

Role of Natural Forces as the cause of Disasters as exemplified from Anatolia

Yücel Yılmaz



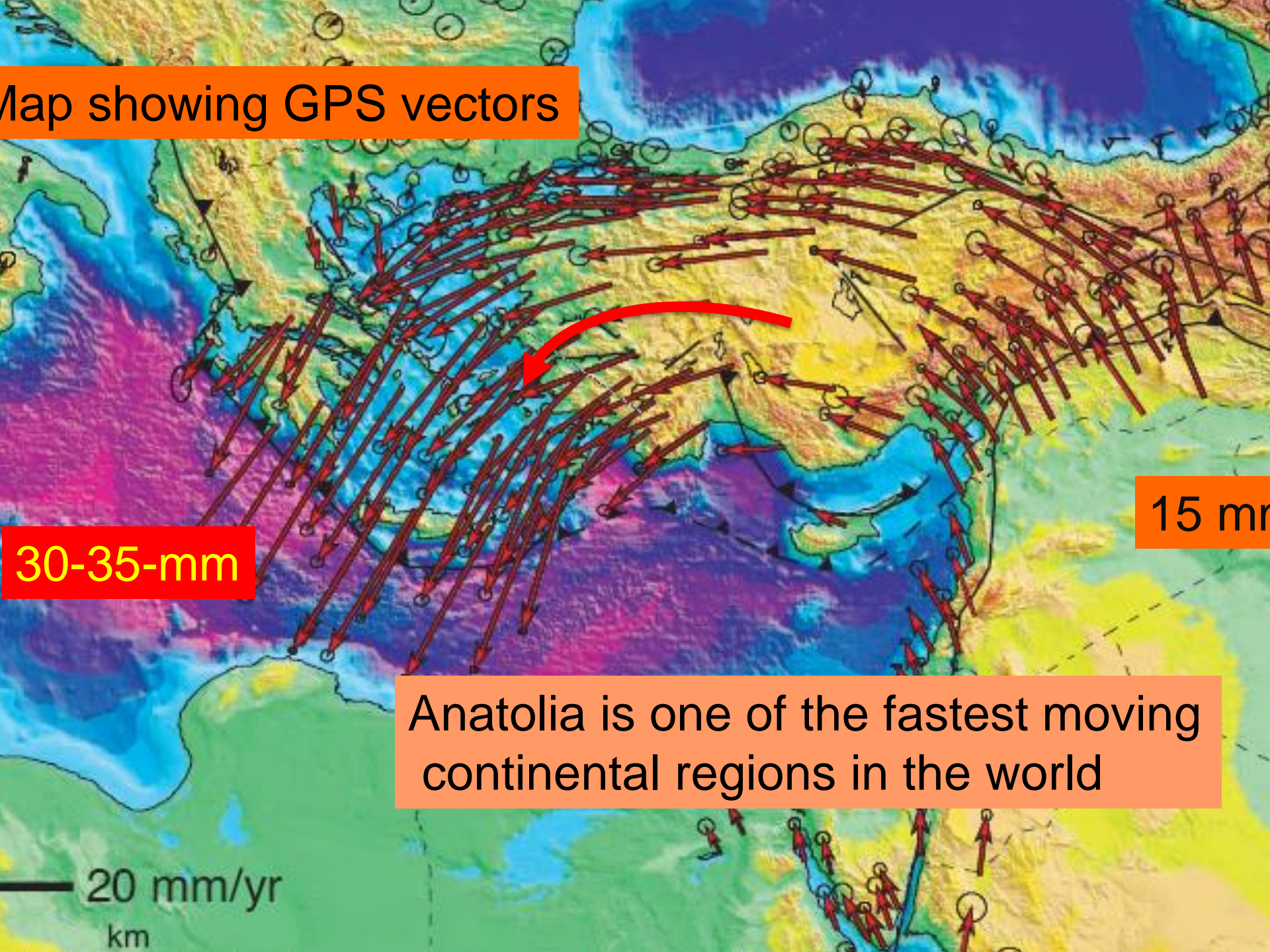
Map showing GPS vectors

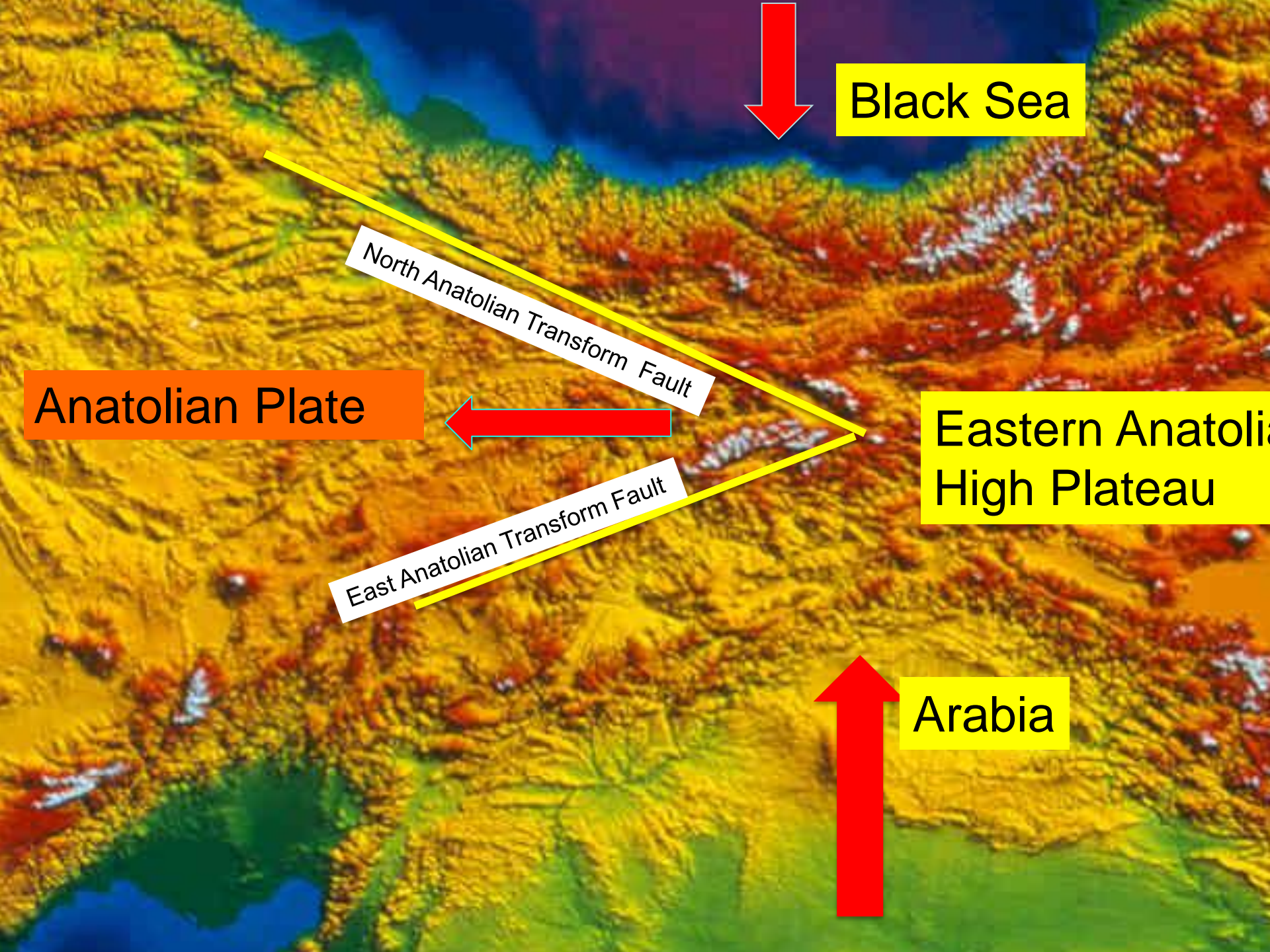
30-35-mm

15 mm

