# The early Holocene seismic activity of Büyük Menderes graben, Western Anatolia, Turkey: Fault scarp dating with cosmogenic $^{36}$Cl

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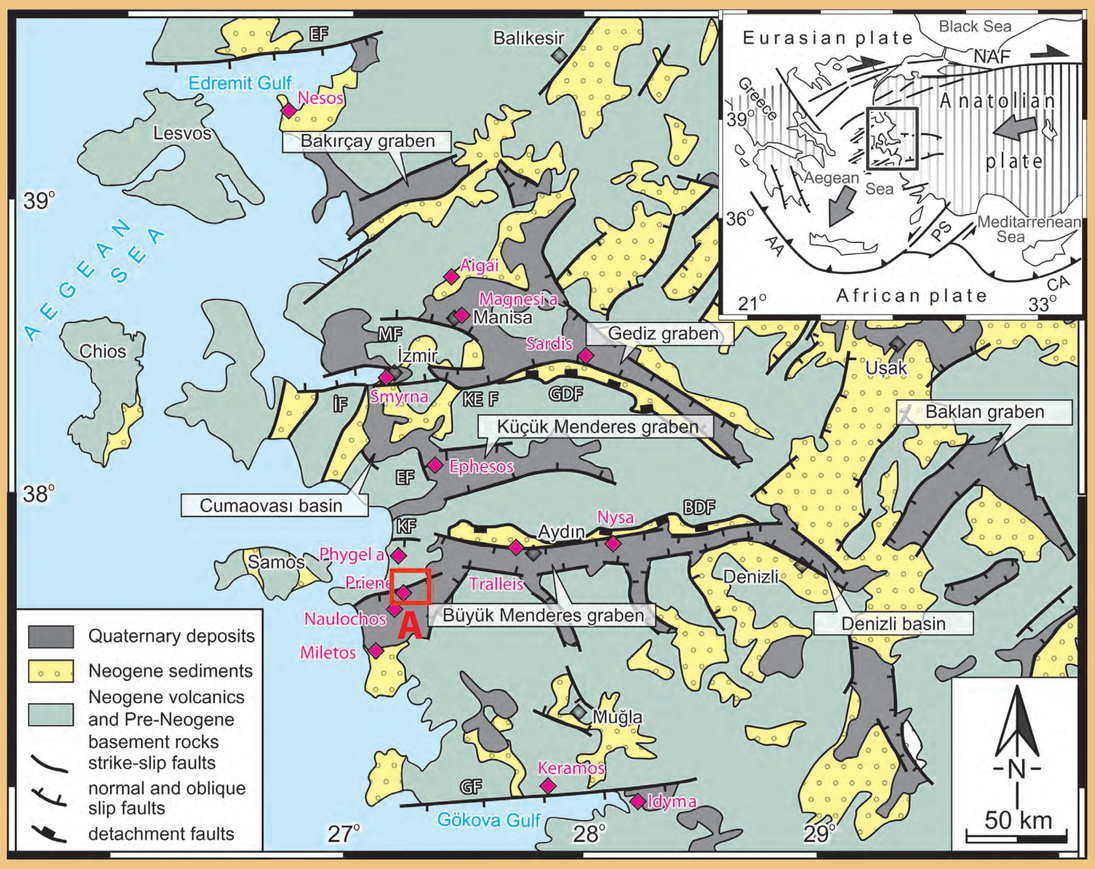
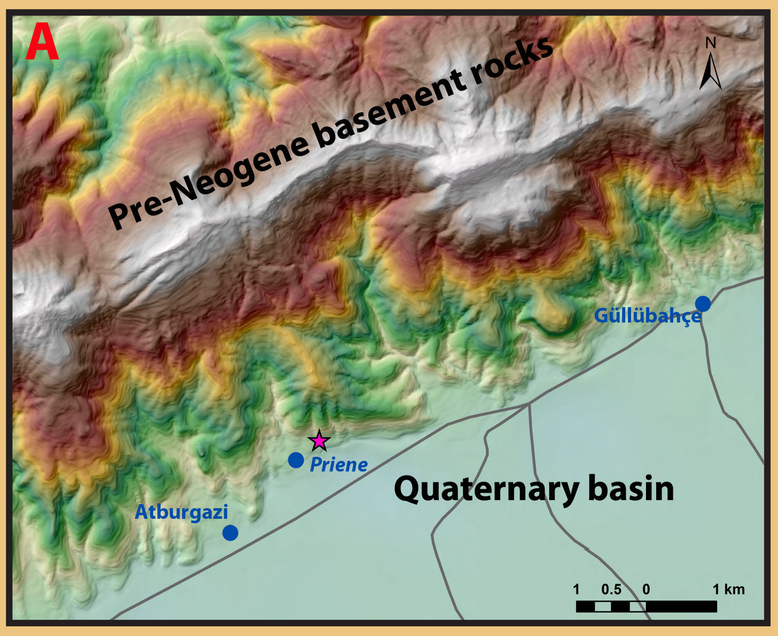
## Introduction

Tectonic activity of the roughly N-S extending West Anatolia, since the early Miocene, caused the formation of three major graben systems: The Gediz, Küçük Menderes and Büyük Menderes (Bozkurt 2001; Bozkurt and Sözbilir 2004). These systems are bounded by large scale normal faults built in carbonate bedrock and recorded surface faulting during the Pleistocene-Holocene.



