



IL SOLLEVAMENTO DELL'ALTOPIANO ANATOLICO CENTRALE (TURCHIA): EVIDENZE GEOLOGICHE DAL SUO MARGINE MERIDIONALE

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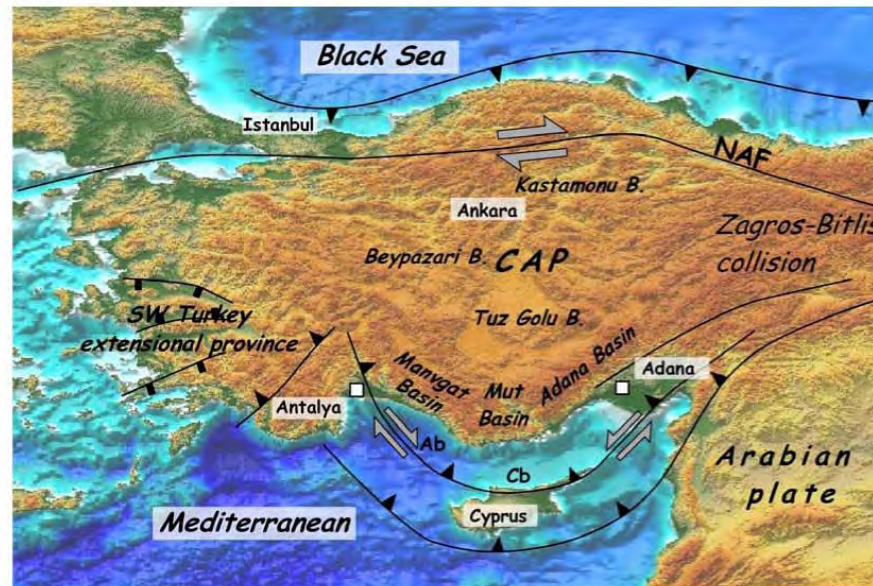
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Roma, 16 dicembre 2011



VAMP Vertical Anatolian Movements Project

A Collaborative Research Project for the TopoEurope
Initiative of the European Science Foundation



HACETTEPE
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M. Strecker

A. Aksu, E. Aydar, G. Bertotti, A. Çiner, K. Dirik
H. Echter, C. Faccenna, E. Gliozzi, R. Govers
M. Kováčová, M. Mattei, A. Mulch
B. Rojay, G. Simpson

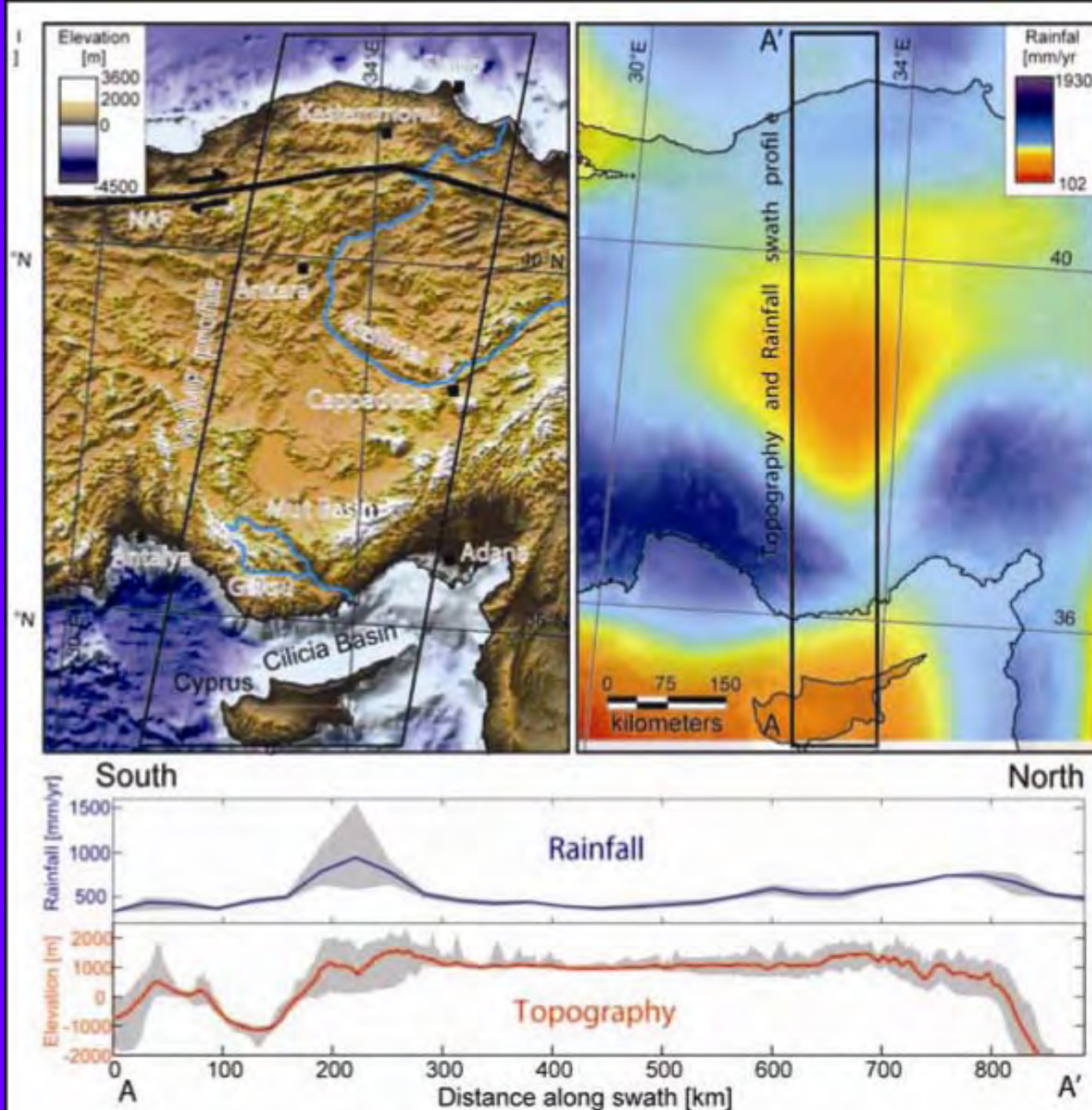
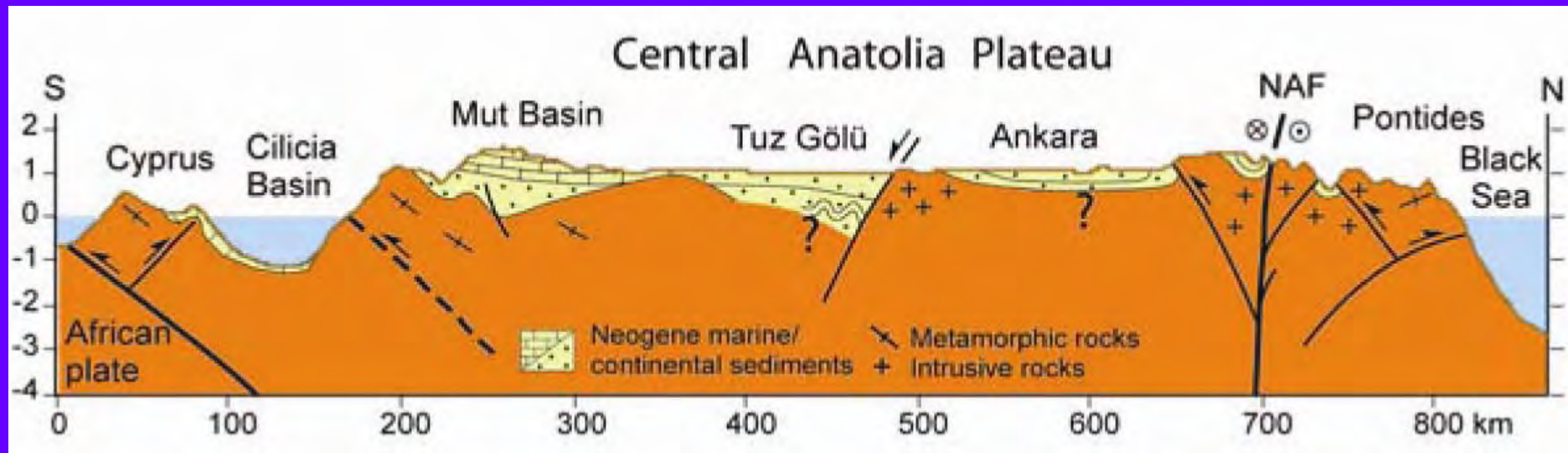
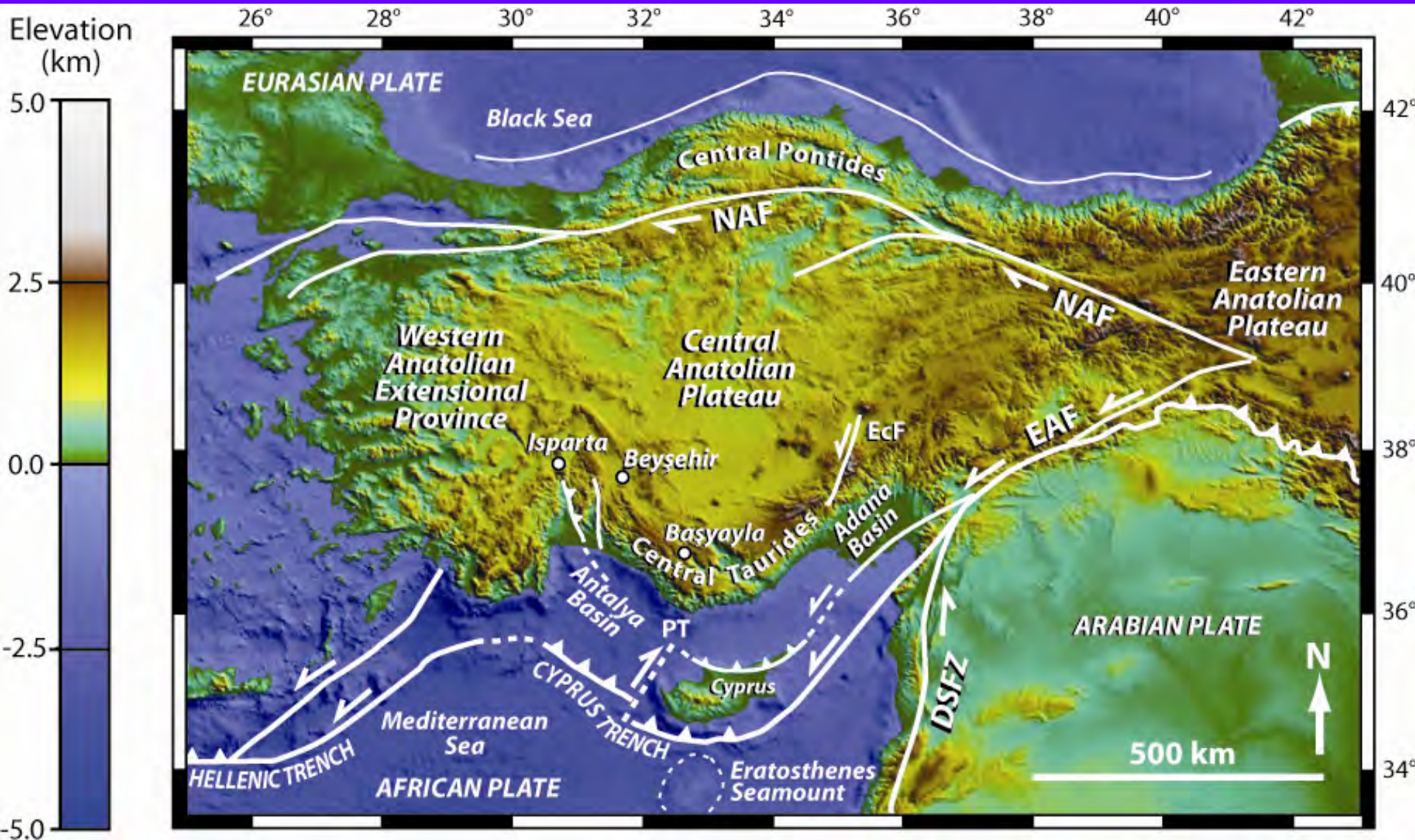


Fig. 1 – The VAMP study area, 1998-2006 precipitation and elevation profiles (Bookhagen, unpublished).

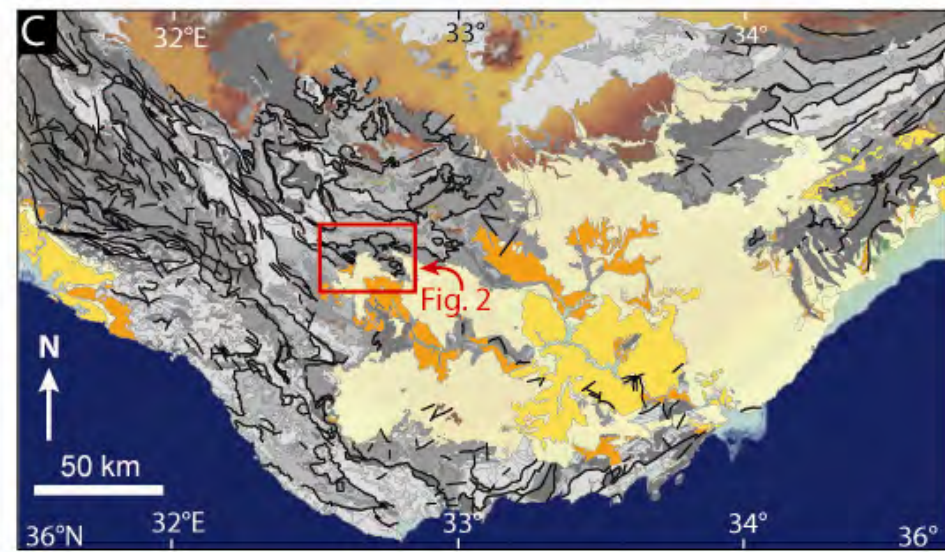
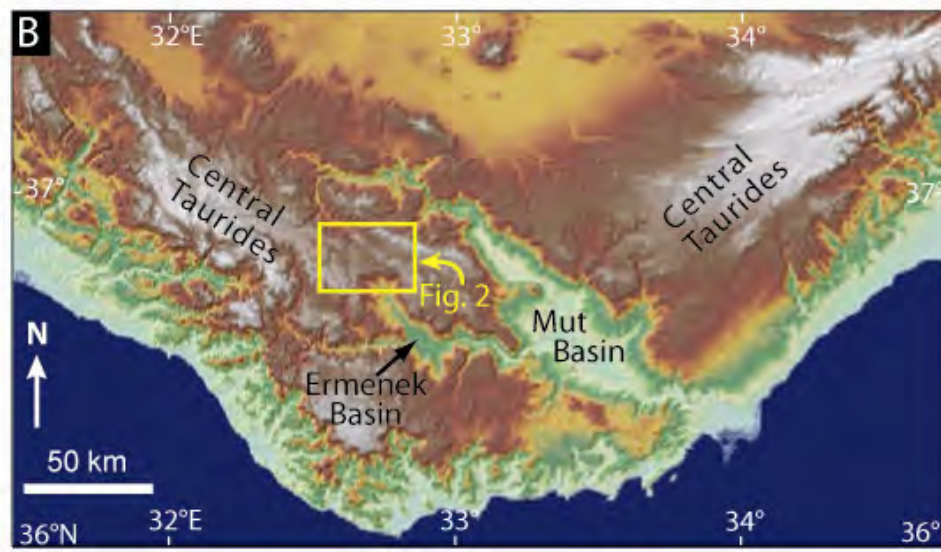
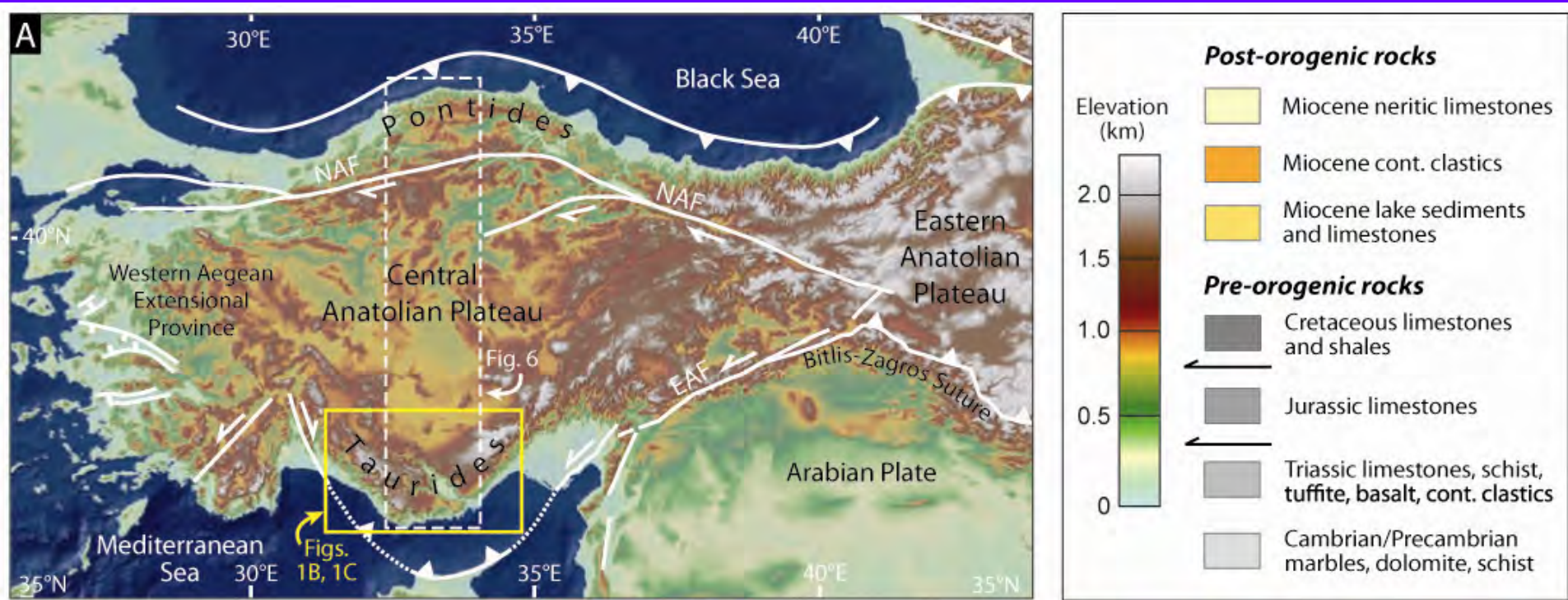