Anatolia is one of the fastest moving continental regions in the world

20 mm/yr
km





Black Sea

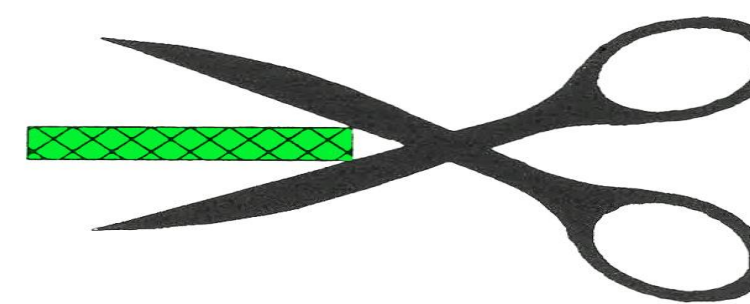
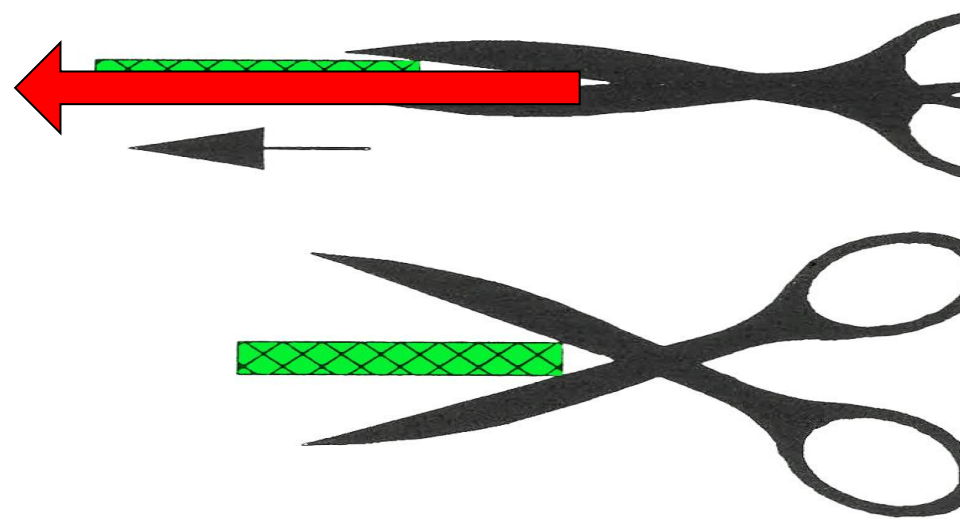
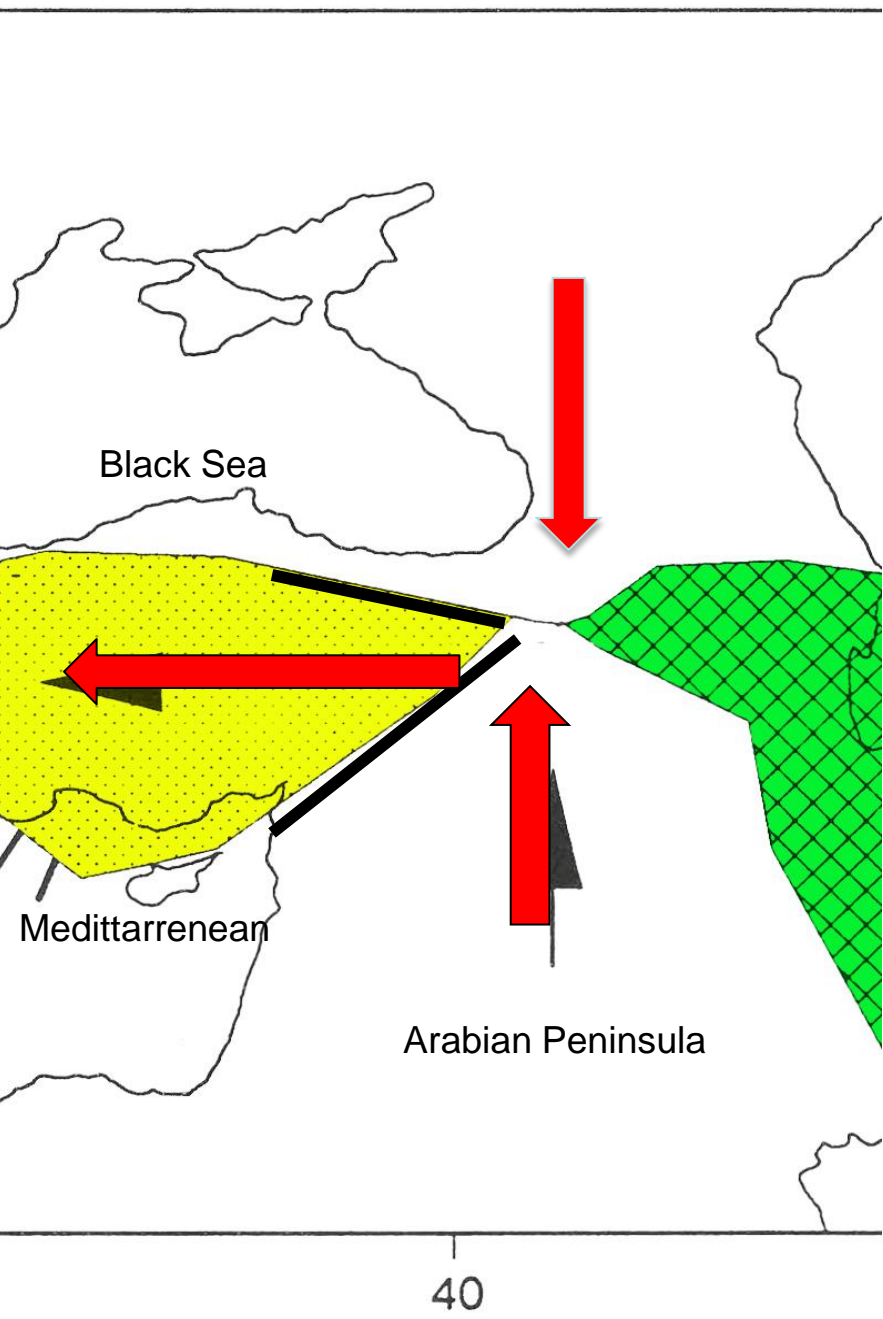
North Anatolian Transform Fault

