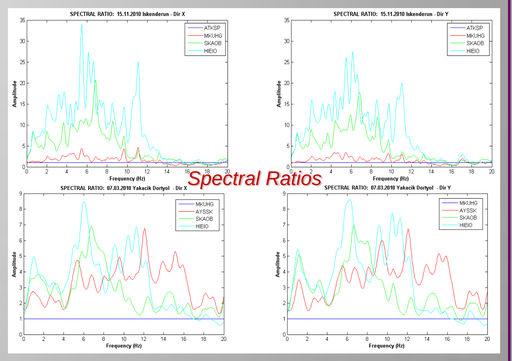
Antakya , general view towards southwest black line marks the extent of stations

STATION INFORMATION			
#	Coordinates	Name	Code
1	36°11'714"N 36°10'174"E	Antakya Su Pompa Binası	ATKSP
2	36°11'682"N 36°09'952"E	MKÜ Hemşirelik MYO Güvenlik Klübesi	MKUHG
3	36°11'890"N 36°09'655"E	Antakya Sosyal Yardımlaşma ve Dayanışma Vakfı	ASYDV
4	36°11'994"N 36°09'303"E	Kapalı Sapor Salonu, Antakya Yaşama Sevinci Spor Klubü	AYSSK
5	36°12'303"N 36°08'794"E	Saray Kent 125. Yıl Anaokulu	SKAOB
6	36°12'594"N 36°08'132"E	Hürriyet İşitme Engelliler İlköğretim Okulu	HIEIO

Records



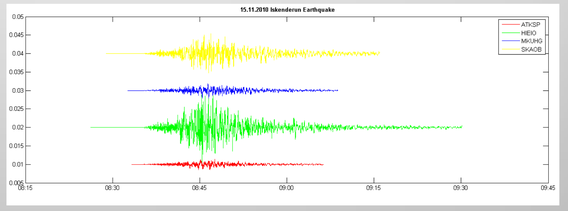
Station FAS



Spectral Ratios

Records

Date	Coordinates	M	Location	# of recording stations
2010.11.15	36.585N, 36.007E	4.9	İSKENDERUN	4
2010.04.01	36.330N, 35.947E	3.3	ARSUZ	4
2010.03.08	36.658N, 36.275E	3.8	YAKACIK	4
2009.07.14	36.154N, 36.089E	3.2	KARAÇAY	3
2009.06.17	36.047N 36.020E	4.5	SAMANDAG	2



Conclusions

- A six-station strong motion network for monitoring basin response is established in Antakya. It is the first of its kind in Turkey.
- The S-wave properties of stations are determined by array measurements.
- To the west of river Asi, average bedrock depth is 480m. The depth of engineering bedrock is estimated as 250m.
- 5 earthquakes are recorded by the system as of April 2011.
- Ground motion amplification along the short-axis of the basin can clearly be observed from the recordings.
- To the west of the Asi River, 3 to 10 times amplifications in ground motion levels are observed. They tend to increase as one moves towards the middle of the basin (at AYSSK x3 btw 3-16Hz, at HIEIO x4-8 btw 0-13Hz, at SKAOB x4-5 btw 0-10Hz)

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