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Miocene tectonic motions in the Central Anatolia Plateau interior: a seismo-structural study in the Tuz Gölü Basin

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Research Questions

Tectonics of the central domain during buildup of the Central Anatolia Plateau (CAP)

Q1. What **type of tectonic movements** occurred?
Q2. Which **structures** accommodated the movements? When?
Q3. What is the **genetic nature** of the CAP?

Central Anatolia micro-Plateau (CAP) interior and the Tuz Gölü Basin

The CAP is the perfect natural laboratory for the study of the complex interactions between deep thermo-mechanical and surface erodibility-climatical processes acting during plateau formation

The Tuz Gölü Basin is a major representative amongst the Late Cenozoic or younger basins in the interior of the Central Anatolia Plateau; unravelling the structural pattern of deformation as well as the accurate timing of the tectonic motions and events undergone by this basin will give relevant constrains on the mode and genetic nature of the CAP and information on plateaux genesis elsewhere

Vertical Anatolian Movement Project (VAMP)

Studying the CAP we aim at increase the temporal and spatial resolution of plateau-building processes, by determining
(i) Miocene to recent deformations, uplift and strain partitioning;
(ii) continental sedimentary archives linked with long-term climate changes;
(iii) patterns of erosional exhumation; and
(iv) the geophysical characteristics of the deep mantle/lithosphere

Plateaux features

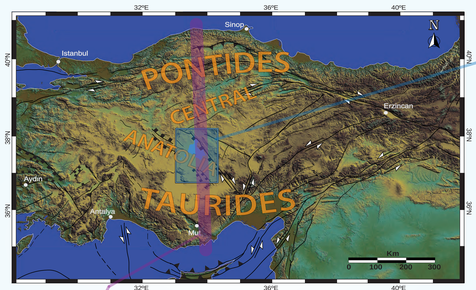


Fig.1. Simplified structural map of Turkey

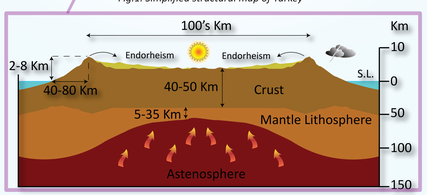


Fig.2. Plateaux cartoon

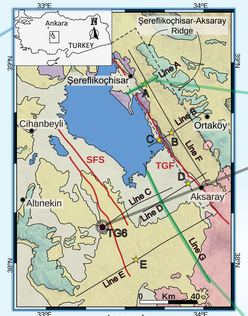


Fig. 3. Geologic and data map

Seismic interpretation

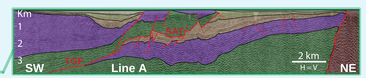


Fig. 4. Depth-converted seismic line A (NE-SW oriented)

m	Epoch (Ma)	Formation Seism. Unit	Lithology	Velocity (m/s)
0	Plio-Q	Unit 1	Poorly consolidated limestones	2035
350	5.3	Chanbeyli Fm. Unit 2	Marly carbonates & clays	2770
584	Messinian 7.3	Unit 3	Limestones & marly limestones	3585
783	Tortonian 11.6	Eskipolatlı Fm. Unit 4	Clay, marls & silts	3810
1330	Paleogene 56	Upper Cretac. Unit 5	Metamorphic rocks	4690
1560				

Table 1. TG6 well data, seismic unit definition and seismic velocity

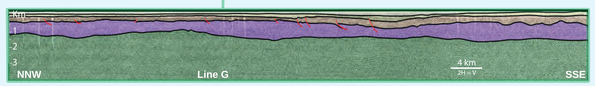
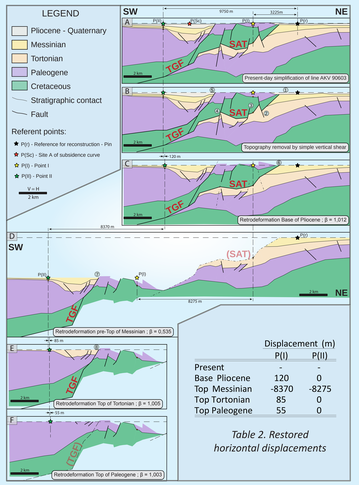


Fig. 5. Depth-converted seismic line G (NNW-SSE oriented)

Restoration



	Displacement (m) P(I)	P(II)
Present	-	-
Base Pliocene	120	0
Top Messinian	-8370	-8275
Top Tortonian	85	0
Top Paleogene	55	0

Table 2. Restored horizontal displacements

Fig.6. Restoration of line A

Subsidence curves

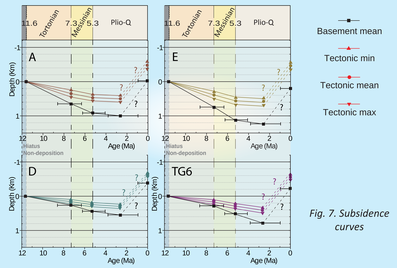


Fig. 7. Subsidence curves

Vertical vs. Horizontal

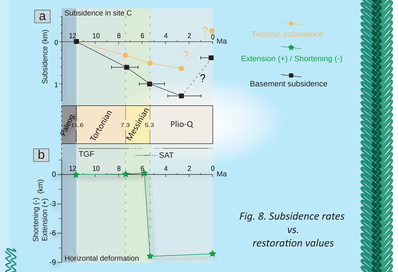
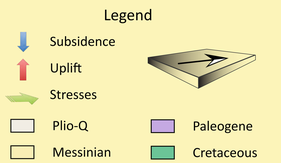


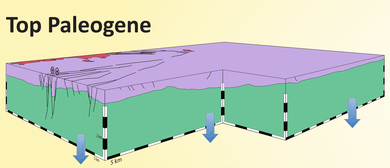
Fig. 8. Subsidence rates vs. restoration values

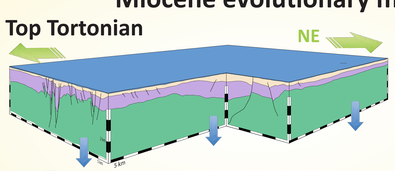
Results

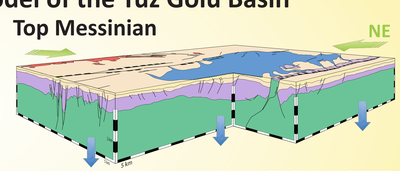
1. **Tuz Gölü is a broad not fault-related Miocene basin**
   1.a. Units 1 to 3 (Miocene): i) continue both sides of fault systems
   ii) show no basin terminations
   1.b. Unit 4 (Paleogene) thickens toward the SW
2. **Tortonian Extension << Late Messinian Shortening >> Plio-Q Extension**
   2.a. Hitherto unreported thrust during Unit 2 (Messinian) (displacement > 8 km)
3. **Primary subsidence signal is tectonic**
4. **Extension/shortening whilst overall subsidence**

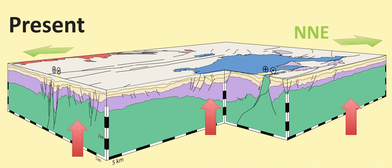
Miocene evolutionary model of the Tuz Gölü Basin











Research Answers

A1. Regional subsidence since Tortonian - Younger regional uplift
Faults create minor modulations
A2. (i) Pre–Miocene: Sultalhani Fault System (SFS) - Extensional
(ii) Tortonian: Tuz Gölü Fault (TGF) - Extensional
(iii) Latest Miocene: Şereflikoçhisar–Aksaray (SAT) - Shortening
A3. Type of motions point to mantle-supported uplift
Orientation/type of structures points to shortening-related uplift

Acknowledgements

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References

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