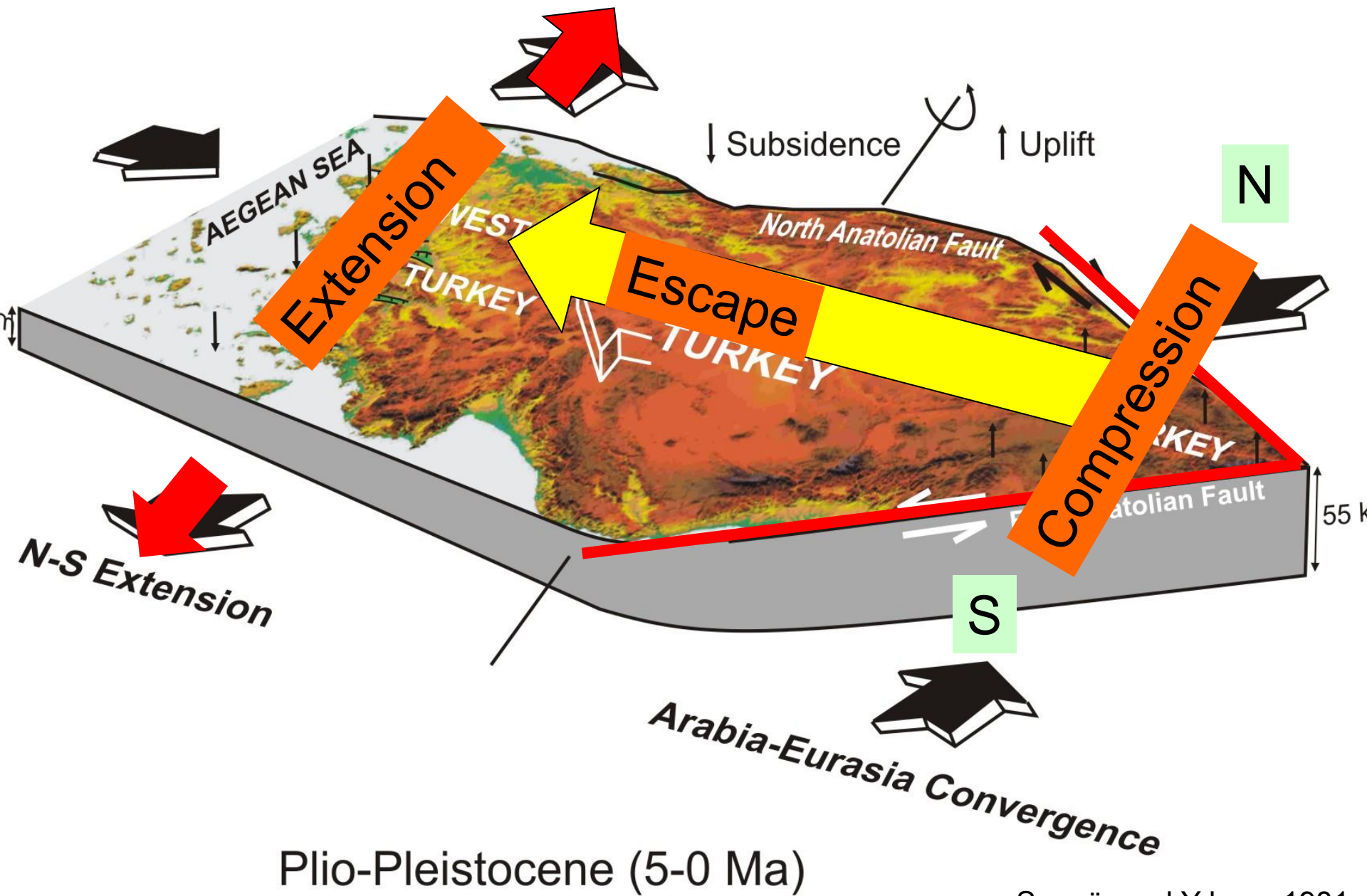
Anatolian Plate

Eastern Anatolian High Plateau

East Anatolian Transform Fault

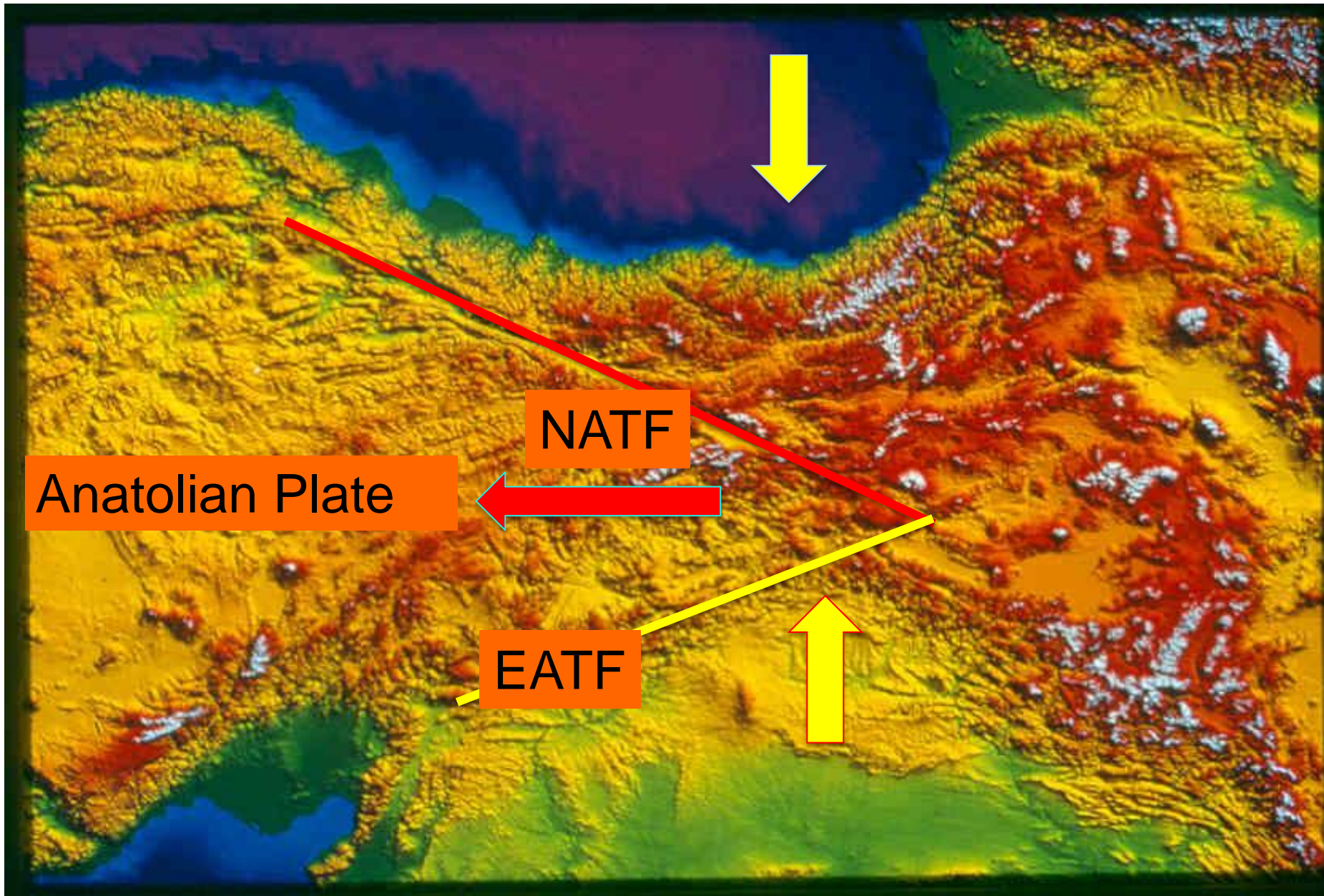
Arabia

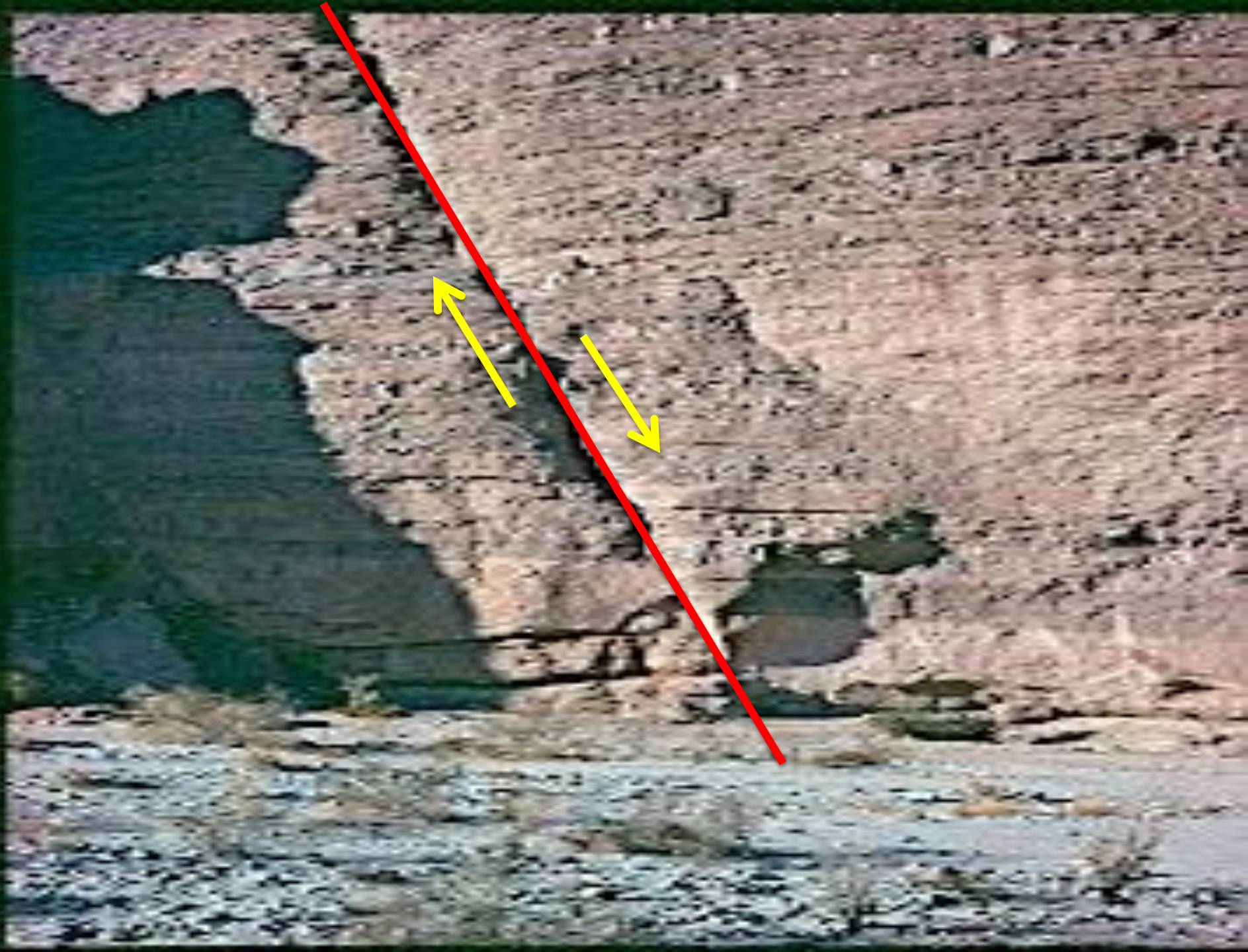