Bassant et al. (2005) identified the upper part of the marine succession on the east side of the Mut Basin to be part of the NN5 biozone (Langhian, 15.97 to 13.65 Ma), while Tanar and Gökçen (1990) identified marine deposits as young as Serravallian (13.65 to 11.61 Ma).



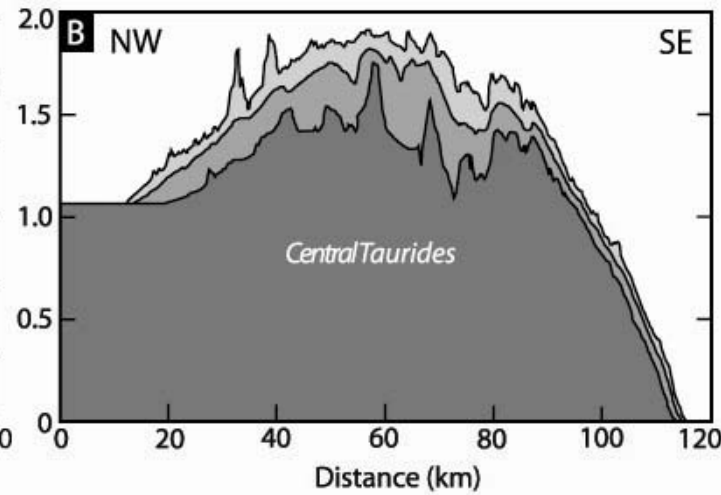
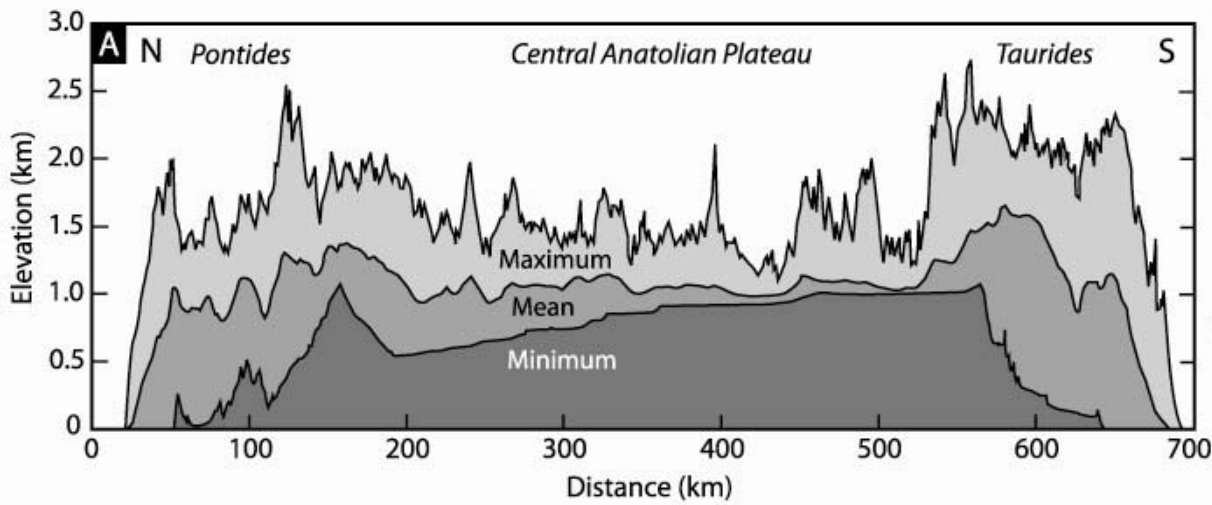


Schildgen et al., Tectonics (2012)



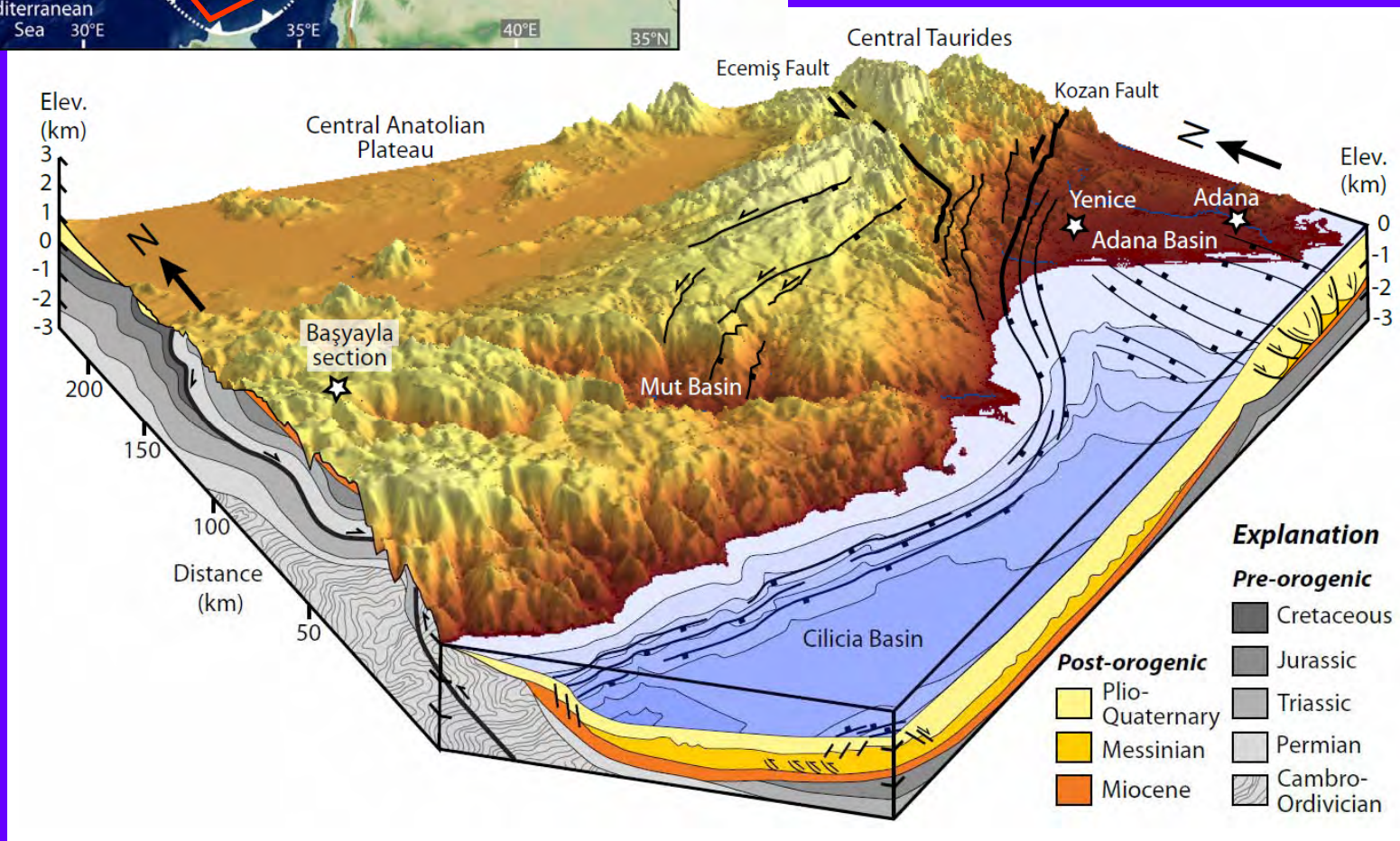
Swath profile of the Central Anatolian Plateau