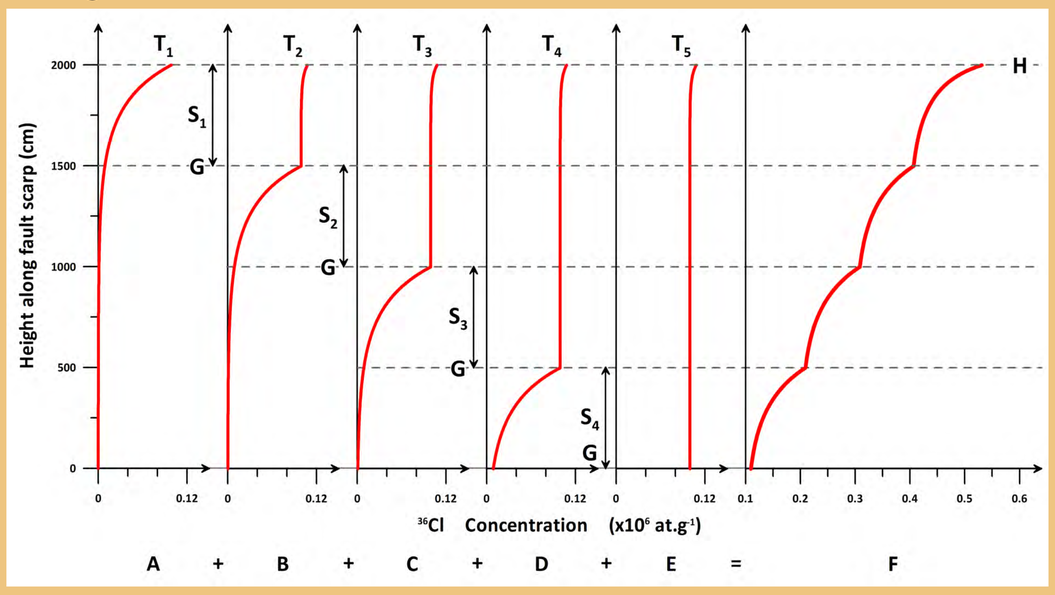

Simplified geological map of the area displaying three main graben systems (Modified after Akçar et al. 2012).




Hillshade map of the Priene-Sazli fault scarp showing Pre-Neogene basement rocks in the footwall against Quaternary sediments in the hanging wall.