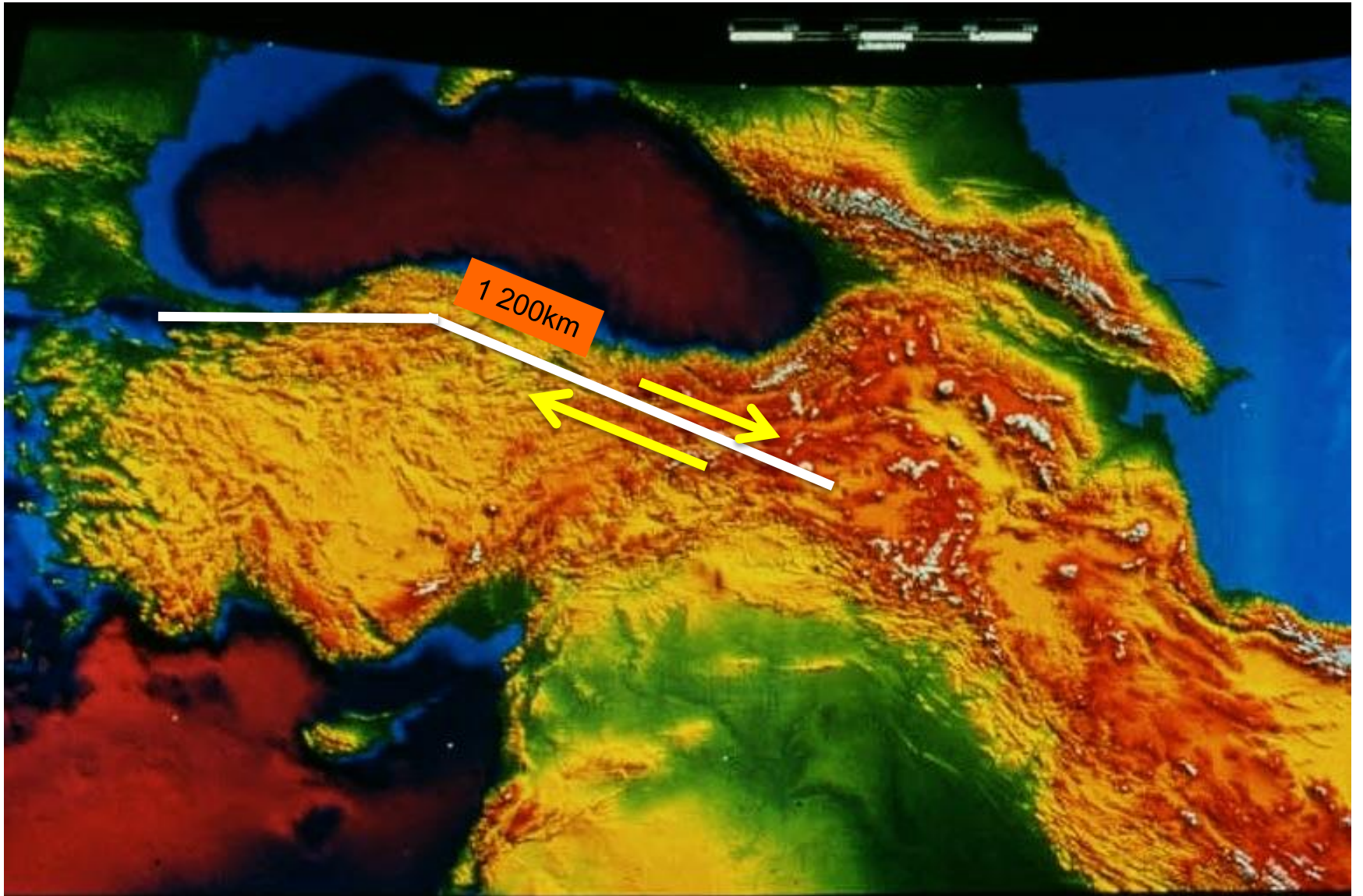


Plio-Pleistocene (5-0 Ma)

Şengör and Yılmaz 1981

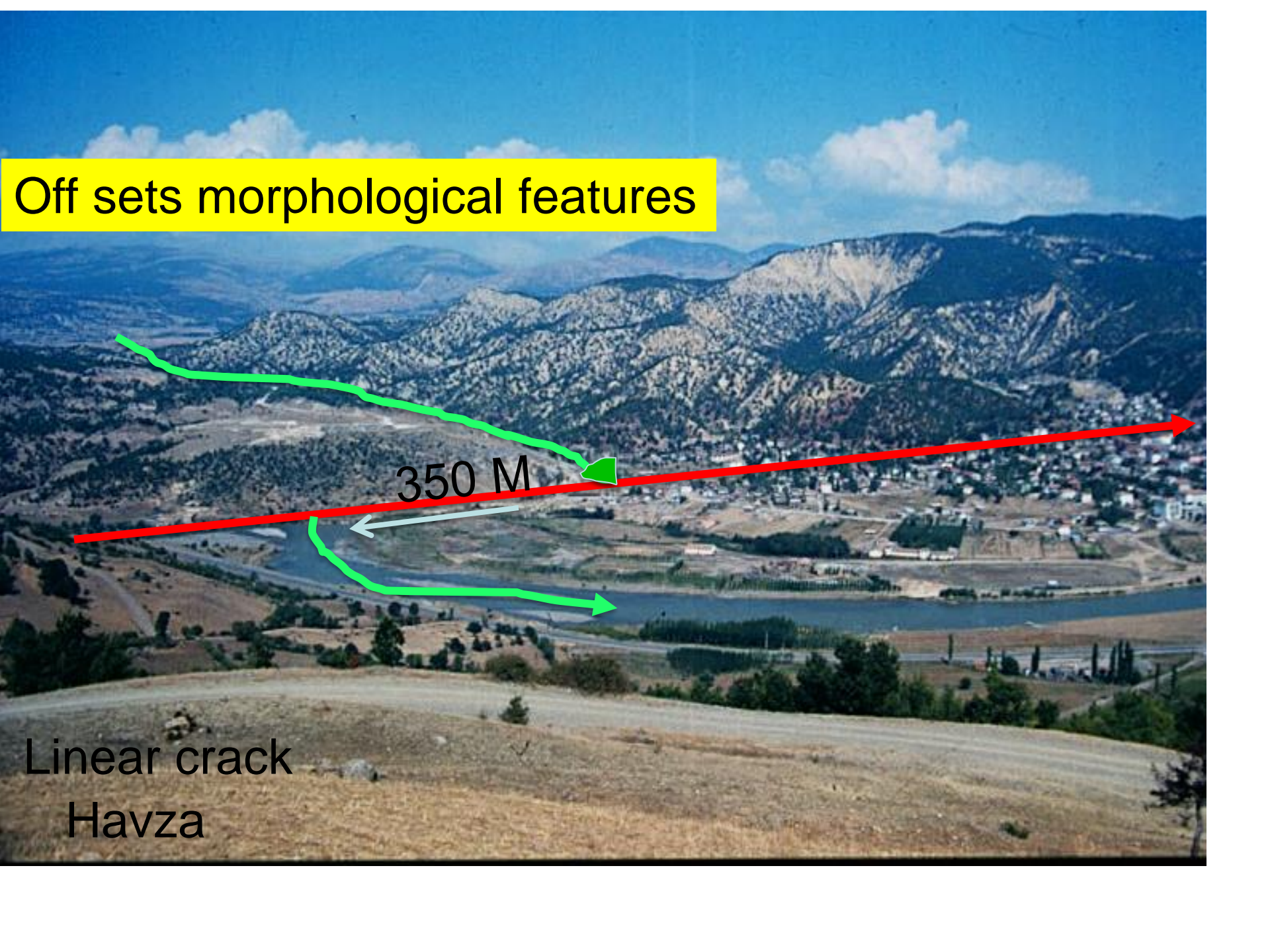






o data.
by EPR remote sensing lab. Plotted at 40 microns.