Swath profile of the CAP
Southern margin



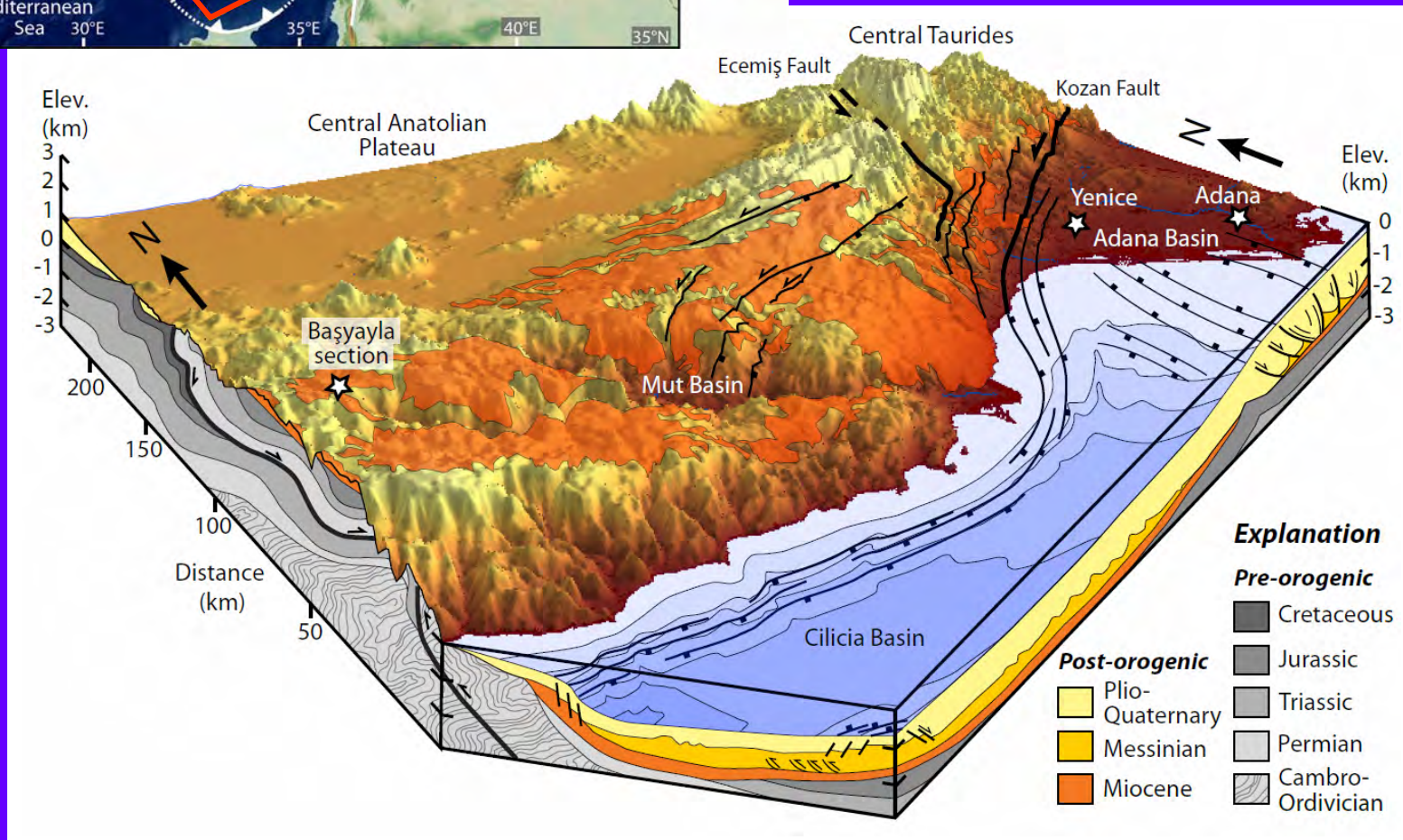


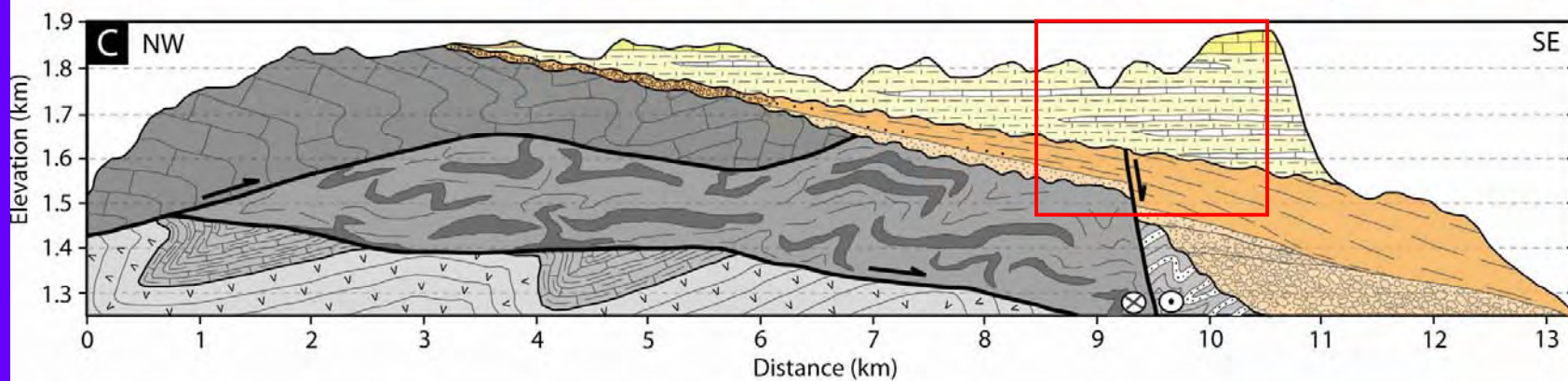
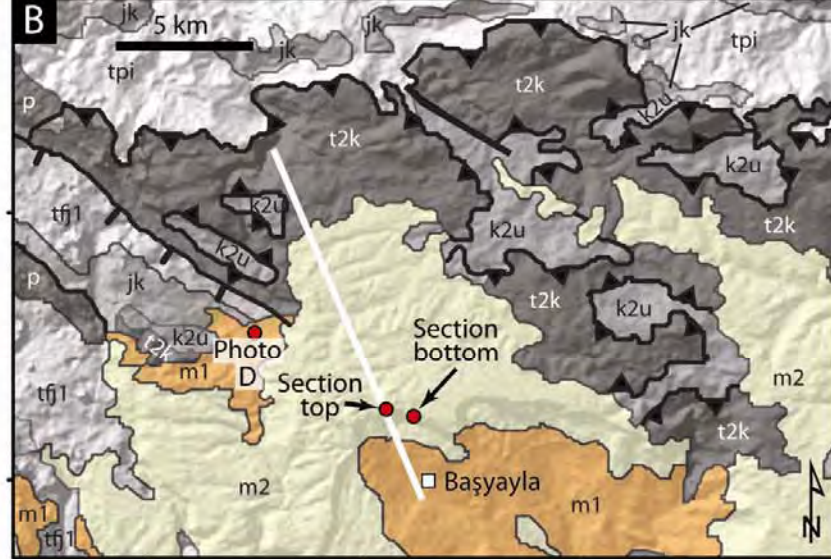
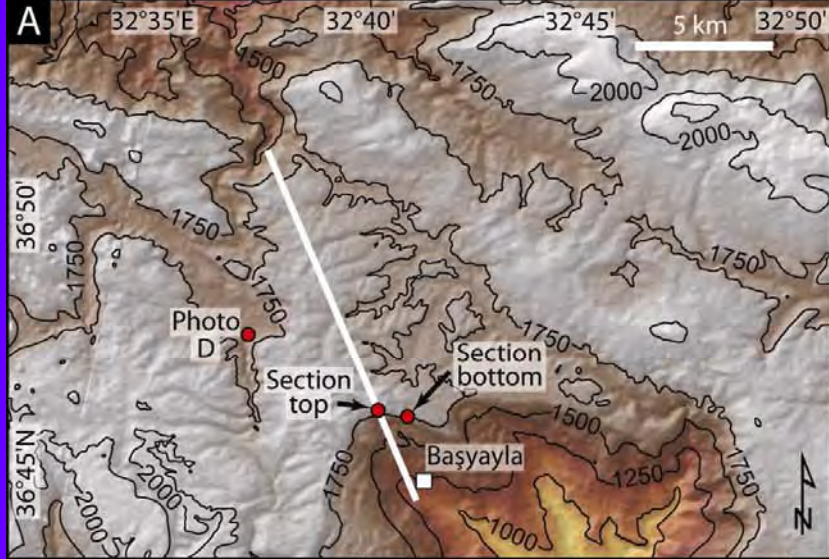
CAP southern margin









Miocene marine deposits overlying the CAP southern margin



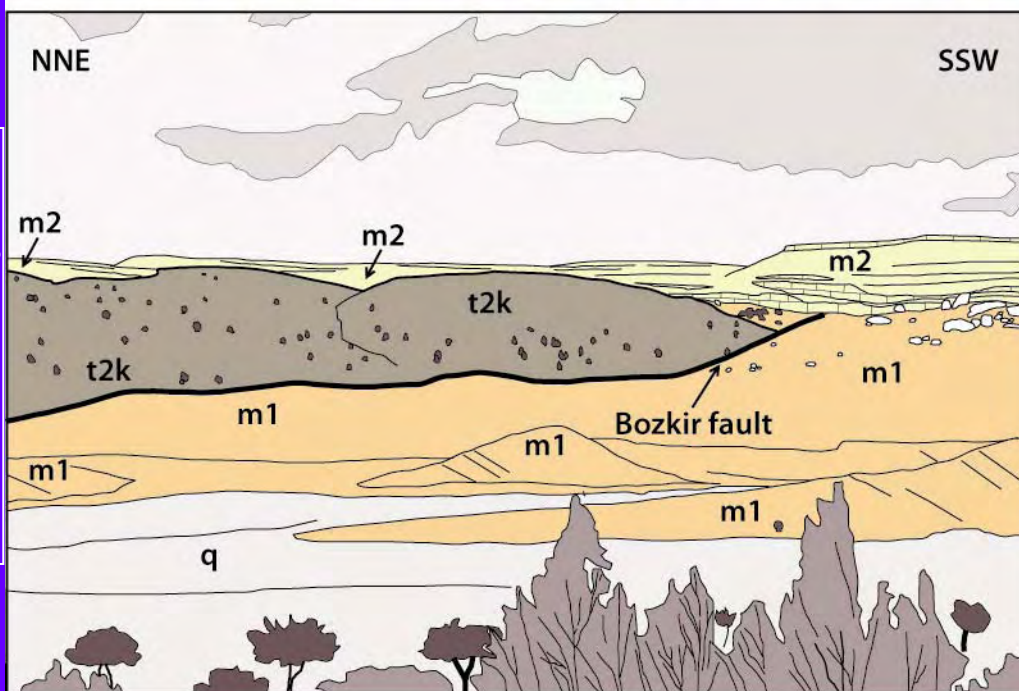
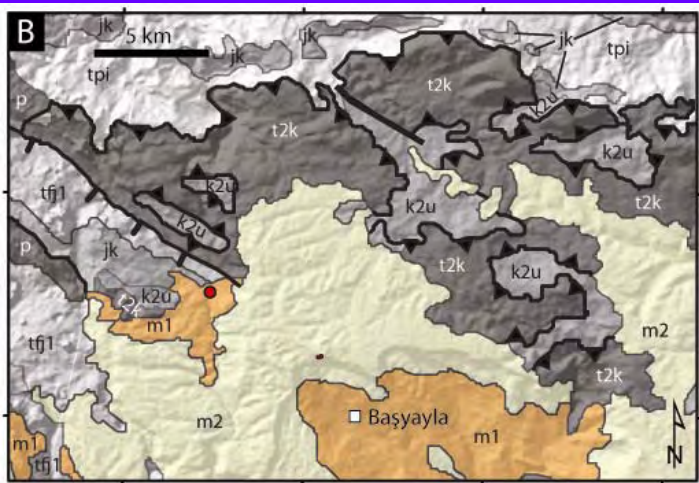


Post-orogenic rocks

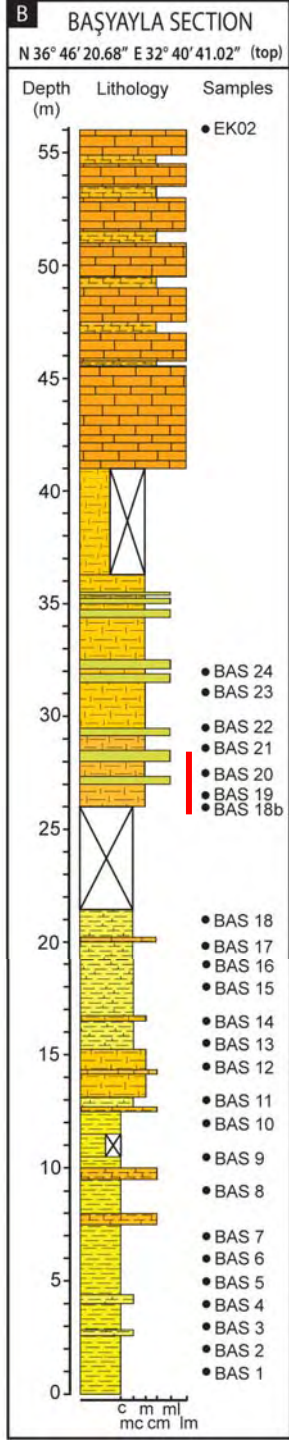
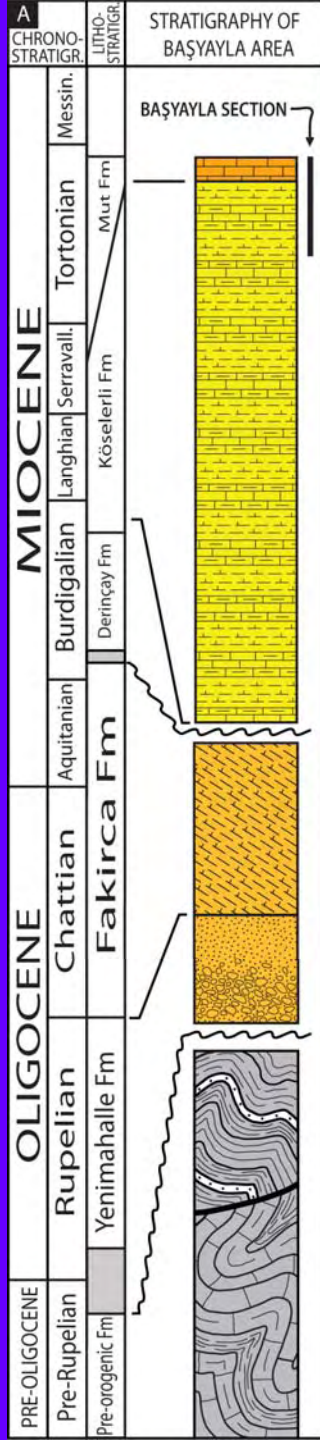
-  Mut Formation (Tortonian p.p., m2)
-  Koselerli Formation (Burdigalian p.p.-Tortonian p.p., m2)
-  Fakirca Formation (Oligocene -Aquitanian p.p., m1)
-  Yenimahalle Formation (Lower Oligocene, m1)

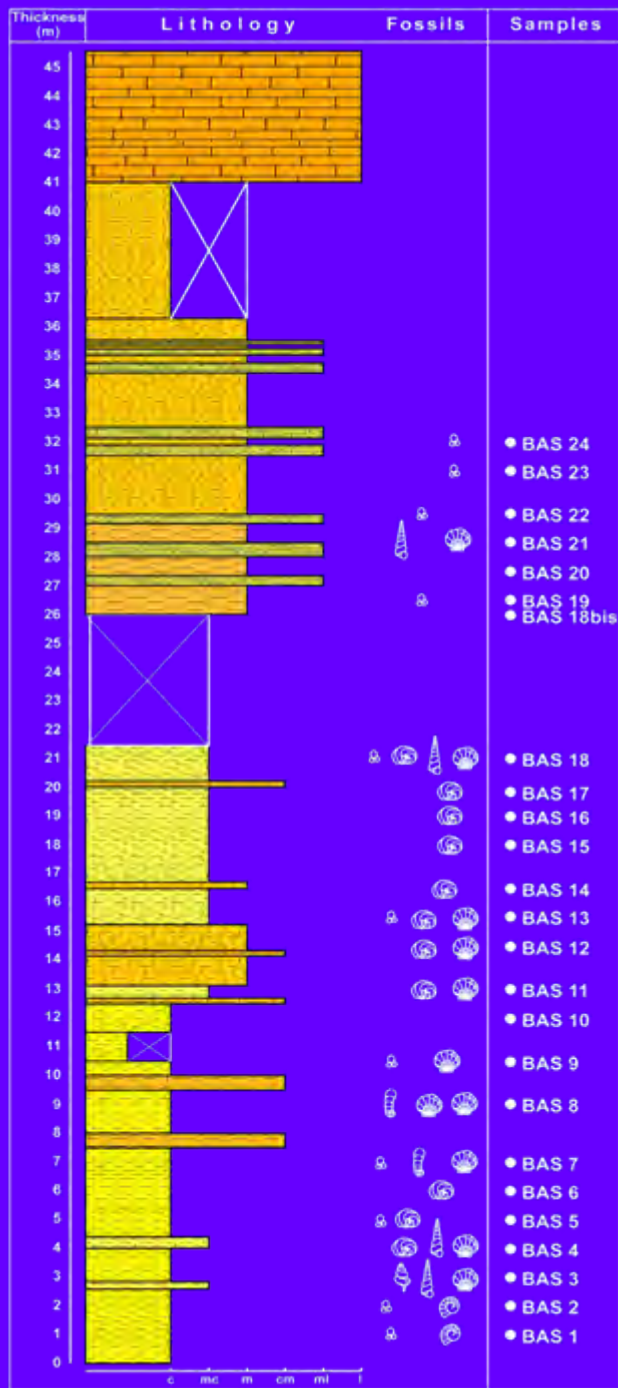
Pre-orogenic rocks

-  Neritic limestones (Middle Triassic-Cretaceous, t2k)
-  Ophiolitic melange (Upper Cretaceous, k2u)
-  Pelagic limestones (Jurassic-Cretaceous, jk)
-  Tuffite, spilite, basalt (Middle-Upper Triassic, tpi)
-  Continental clastic rocks (Upper Rhaetian-Lower Lias, tfj1)
-  Carbonates (Permian, p)



q= Quaternary covers
m2= shallow and deeper marine deposits
 (Burdigalian p.p.-Tortonian p.p.)
m1= continental clastic deposits
 (Rupelian-Aquitainian p.p.)
t2k= neritic limestones
 (Middle Triassic-Cretaceous)





DEPTH (m)

Infralittoral

Inner Circalittoral

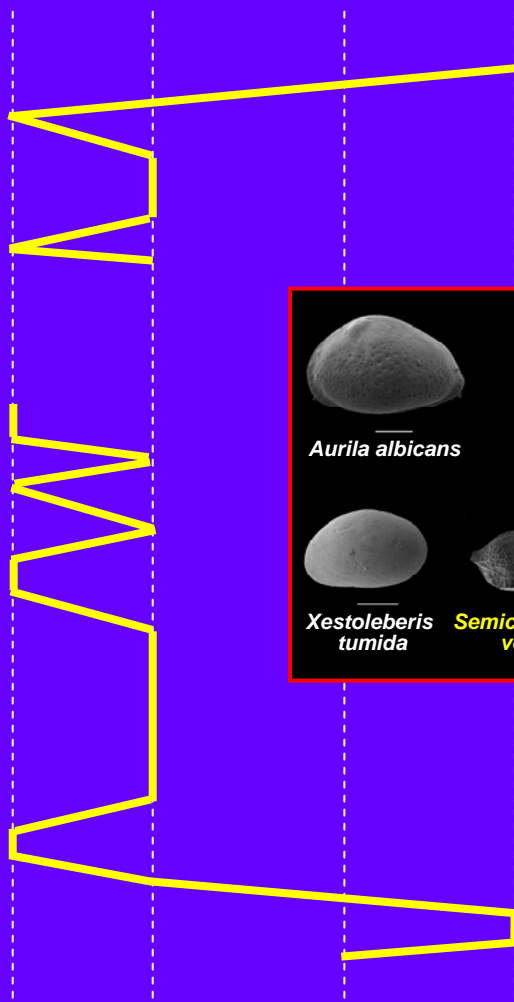
Outer Circalittoral

0-25

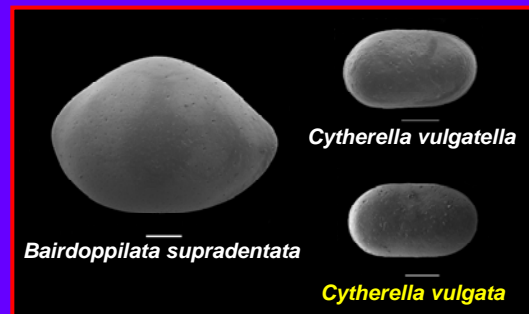
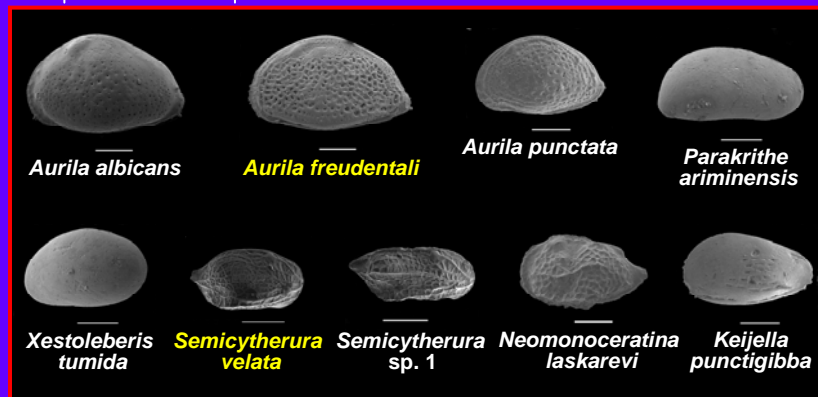
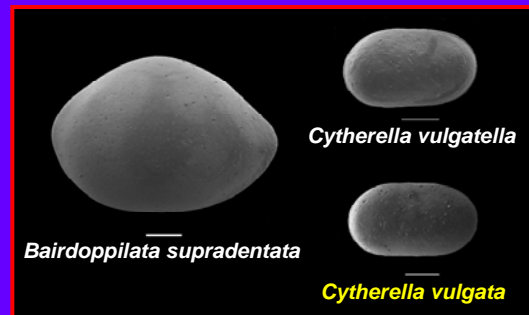
50-60