## Method

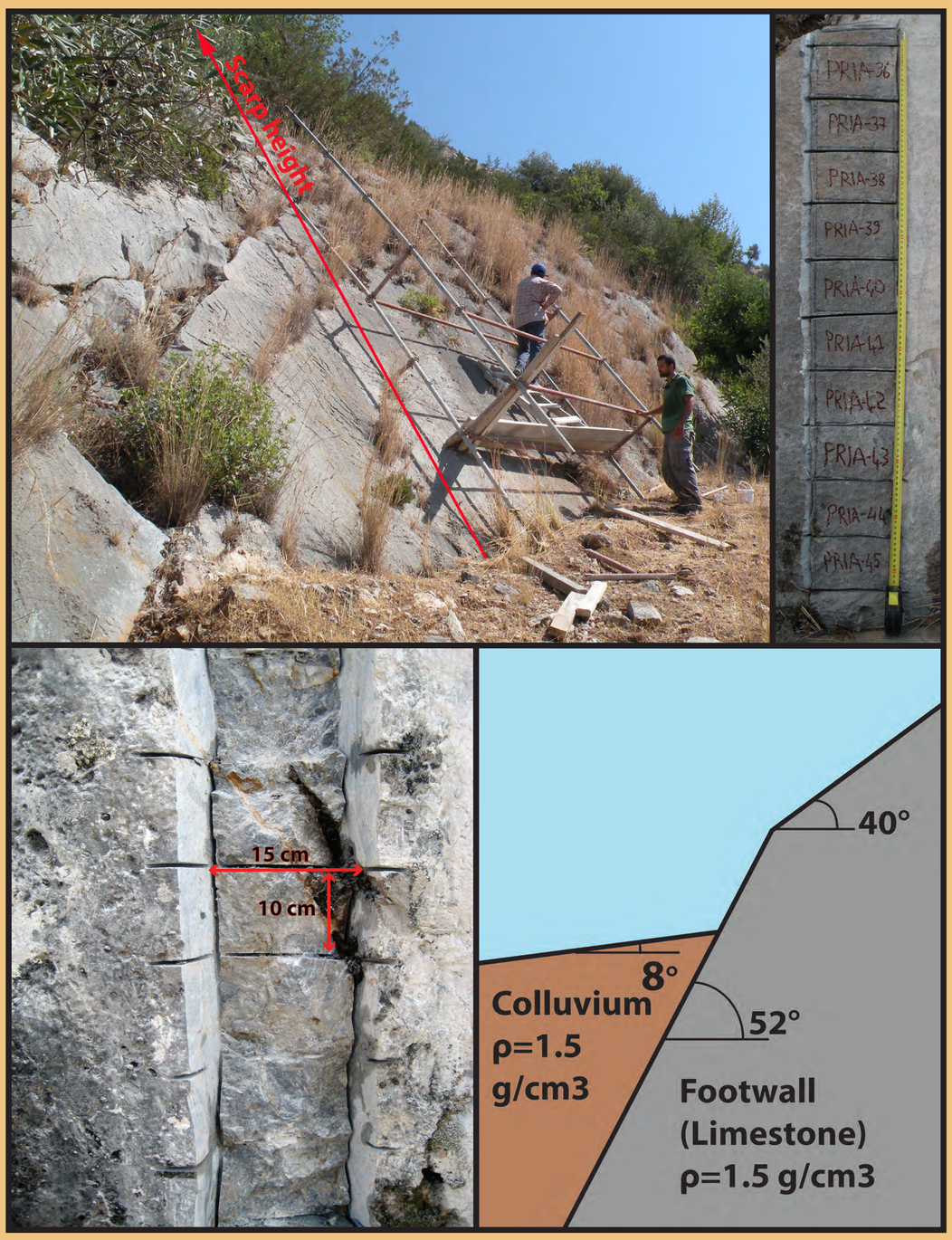
Preservation of fault scarp in carbonate bedrock resulted in efficient recording of past earthquakes and makes it idealized to examine periods of sporadic seismic activity and quiescence. With each rupture, a buried section of the scarp is exposed to the surface and interacts with cosmic rays which consequently results in speeding up of $^{36}$Cl concentration during period of inactivity. By measuring the $^{36}$Cl concentration along the fault, the rupture and its timing can be determined.




Theoritical distribution of $^{36}$Cl along fault scarp after four earthquakes and 25 ky of total exposure (Akçar et al. 2012).

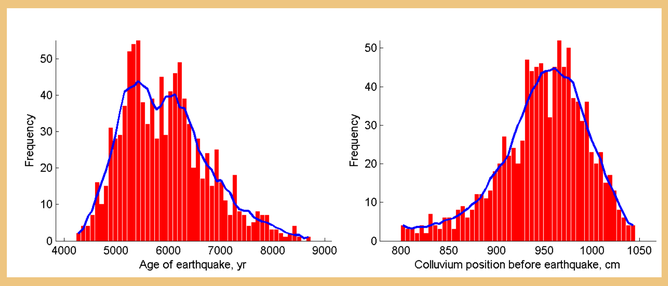
## Sampling and lab work

- 117 samples from well-exposed sections of limestone bedrock fault scarps along the Priene-Sazli faults.
- Scarp geometry measurements
- Sample crushing and leaching
- Elemental analysis of each sample (AMS)




## Modeling and preliminary results

We used a Matlab code to model the remarkable ruptures and their timing (Tikhomirov et al., submitted). Our first results indicate evidence of enhanced seismic activity along the Büyük Menderes graben during the early Holocene.

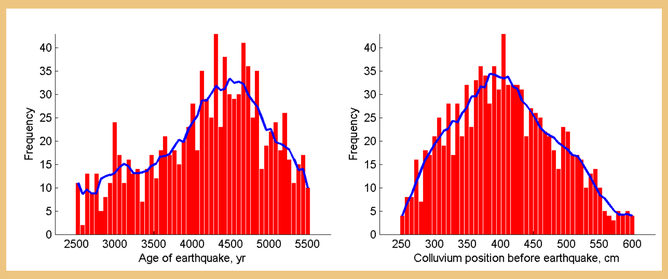



**Earthquake 1:**

**Age: 6.2 ± 1.5 kyr**
**Slip: 5.5 ± 0.8 m**

**Earthquake 2:**

**Age: 3.8 ± 0.9 kyr**
**Slip: 2 ± 0.3 m**




## References

Akçar N., Tikhomirov D., Özkaymak Ç., Alfimov V., Ivy-Ochs S., Sözbilir H., Uzel B. and Schlüchter C., 2012. $^{36}$Cl Exposure Dating of Paleoearthquakes in the Eastern Mediterranean: First Results from Western Anatolian Extensional Province, Turkey. GSA Bulletin 124, no. 11-12, 1724-1735.

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