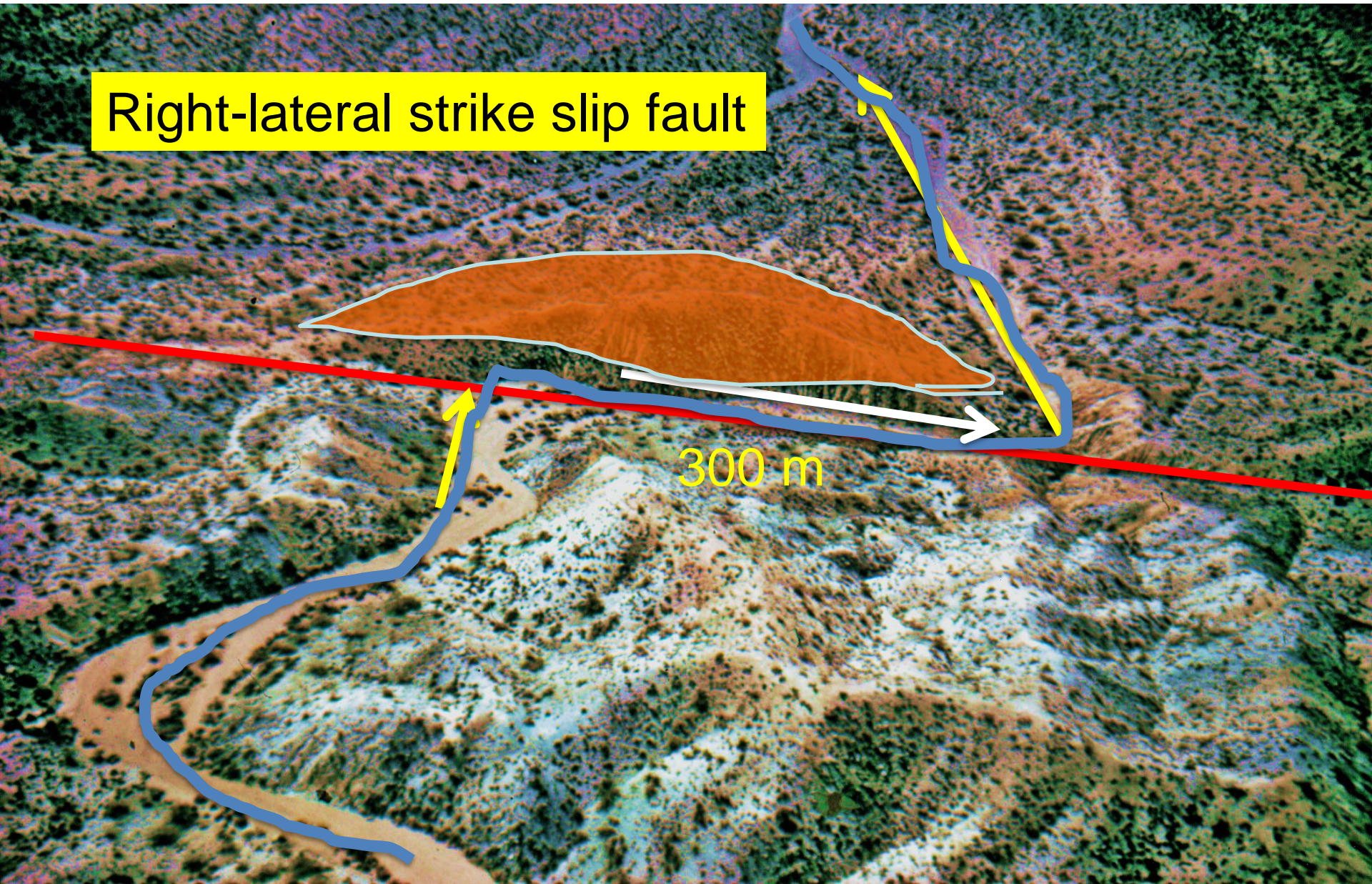
Off sets morphological features



350 M

Linear crack
Havza

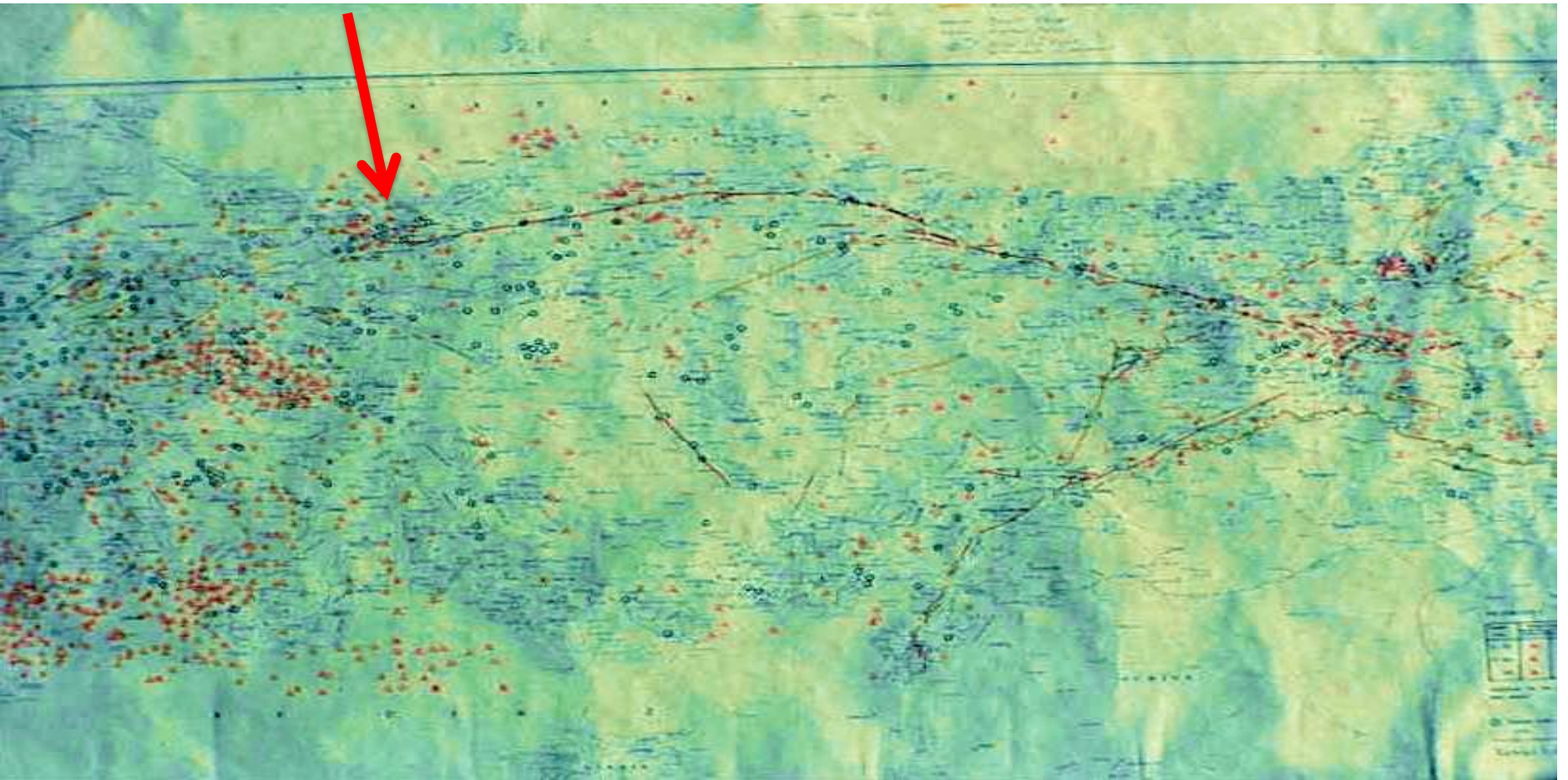
Right-lateral strike slip fault



Cuts the fronts of the hills abruptly forming triangular surfaces;