70-80

100-150



OSTRACOD ASSEMBLAGES



Bryozoa

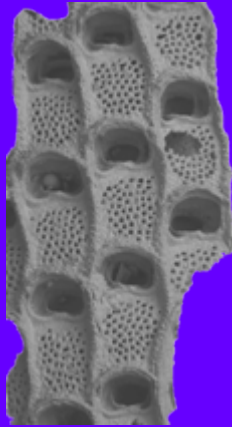
Hippoporella



Biflustra



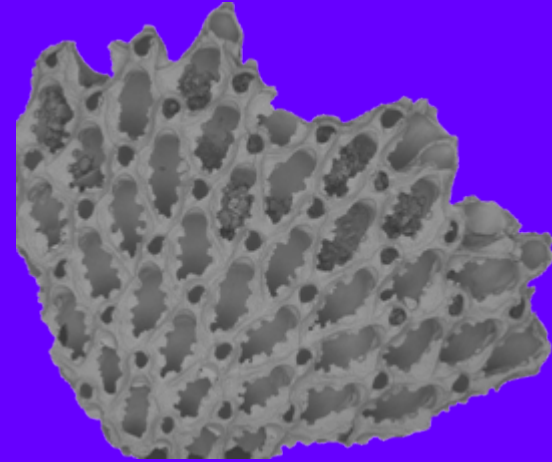
Steginoporella



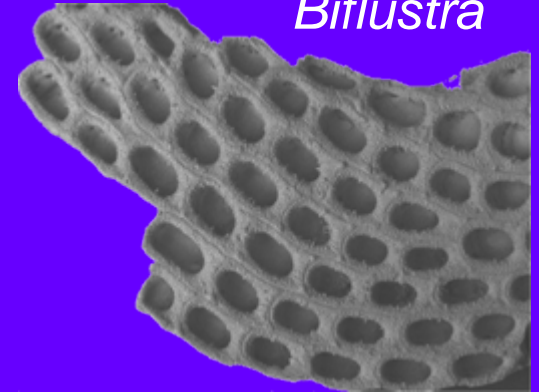
Nellia cf. oculata



Reussiella haidingeri



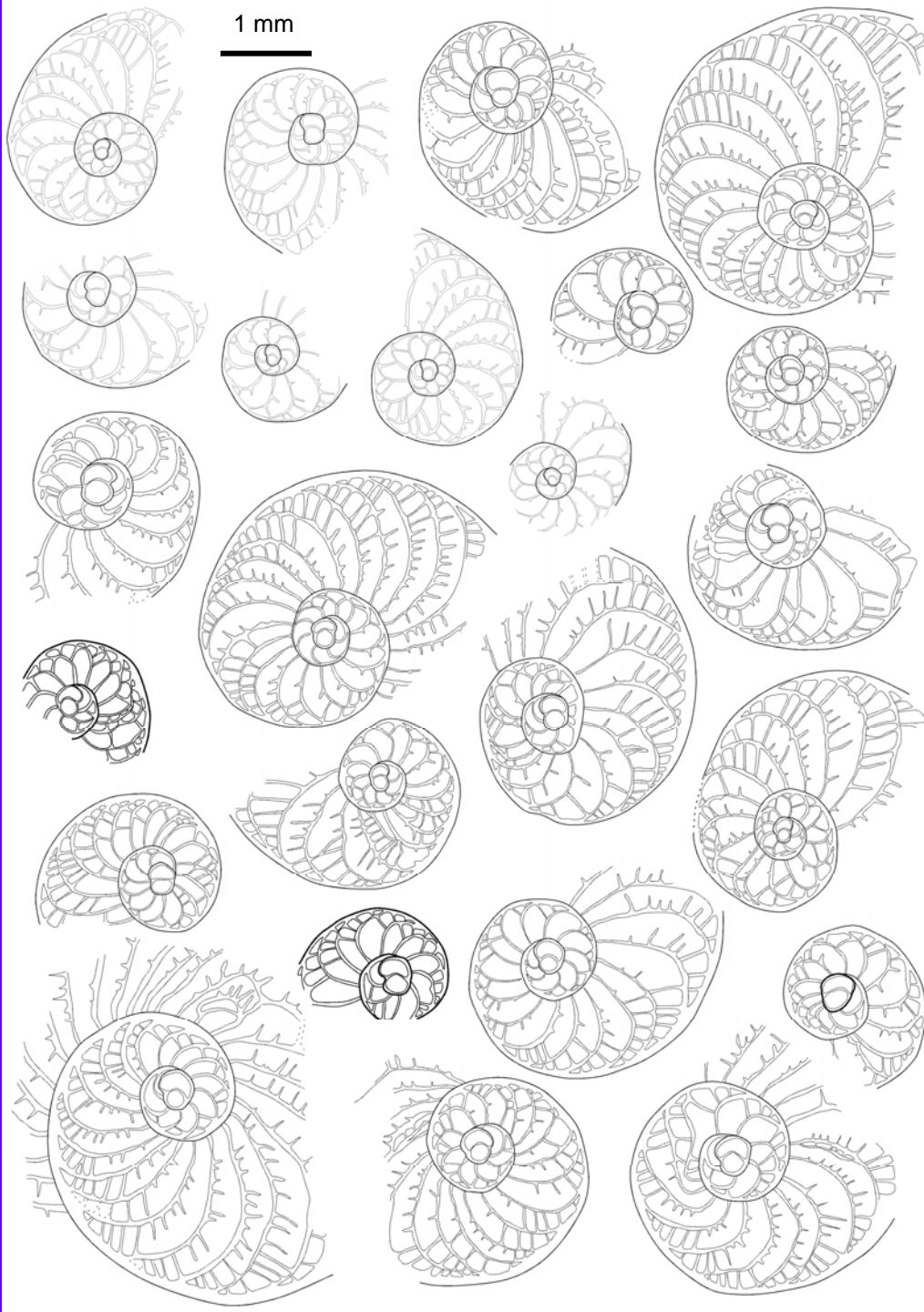
Biflustra



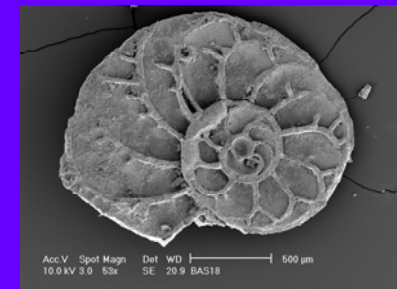
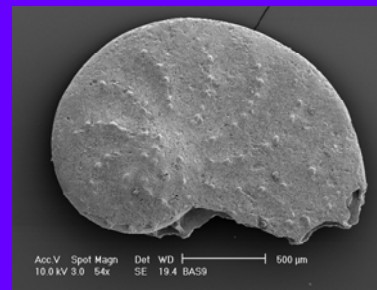
by courtesy of K. Zágoršek

Palaeoenvironmental indications:

very hot water, deeper environment (up to 100m), and low energy of water



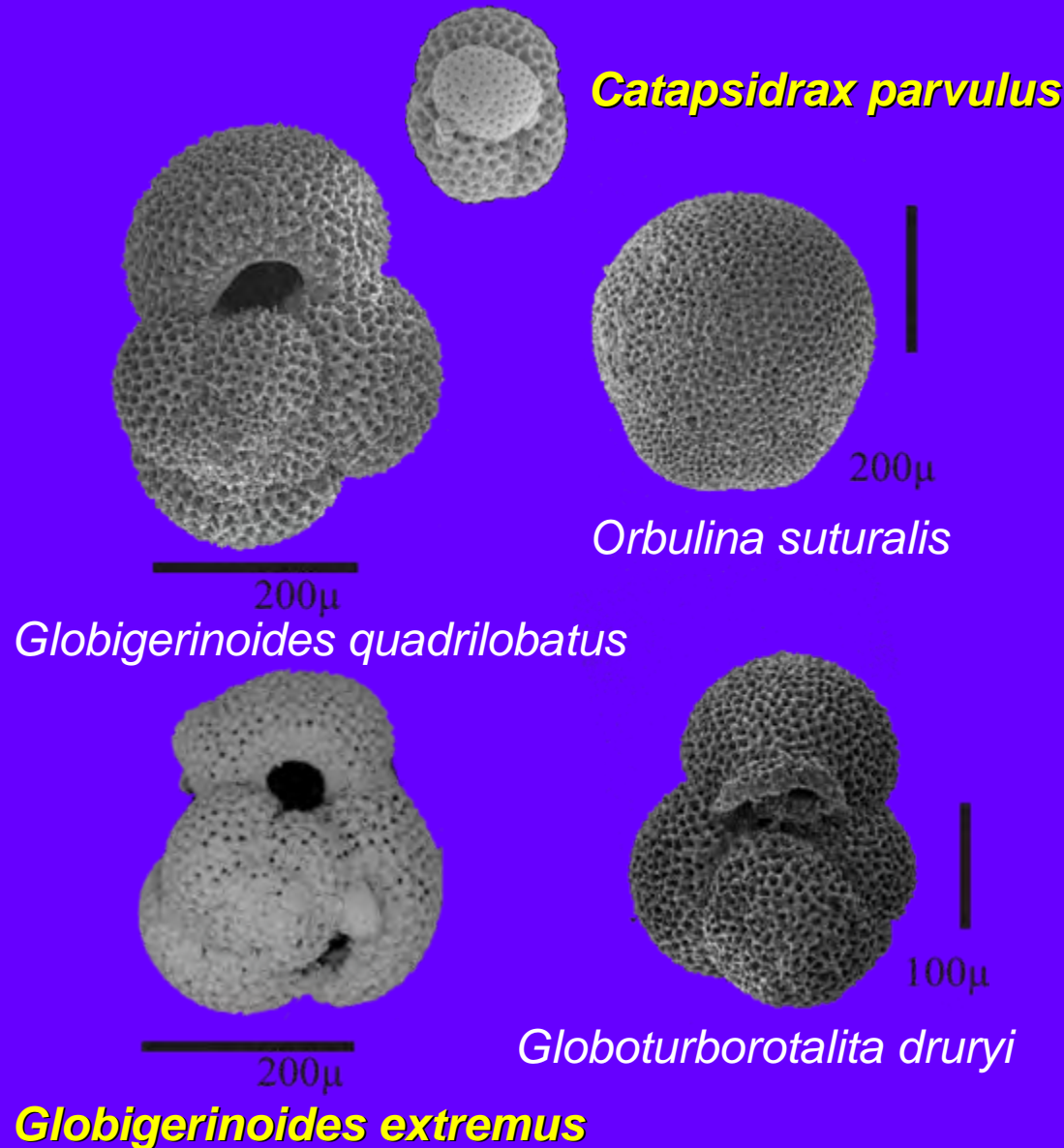
by courtesy of J. Pignatti

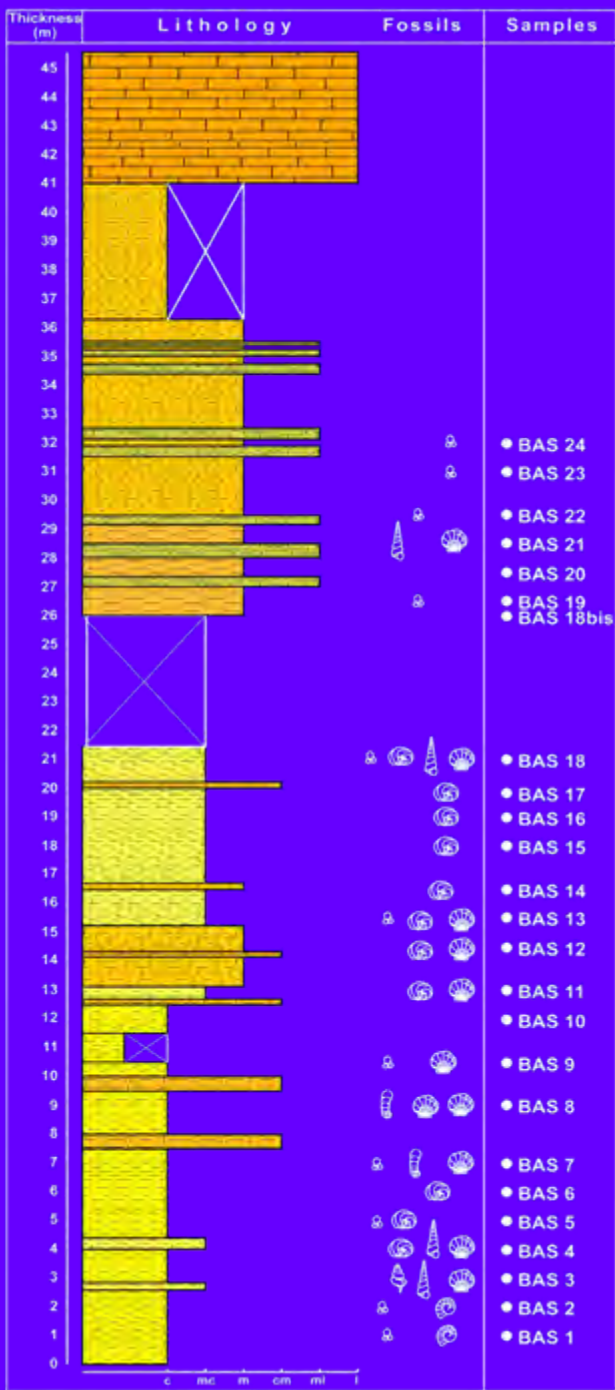


In the Başyayla section, the heterostegina assemblages are characterized by the occurrence of two species:
Heterostegina costata and *H. papyracea*

PLANKTONIC FORAMS

- The planktic foraminiferal contingent consists of few species, among which *Orbulina suturalis* and *O. universa*, rare *Praeorbulina* sp., frequent ***Catapsidrax parvulus***, *Globigerinoides trilobus*, *Globigerinoides quadrilobatus* and ***Globigerinoides extremus***.
- *Globigerinoides extremus* - *Globorotalia suterae* Interval Subzone (MMi 12a), which ranges from 8.35 to 7.81 Ma (late Tortonian).