Flatiron





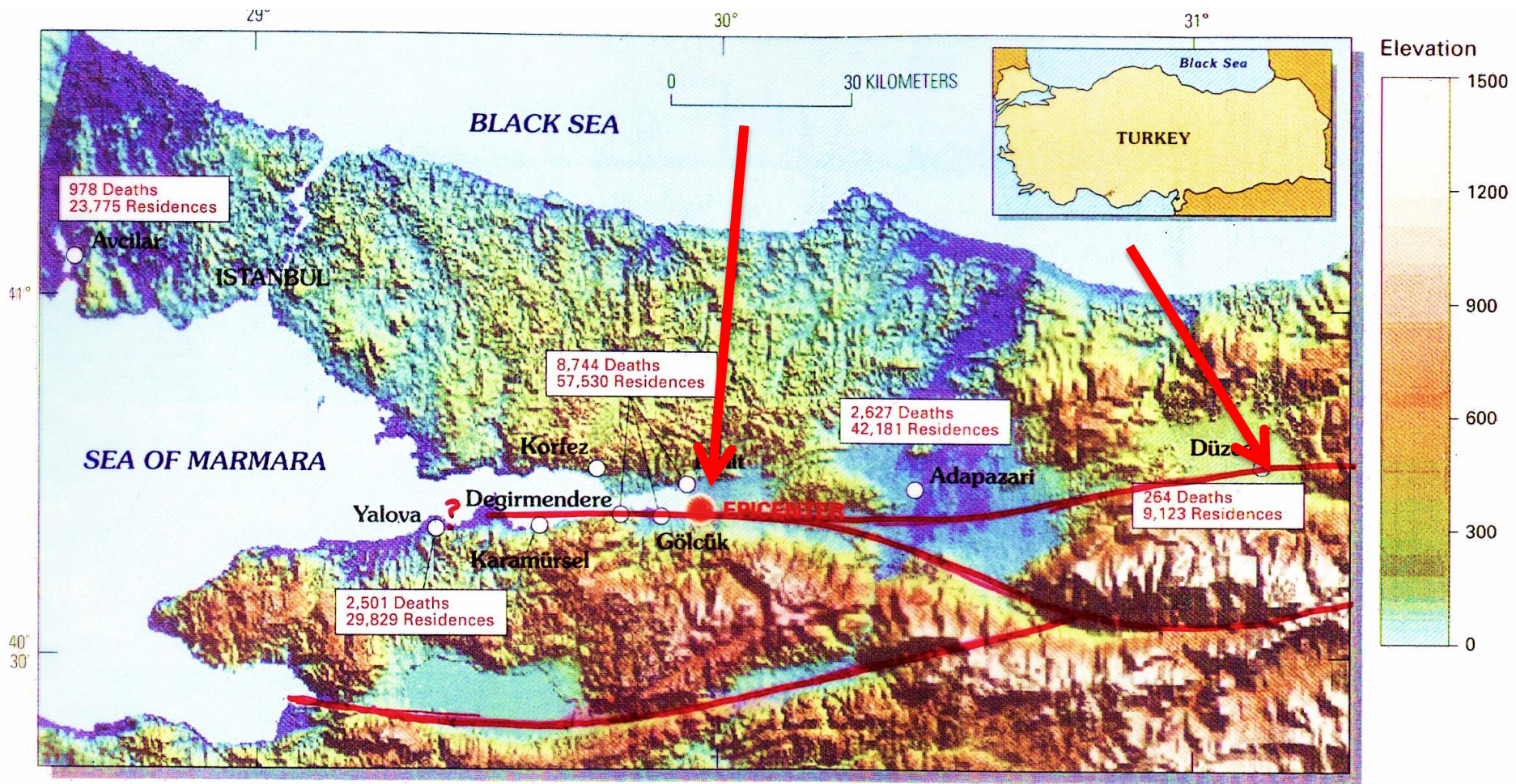
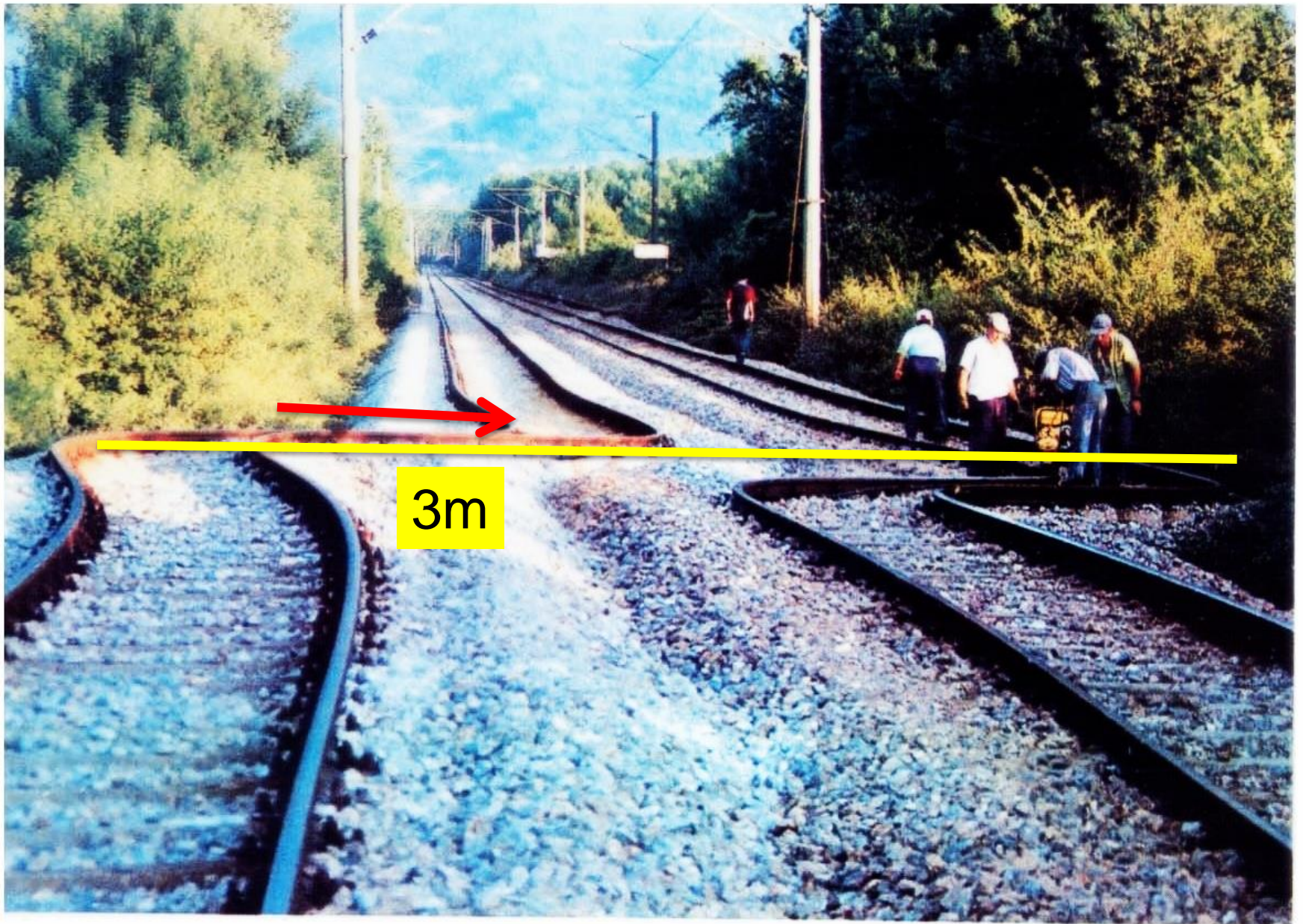


Figure 2. Major cities and towns in Turkey that experienced significant damage to residential units and loss of life during the Kocaeli earthquake. Upper number is fatalities; lower number is lightly to heavily damaged residential units. (Statistics from the Prime Ministry of Turkey, Crisis Management Center, September 12, 1999).



3 m railway offset near Tepetarla, İzmit.



Figure 6. The 4.3 m offset of the garden wall near Çınarlı village, east of Eften lake.



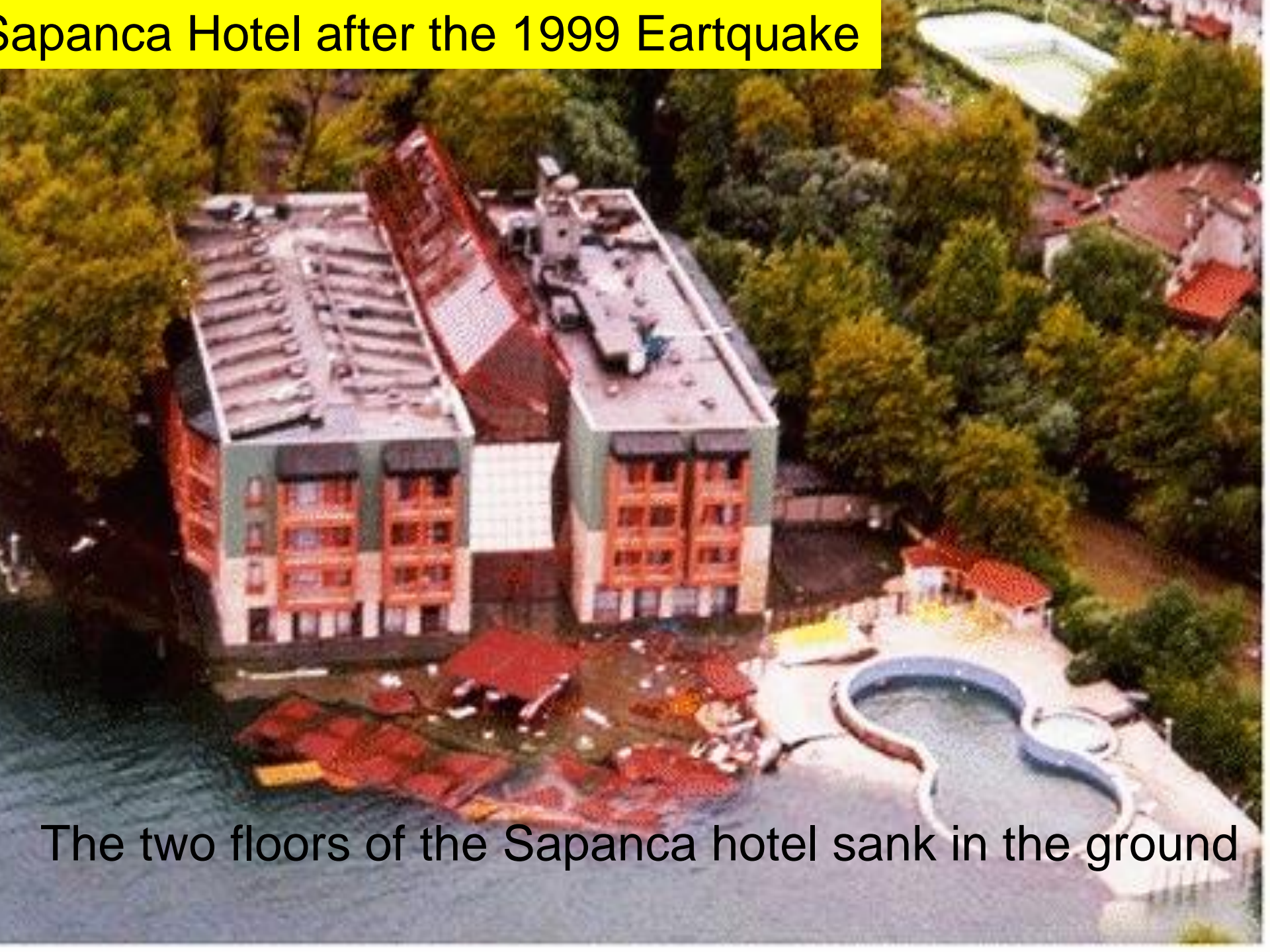




Buildings sink in the ground

Liquefaction: Water saturated ground losing strength during earthquake :

Sapanca Hotel after the 1999 Earthquake



The two floors of the Sapanca hotel sank in the ground

Severe Destructions



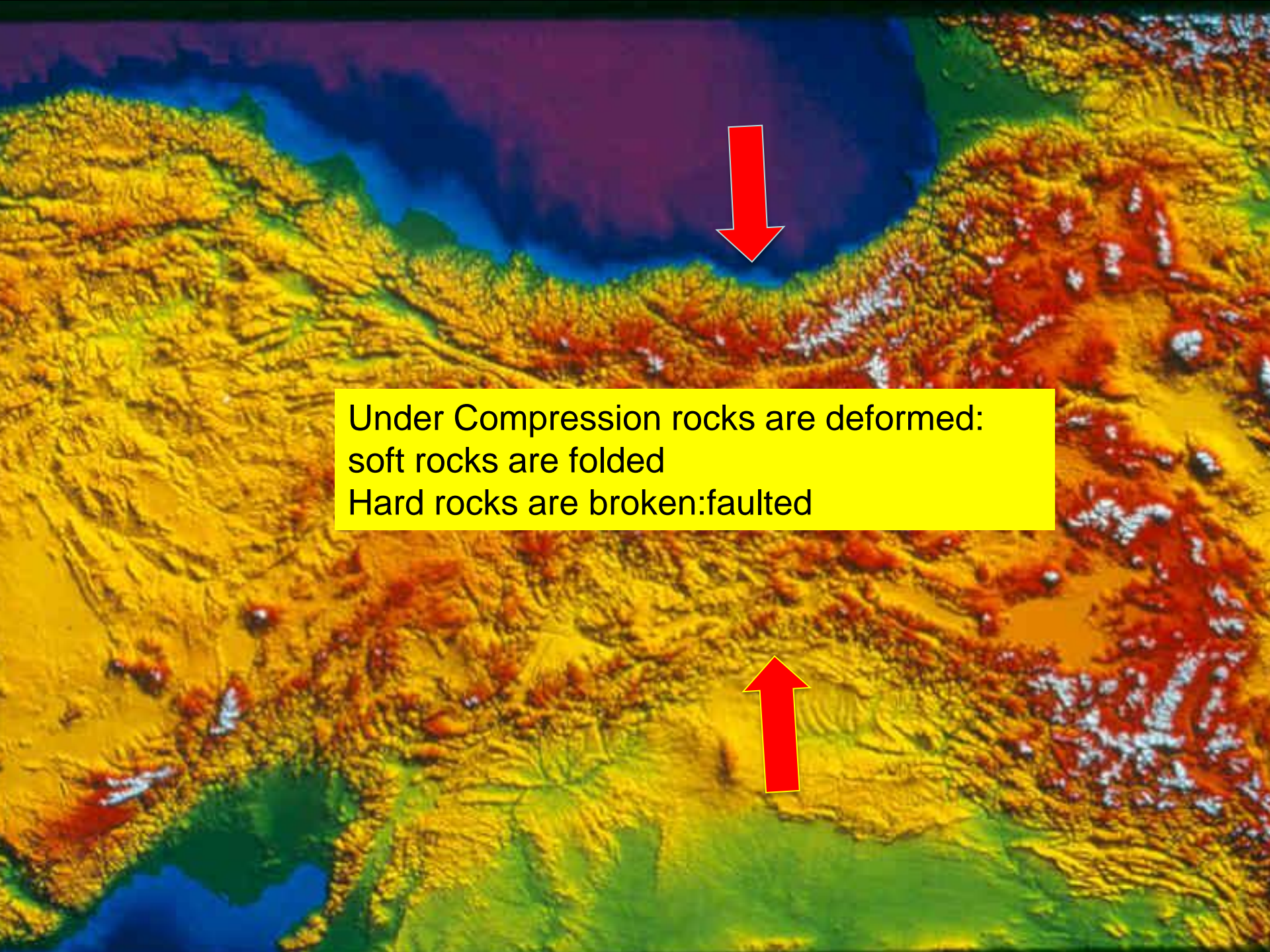


Weak buidings collapsed!