Globigerinoides extremus

Catapsidrax parvulus

Mediterranean planktonic foraminifer biozone
(Iaccarino et al., 2007)

MMi 12a

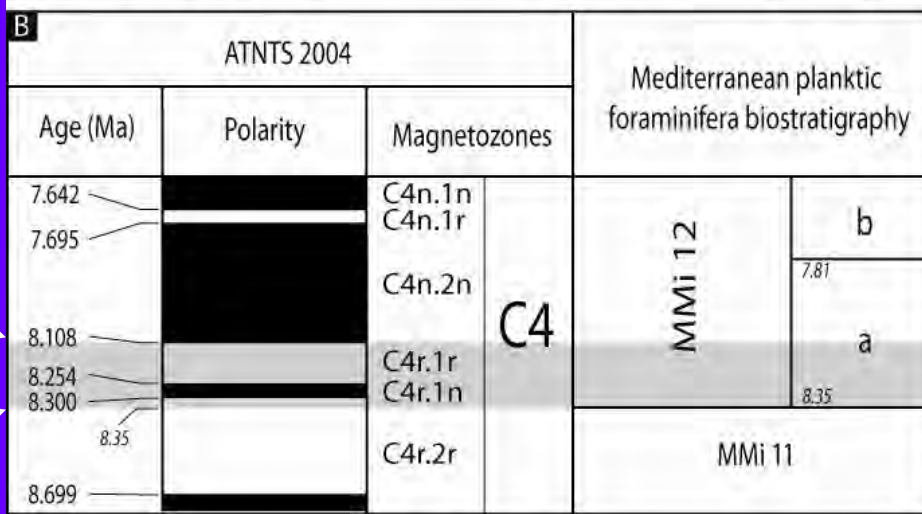
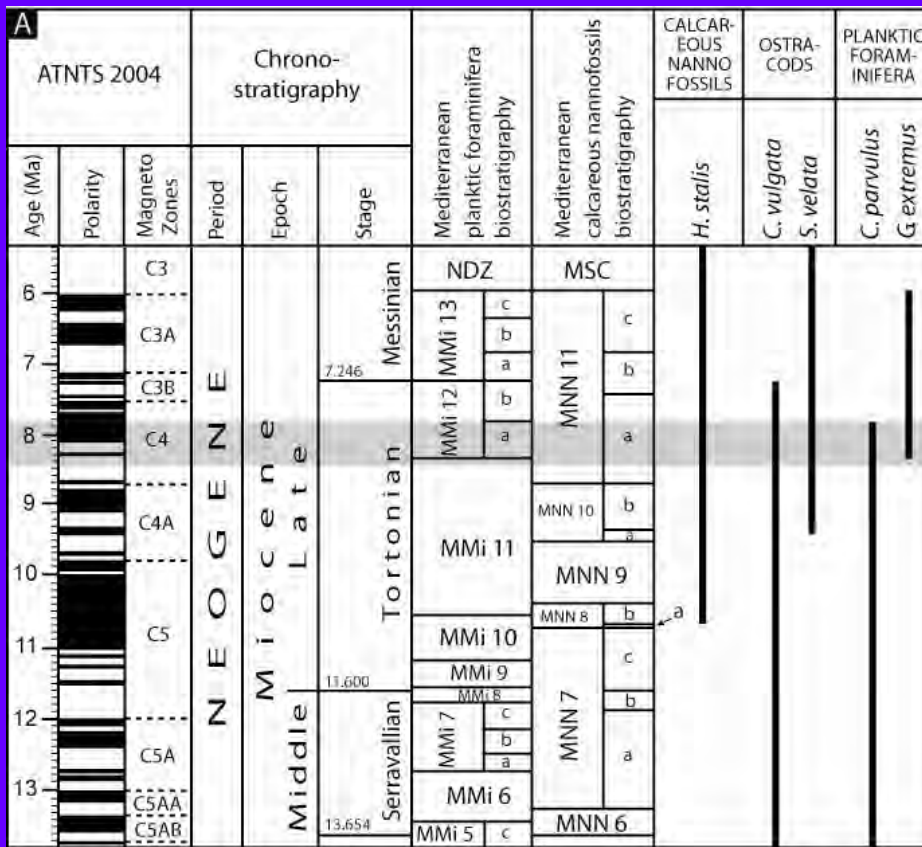
MMi 11

T O R T O N I A N

Age

8.35 Ma

ATNTS 2004			Chronostratigraphy			Mediterranean planktonic foraminifer biostratigraphy	Mediterranean calcareous nannofossils biostratigraphy	CALCAREOUS NANNO FOSSILS	OSTRACODS	PLANKTONIC FORAMINIFERS			
Age	Polarity	Magneto Zones	Period	Epoch	Stage			<i>H. stalis</i>	<i>C. vulgata</i> <i>S. velata</i>	<i>C. parvulus</i> <i>G. extremus</i>			
6		C3	E	e	Messinian	NDZ		MNN 11	MSC				
7		C3A				N	7.246				MMi 13	c	c
		C3B										a	b
8		C4	E	n	Tortonian	MMi 12	a	MNN 11	MSC				
9		C4A	G	e	Tortonian	MMi 11	MNN 10	b					
10							a						
11		C5	E	o	Middle	MMi 10	MNN 9	b					
12		C5A					N	11.600			MMi 9	MNN 8	a
												MMi 8	c
13		C5AA C5AB		13.654	Serravalian	MMi 7	a	MNN 7					
						MMi 6	b						
						MMi 5	c	MNN 6					



8.108 Ma

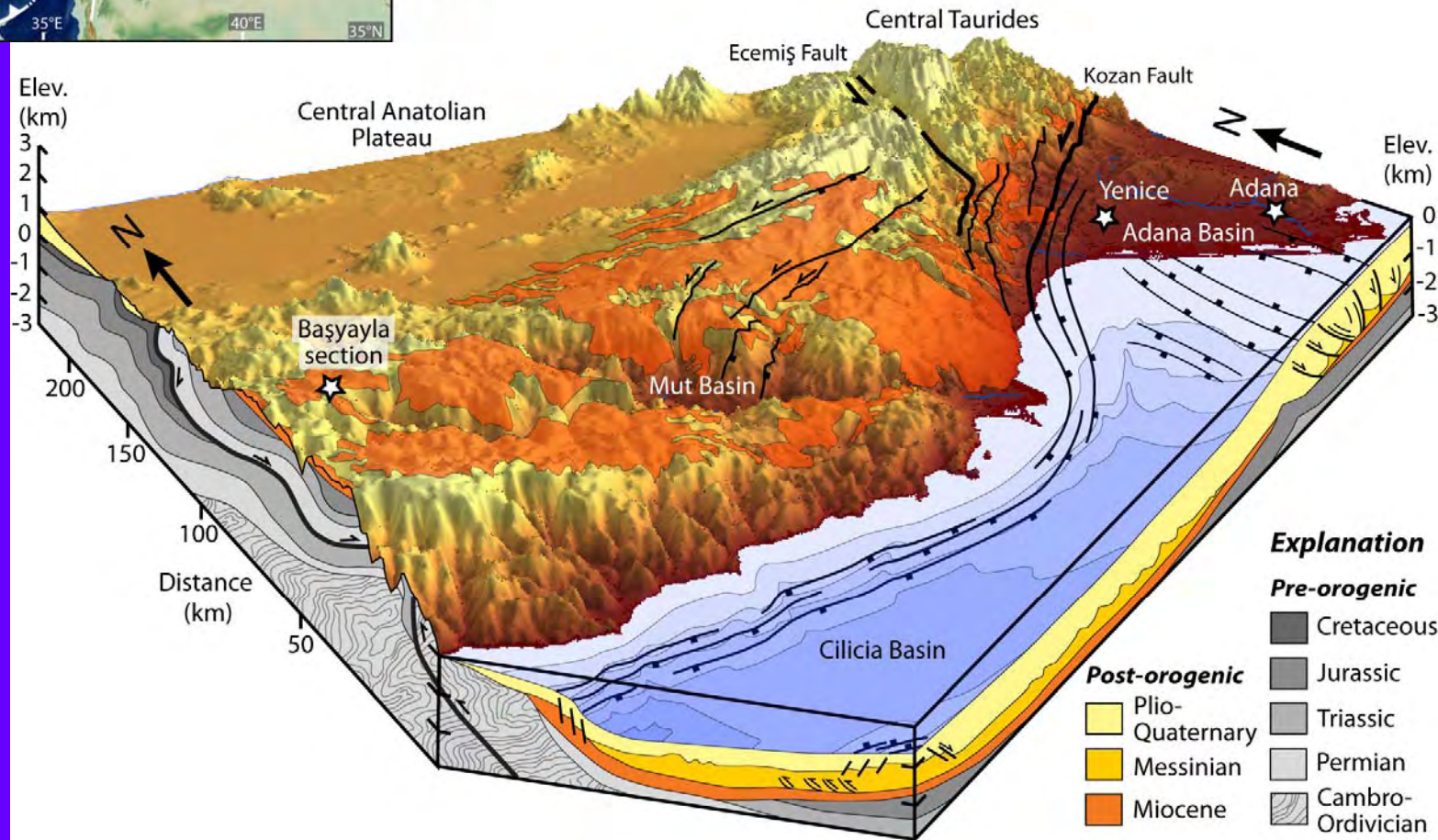


8.35 Ma





The uplift of the CAP southern margin is younger than ca. 8 Ma
 Post-8 Ma uplift rate ~0.25 mm/yr



Cosentino et al., GSA Bull. (2012)



Schildgen et al., Tectonics (2012)



Image © 2010 GeoEye
© 2010 Cnes/Spot Image
Image © 2010 DigitalGlobe

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

37°20'40.72"N 11°21'27.27"E elev.1520 m

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le immagini: 24 Gen. 200230 Maggio 2009

Alt. 5.70 km



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Alt. 4.17 km

E

W

1500 m a.s.l.





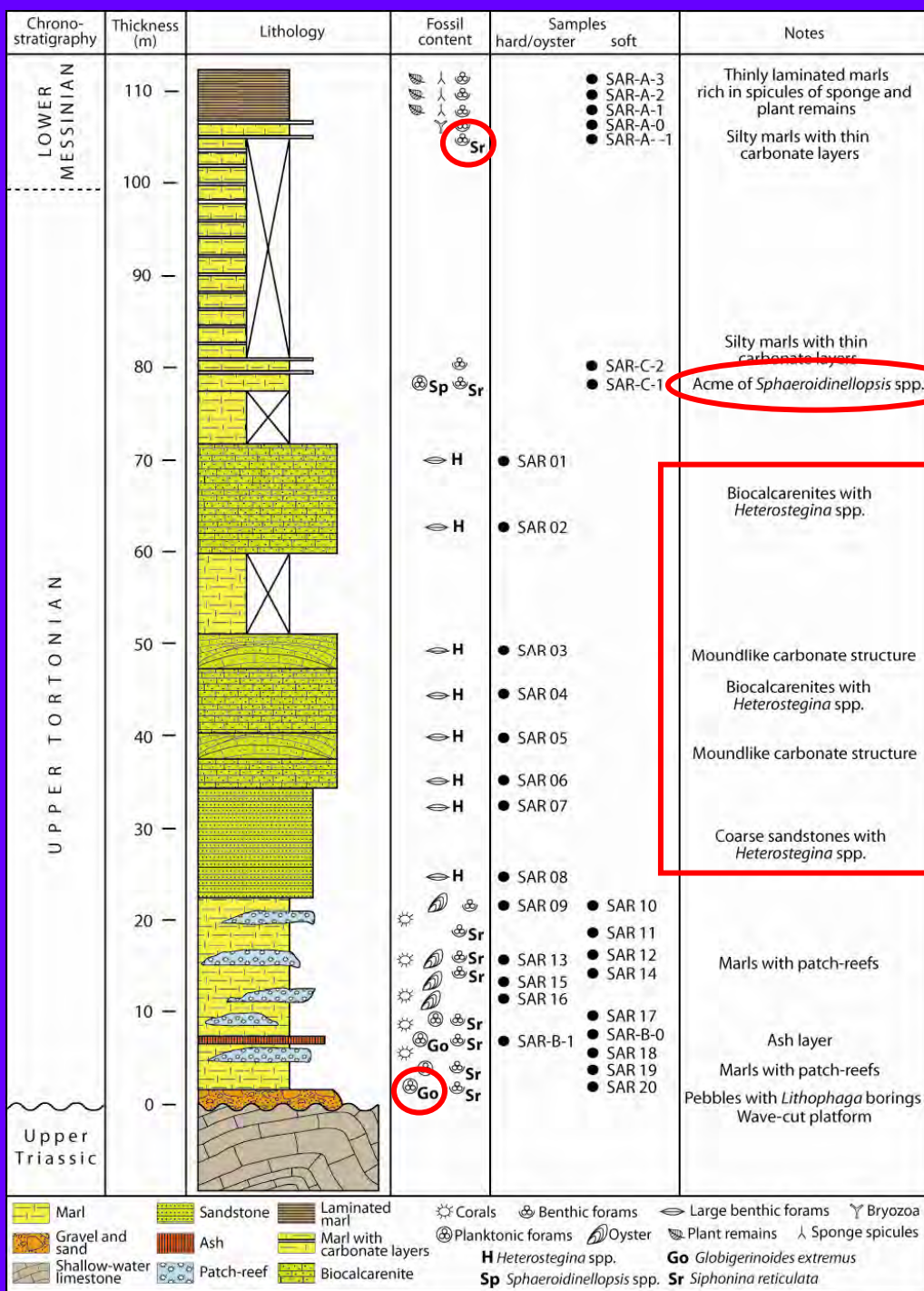
Nikon

E

W



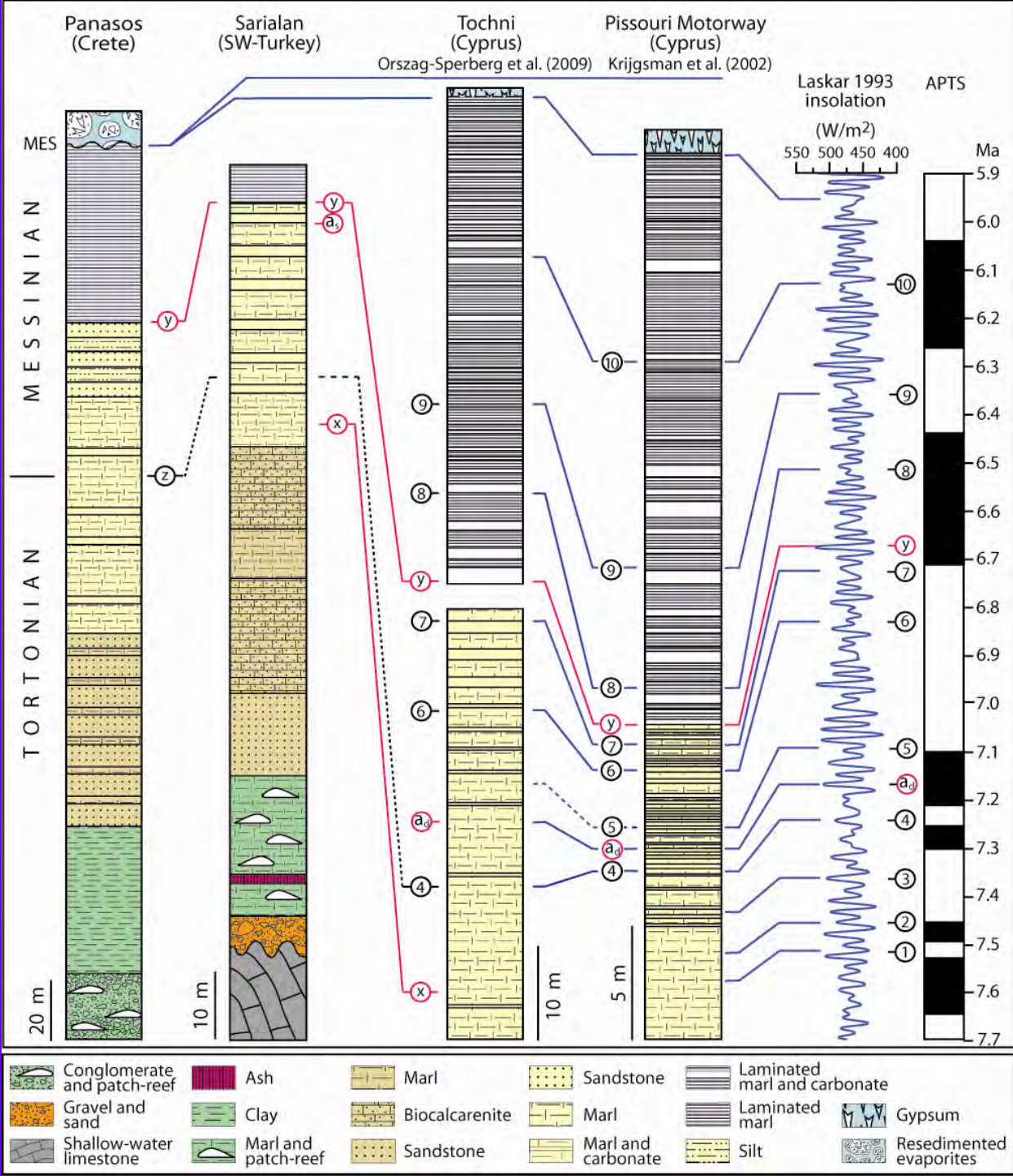
Sarialan section

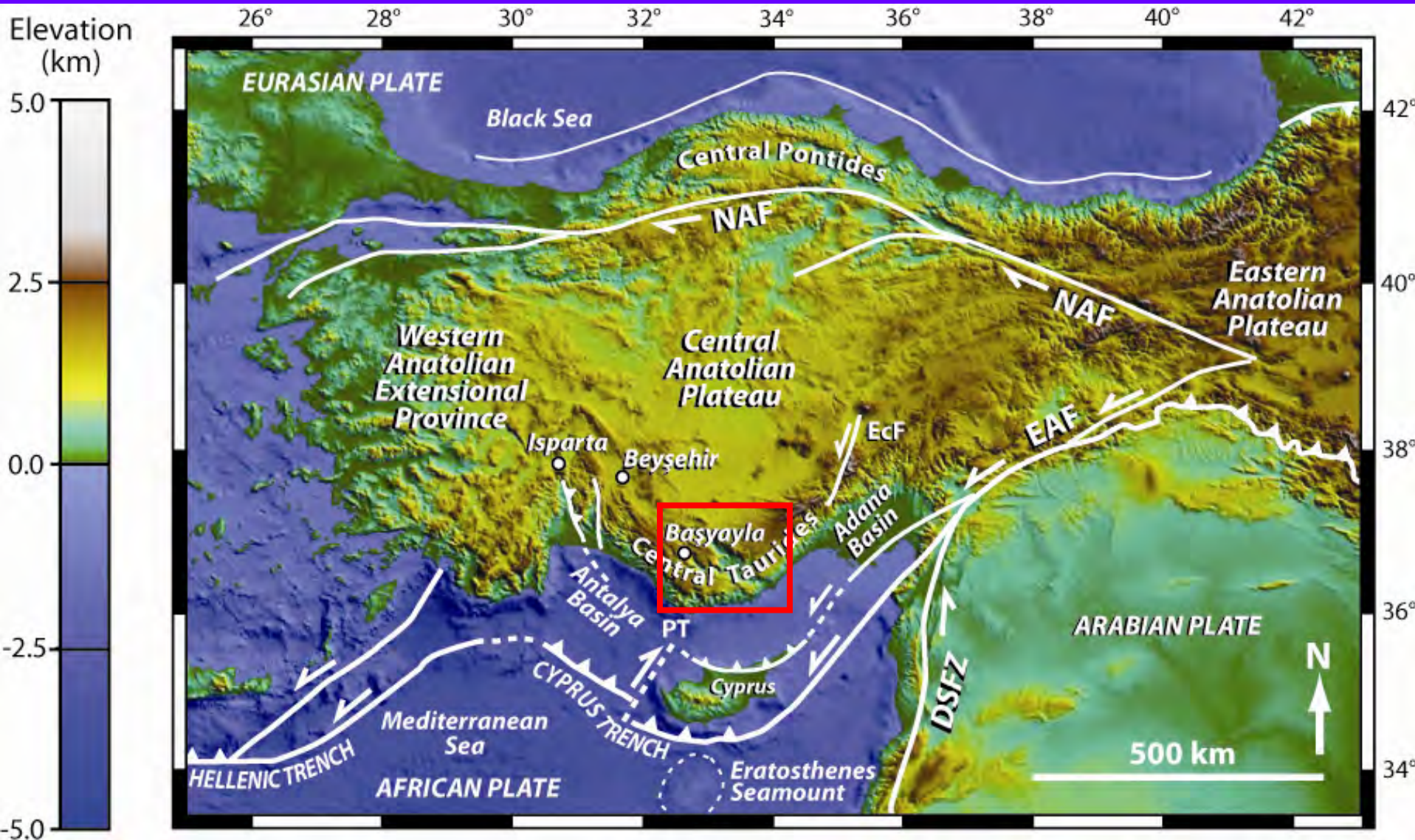


< 8.35 Ma

Younger marine deposits at Sarialan section <6.7 Ma

Uplift of the SW margin is younger than 6.7 Ma
 Post-6.7 Ma uplift rate ~0.22 mm/yr

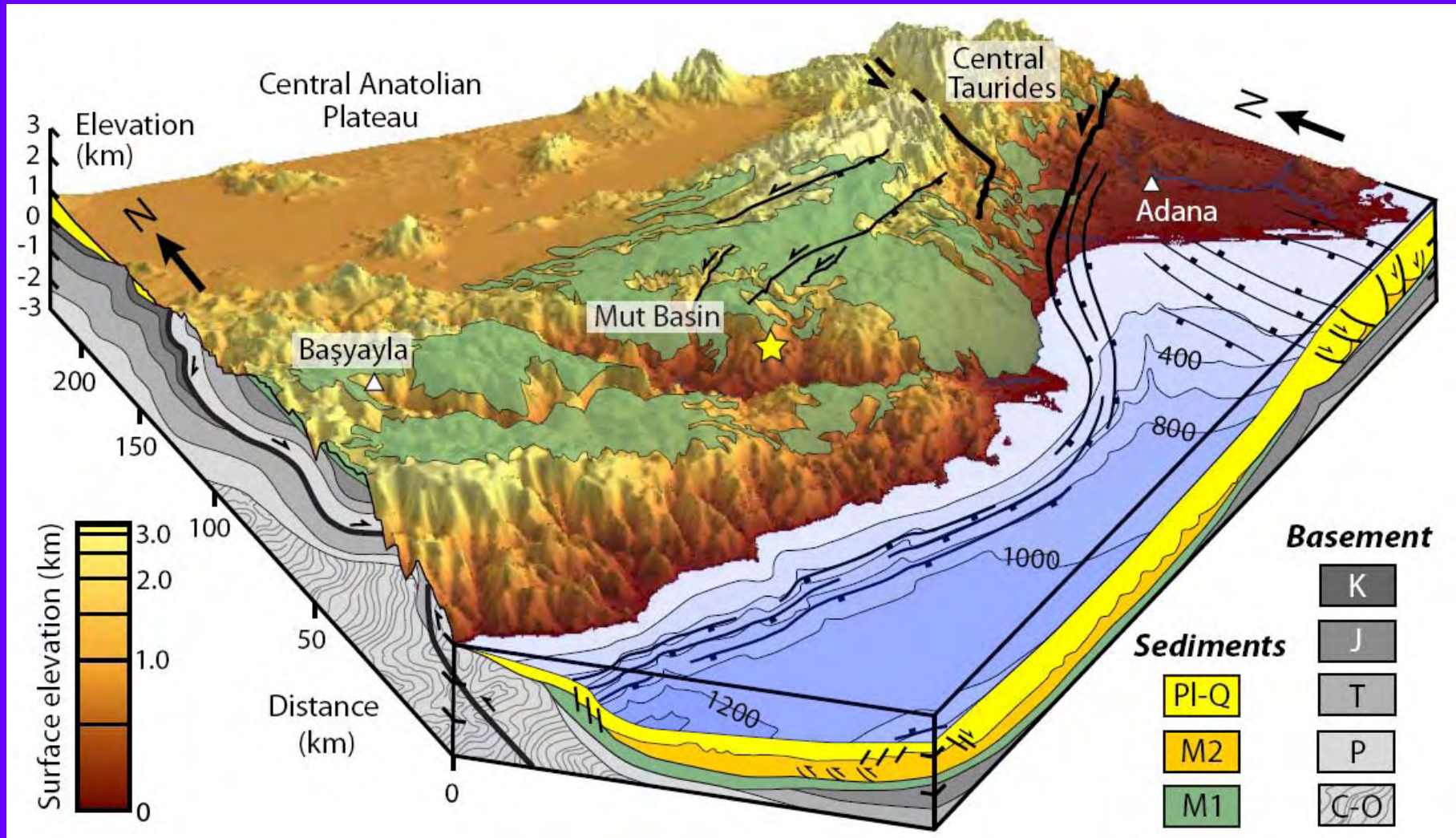




Schildgen et al., Tectonics (2012)

Next constraint:

Age of younger inset marine sediments within Mut Basin



NE

SW

Marine onlap

1200 m a.s.l.



Yenisu



SW

NE

Marine onlap
1200 m a.s.l.

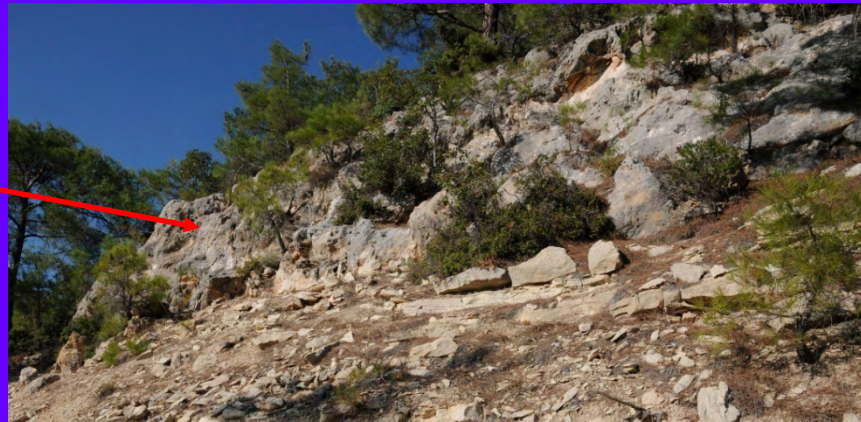
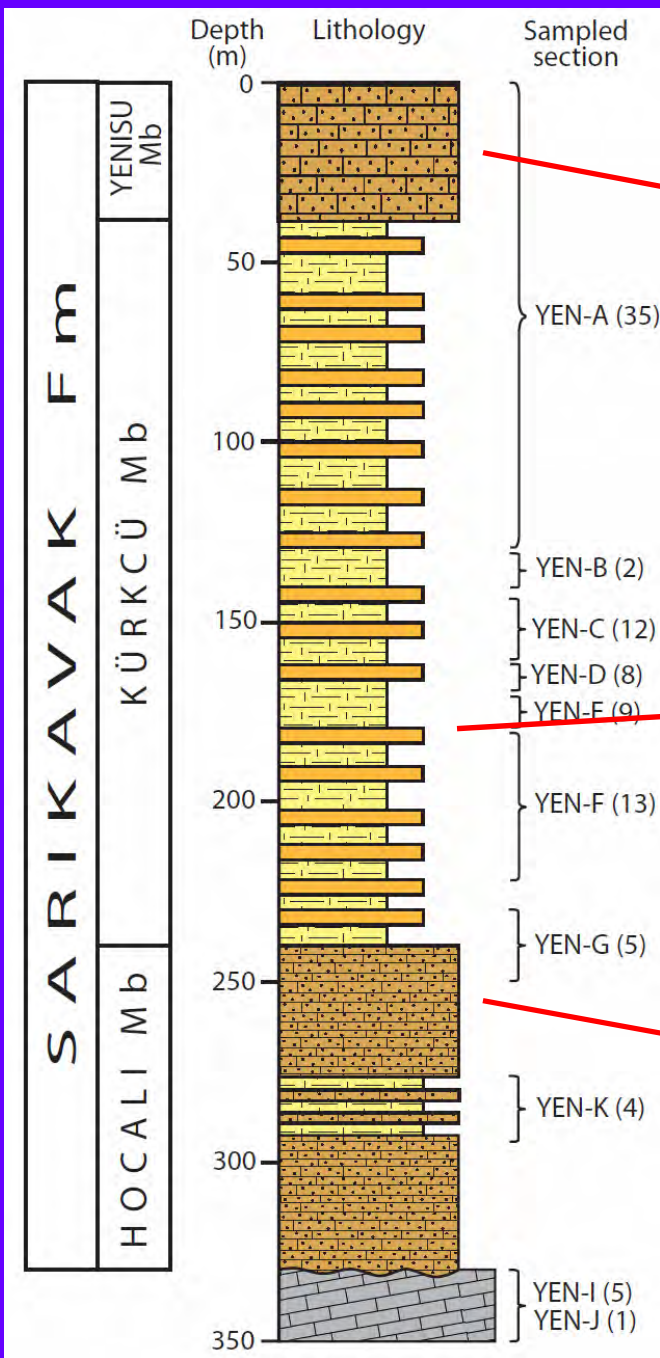


NW

SE

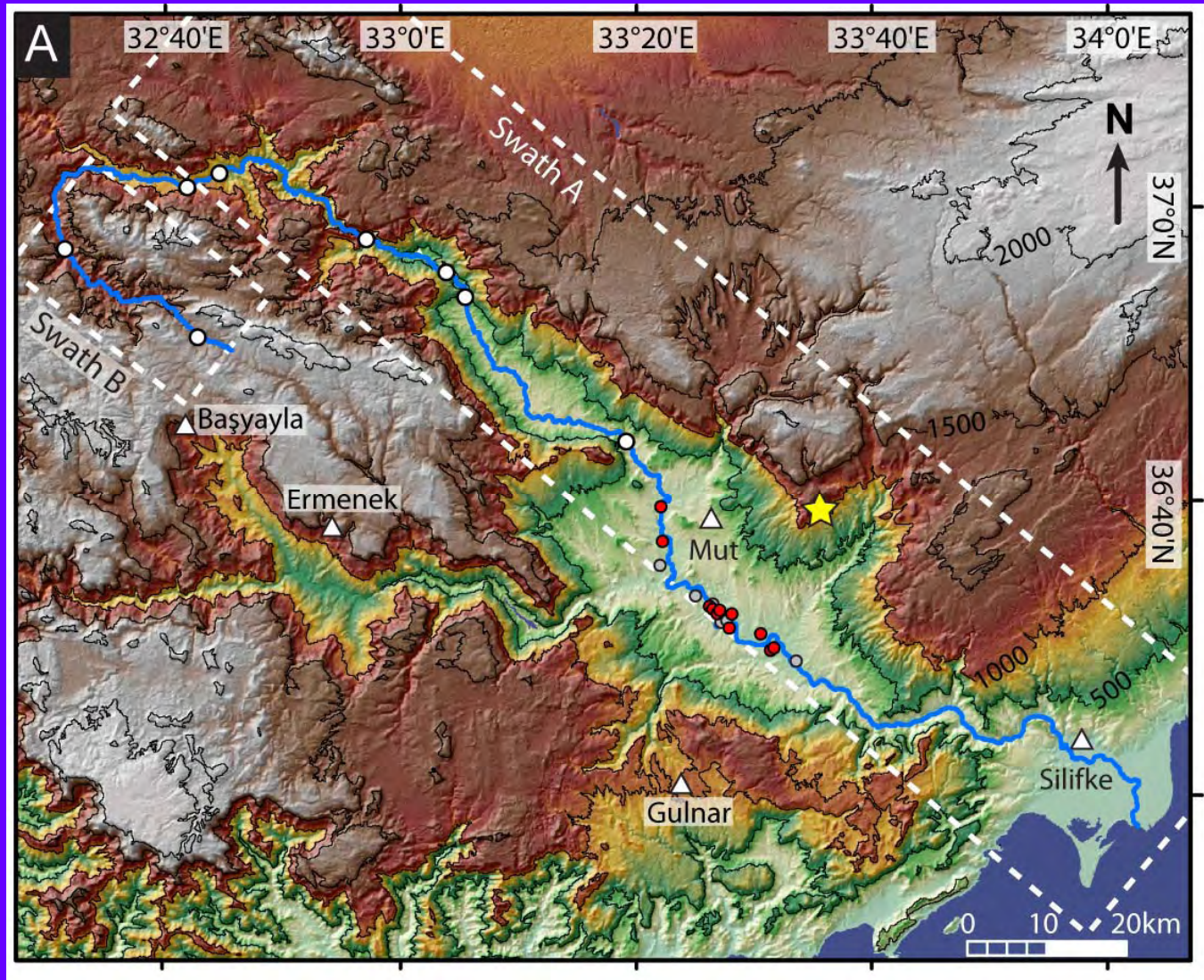
Yenisu





Youngest and highest marine sediments within inset succession:
1.6 Ma at ~1.2 km
 Post-1.6 Ma uplift rate:
~0.7 mm/yr

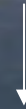
Final geologic constraint: Mut Basin fluvial terraces

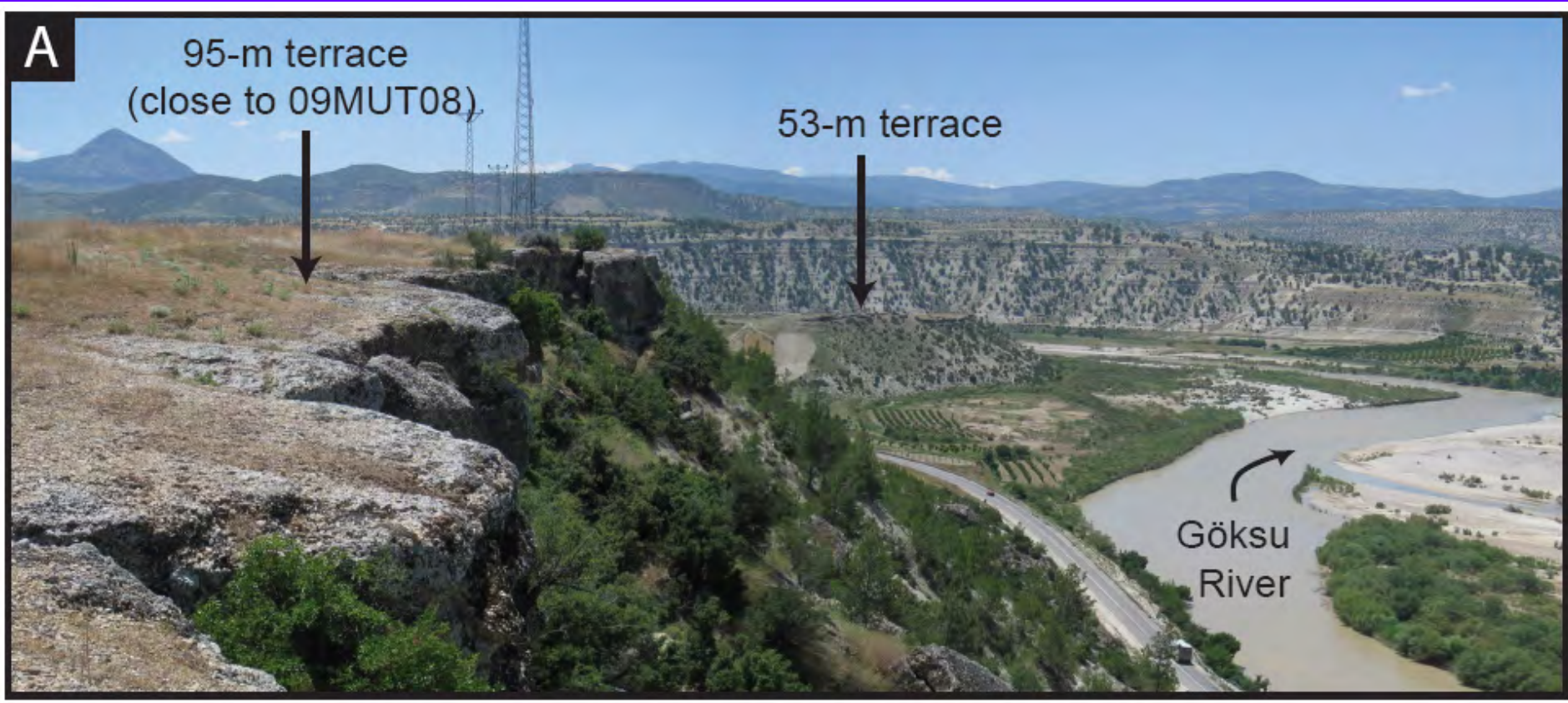


NW

SE

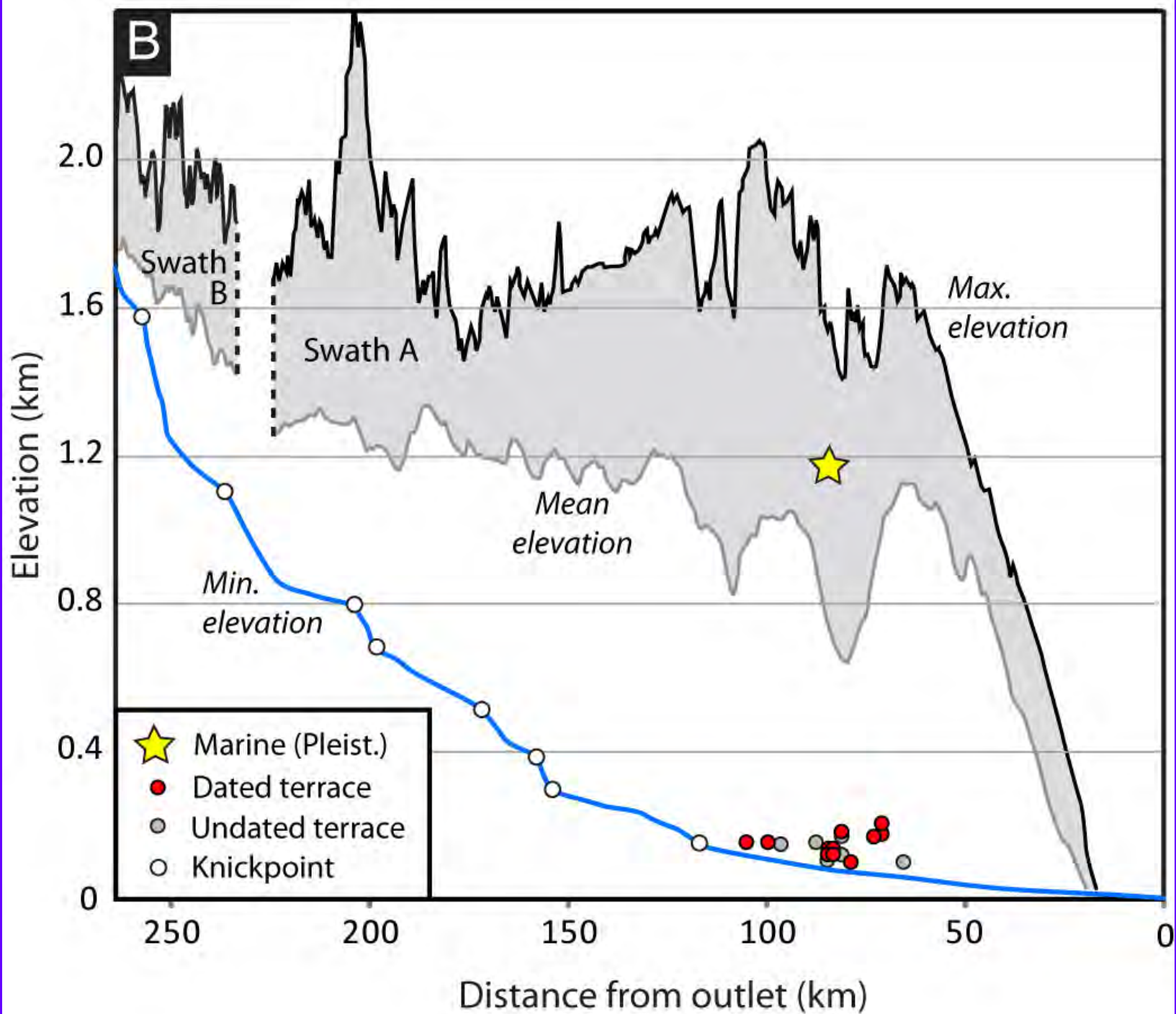
Göksu River



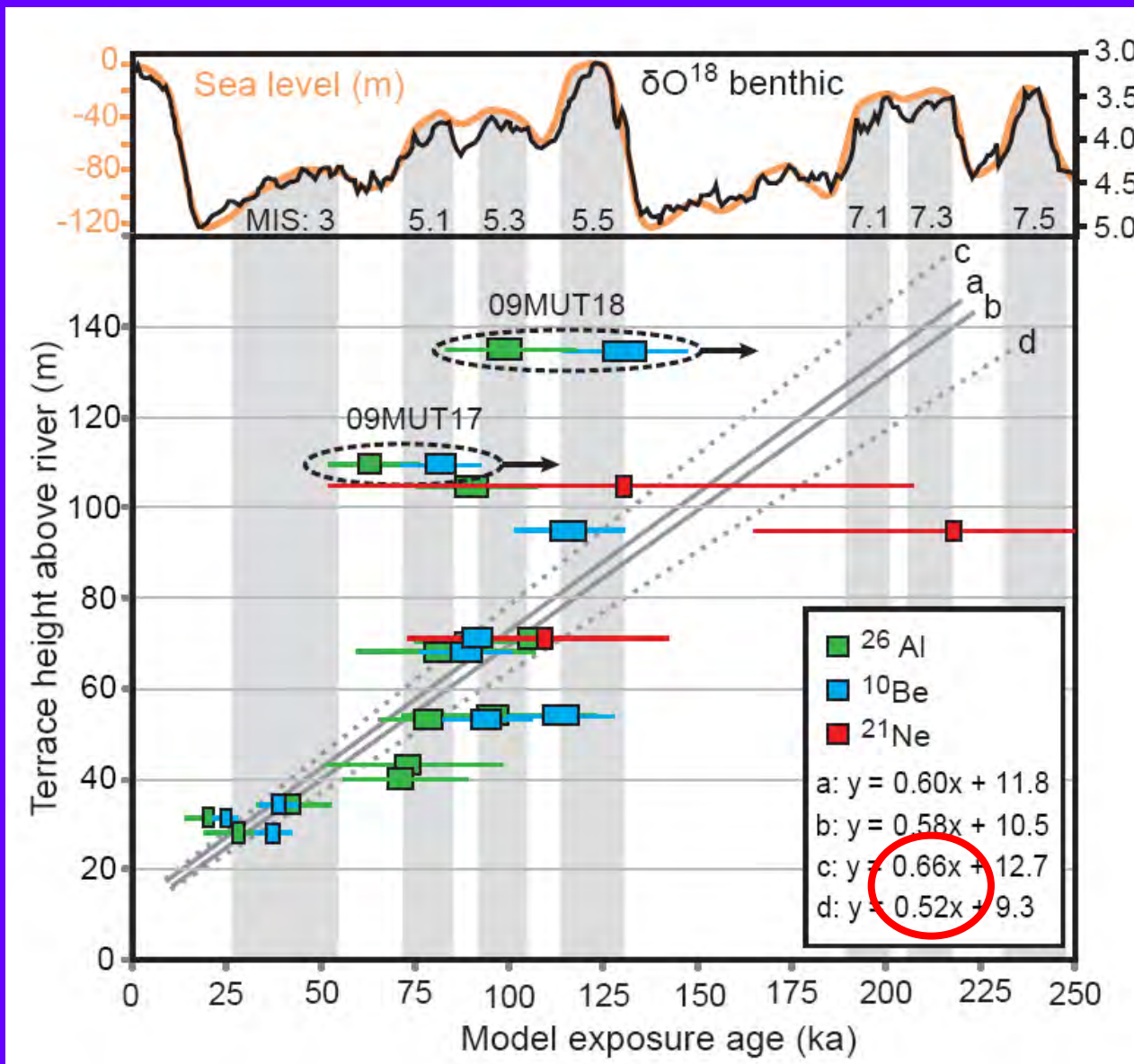


Gravels capping strath
terraces

Schildgen et al., EPSL (2012)



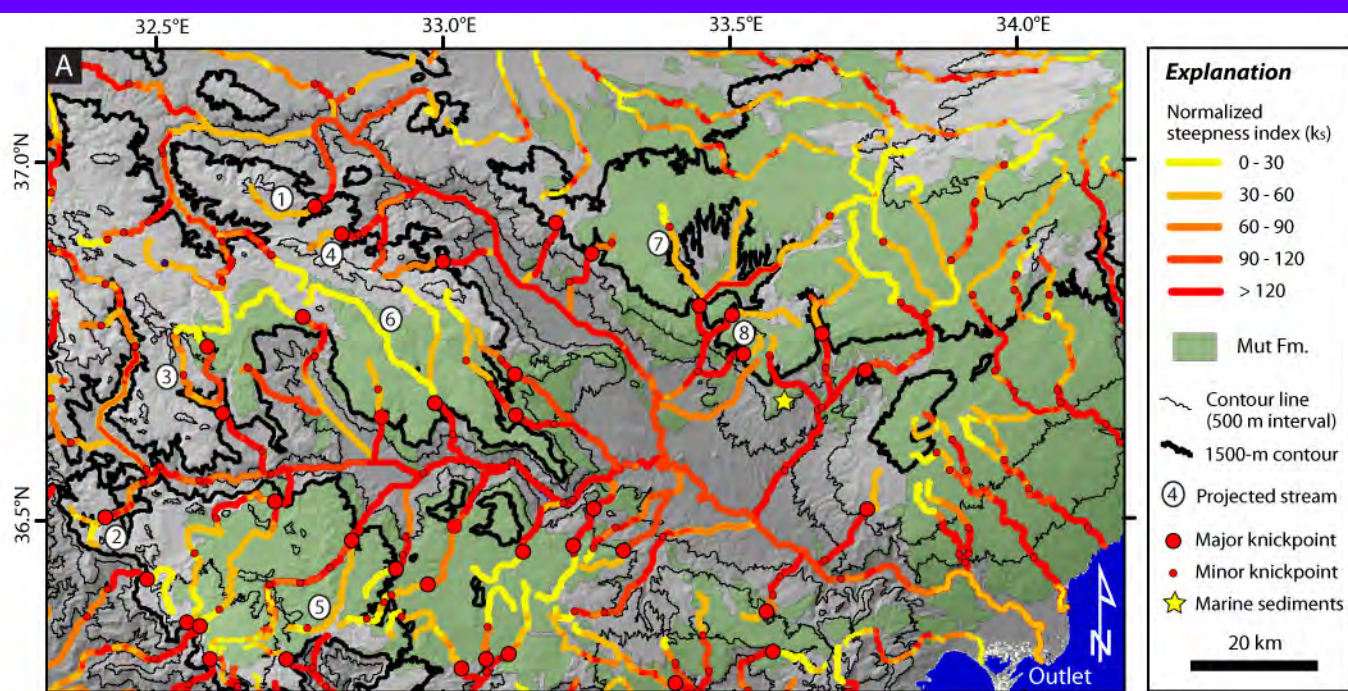
Cosmogenic ^{26}Al , ^{10}Be , and ^{21}Ne exposure ages of terraces



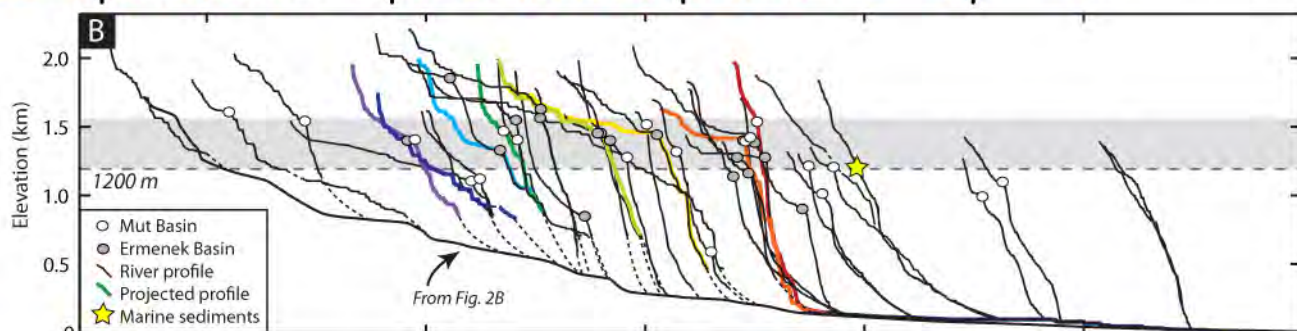
Schildgen et al., EPSL (2012)

Post-8 or 5.45 Ma: **0.25 to 0.37 mm/yr** Post-1.6 Ma: **0.6 to 0.7 mm/yr**

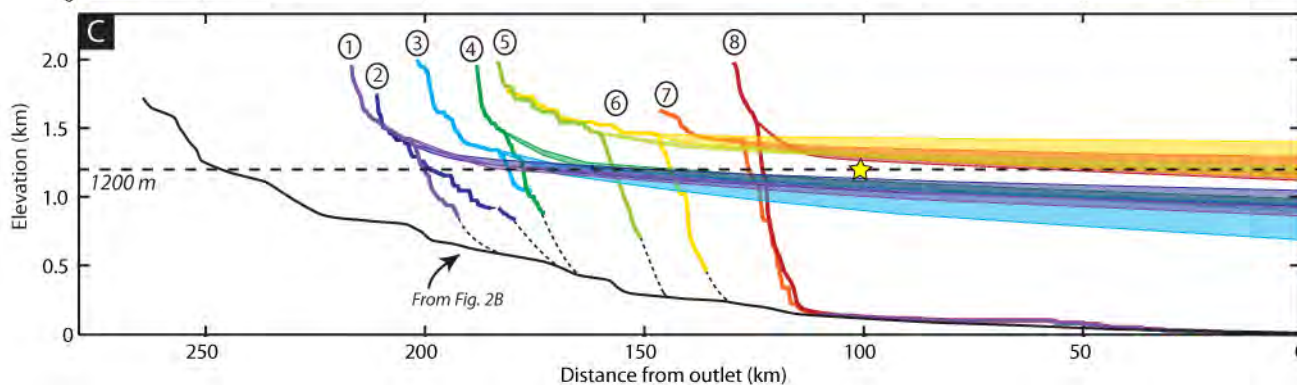
Map of channel normalized steepness index (ksn) values through the Mut and Ermenek basins

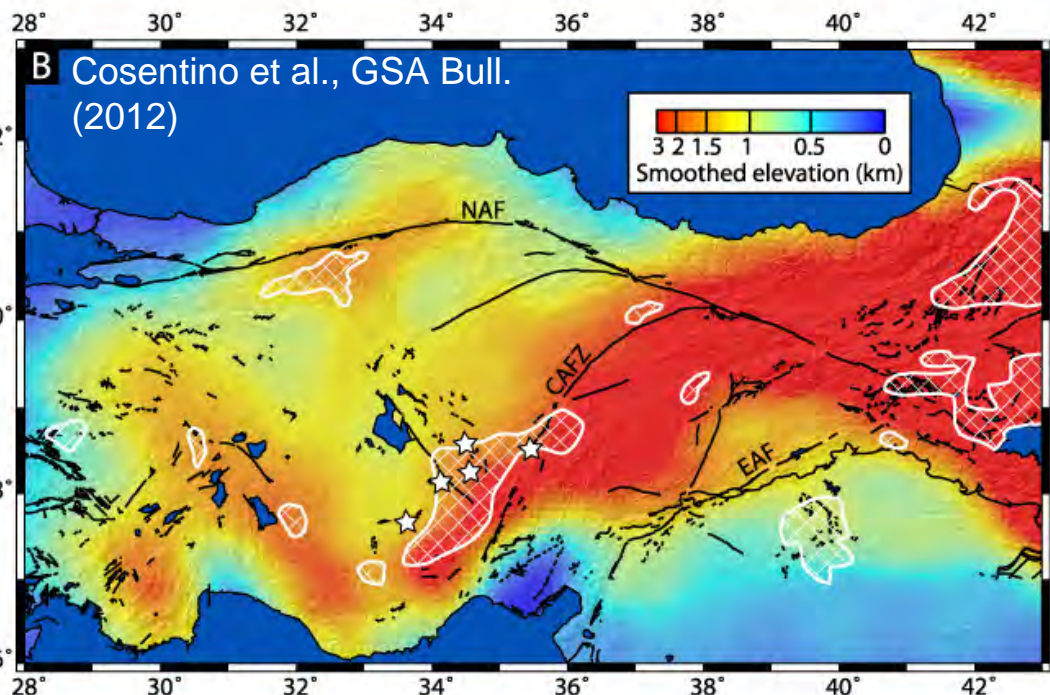
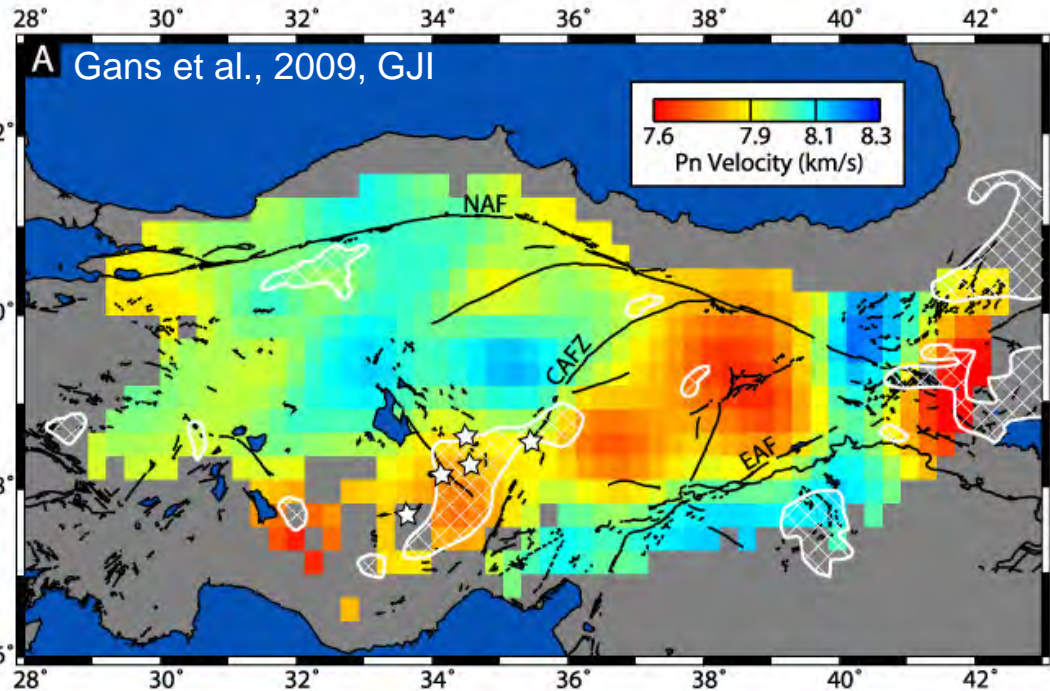


Longitudinal channel profiles with major knickpoints marked by circles



Channel projections of upper, relict portions of channels to the position of the modern outlet





Adakite 11 Ma → Subduction signature (low Mg)

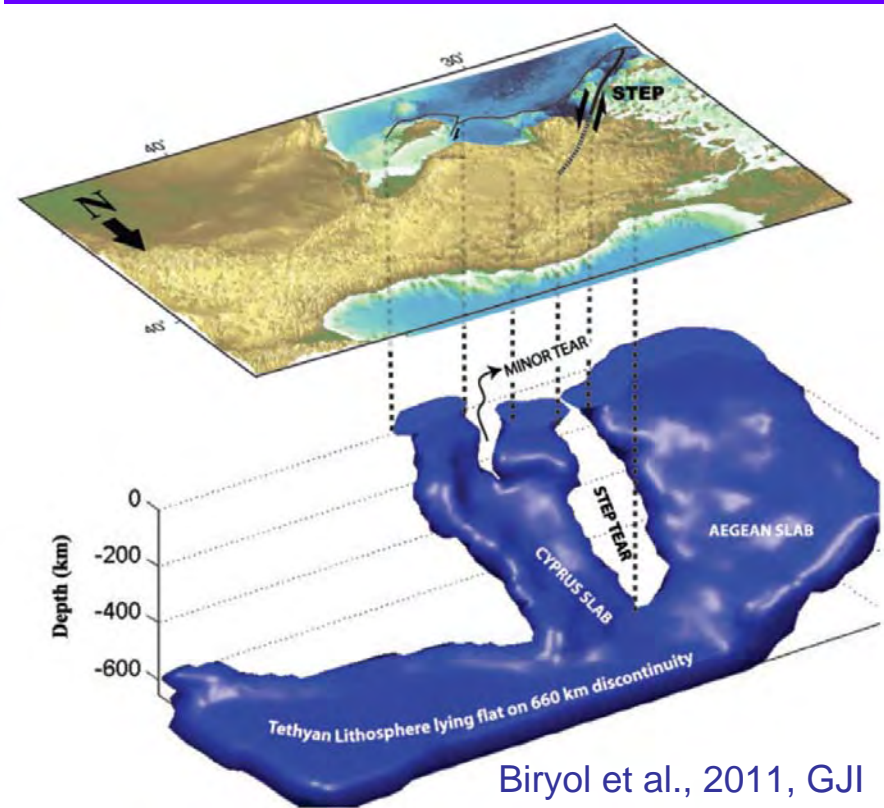
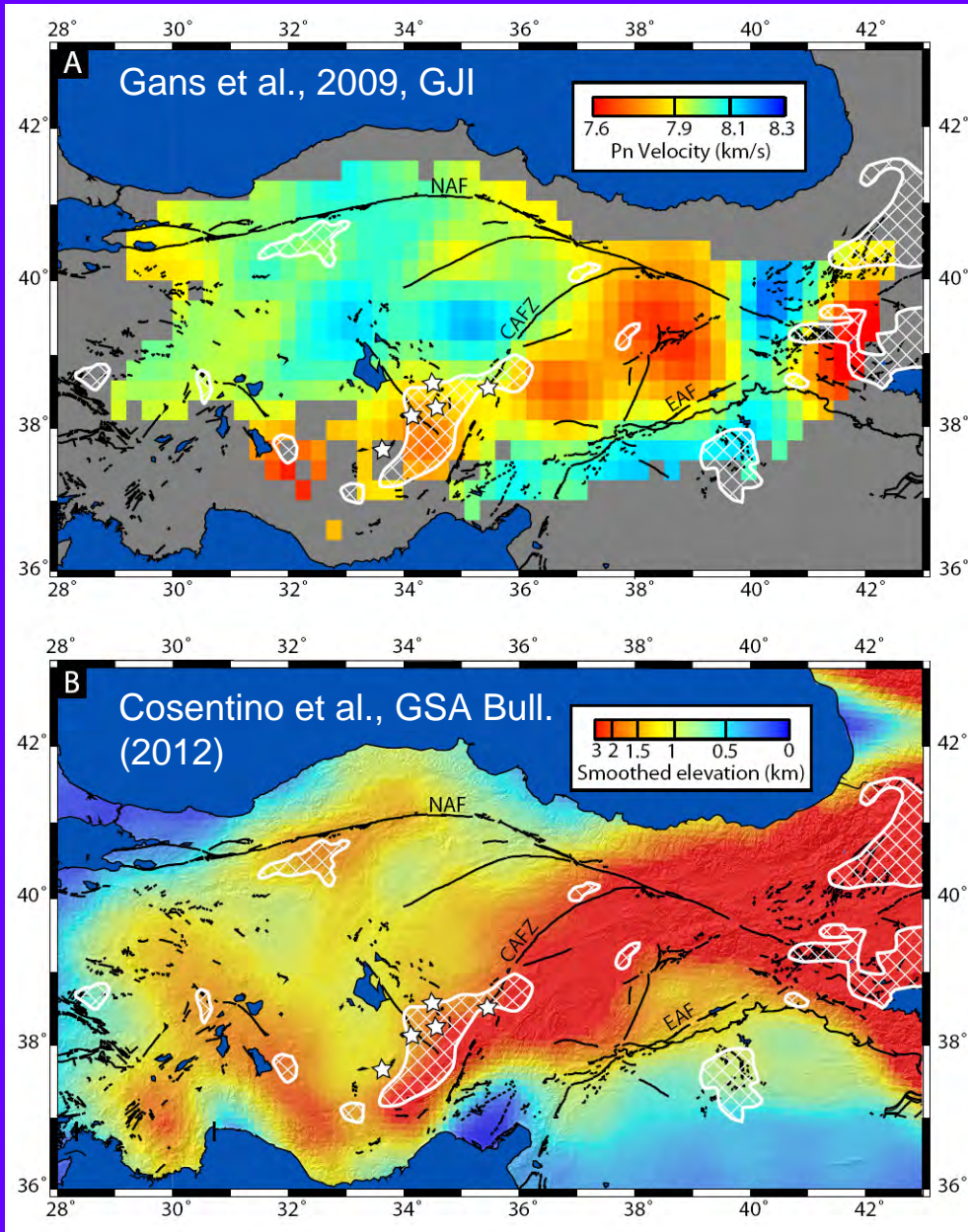
Adakite 7-5 Ma → Lithospheric delamination or slab window (high Mg)

Hasan Dağ
(3.253 m)



A caldera 4-5 kilometres wide formed near the current summit around 7500 BC, in an eruption recorded in Neolithic paintings.

Surface uplift above a detached slab?





GRAZIE PER L'ATTENZIONE