Partially



Totally



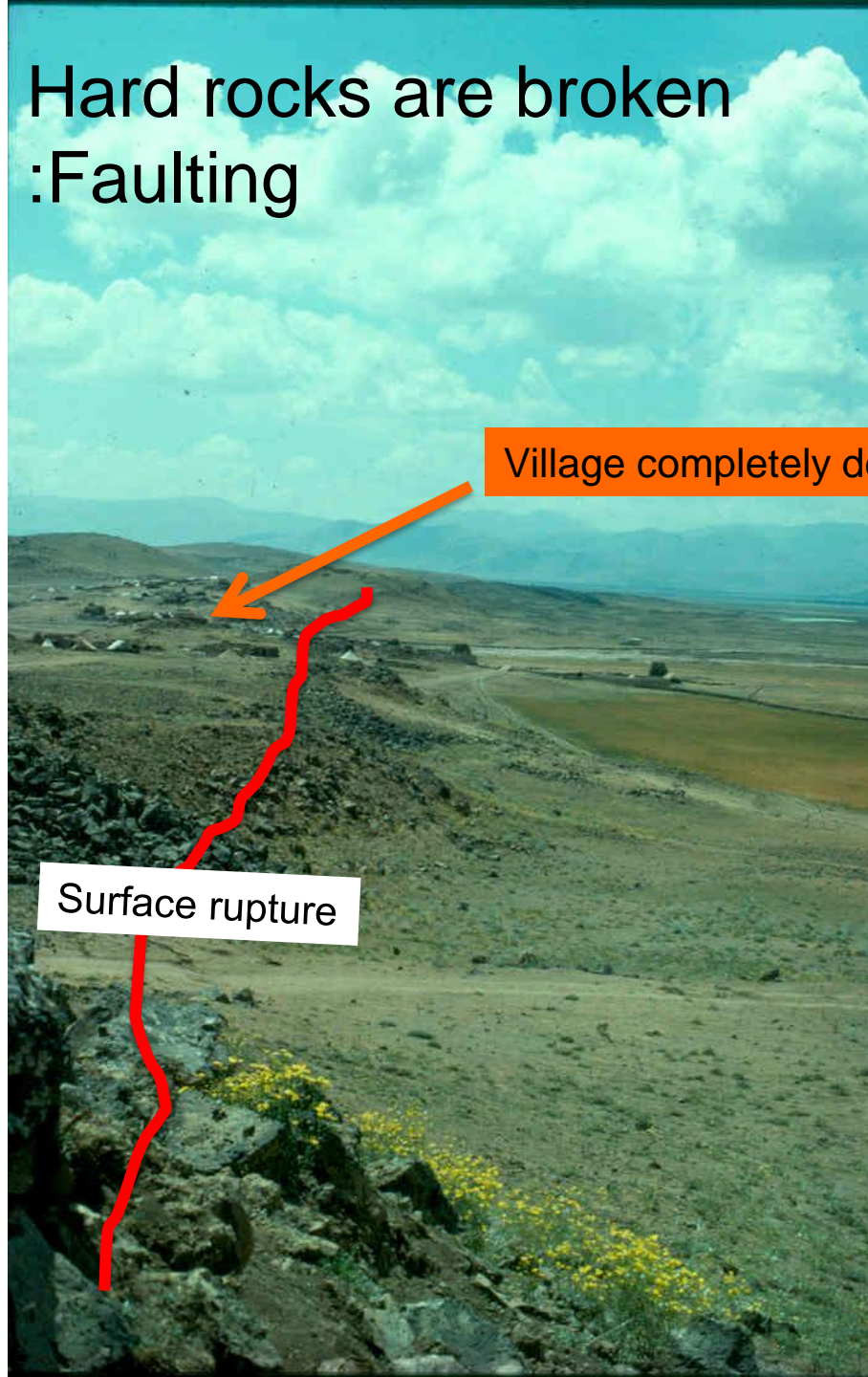
Under Compression rocks are deformed:
soft rocks are folded
Hard rocks are broken: faulted

Tuzluca -Eastern Anatolia



The Rocks were folded like
a Knee

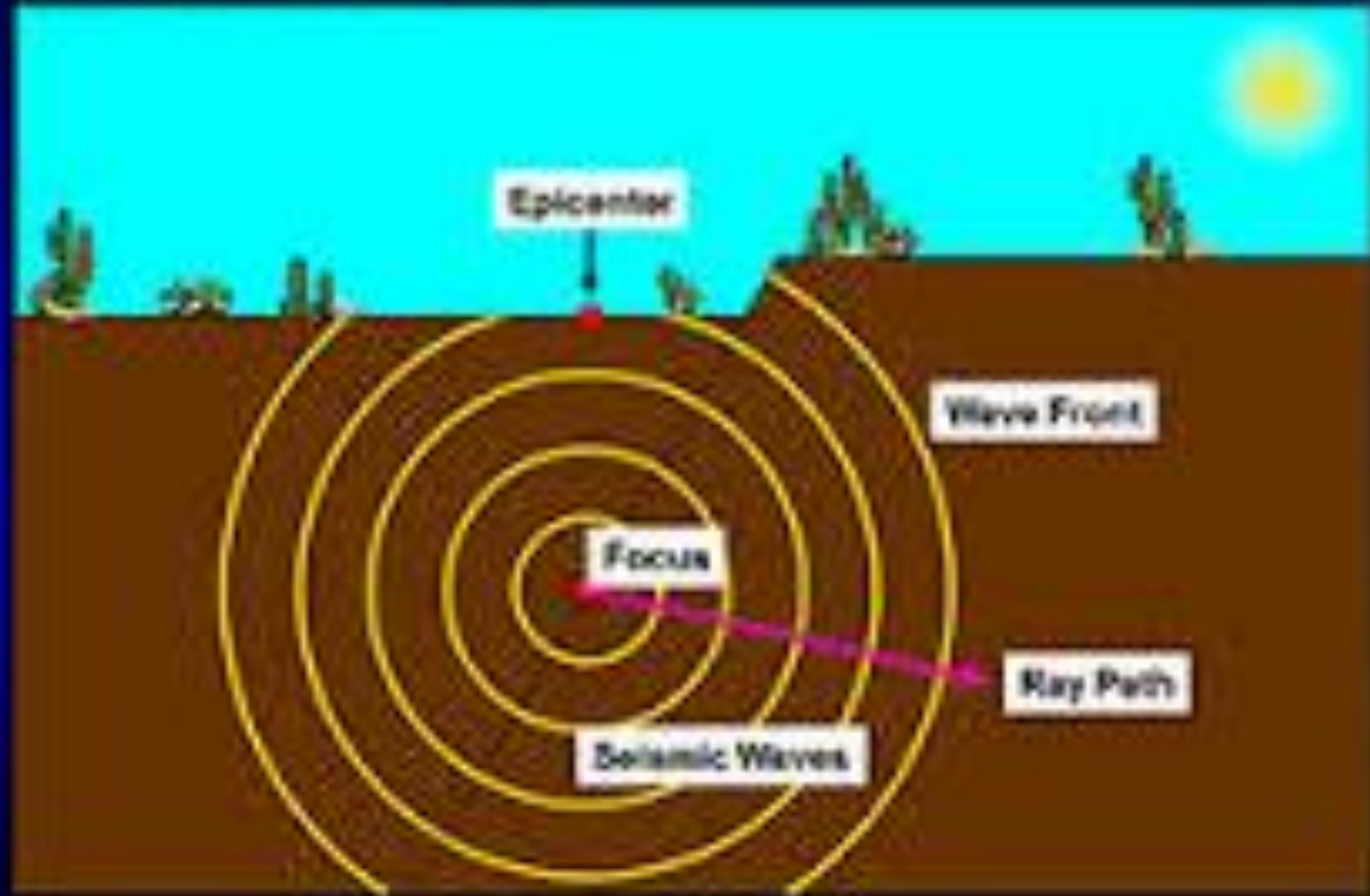
Hard rocks are broken :Faulting



Village completely destroyed

Surface rupture

When rocks are broken energy is released and propagated as seismic waves. It shakes the earth: An earthquake

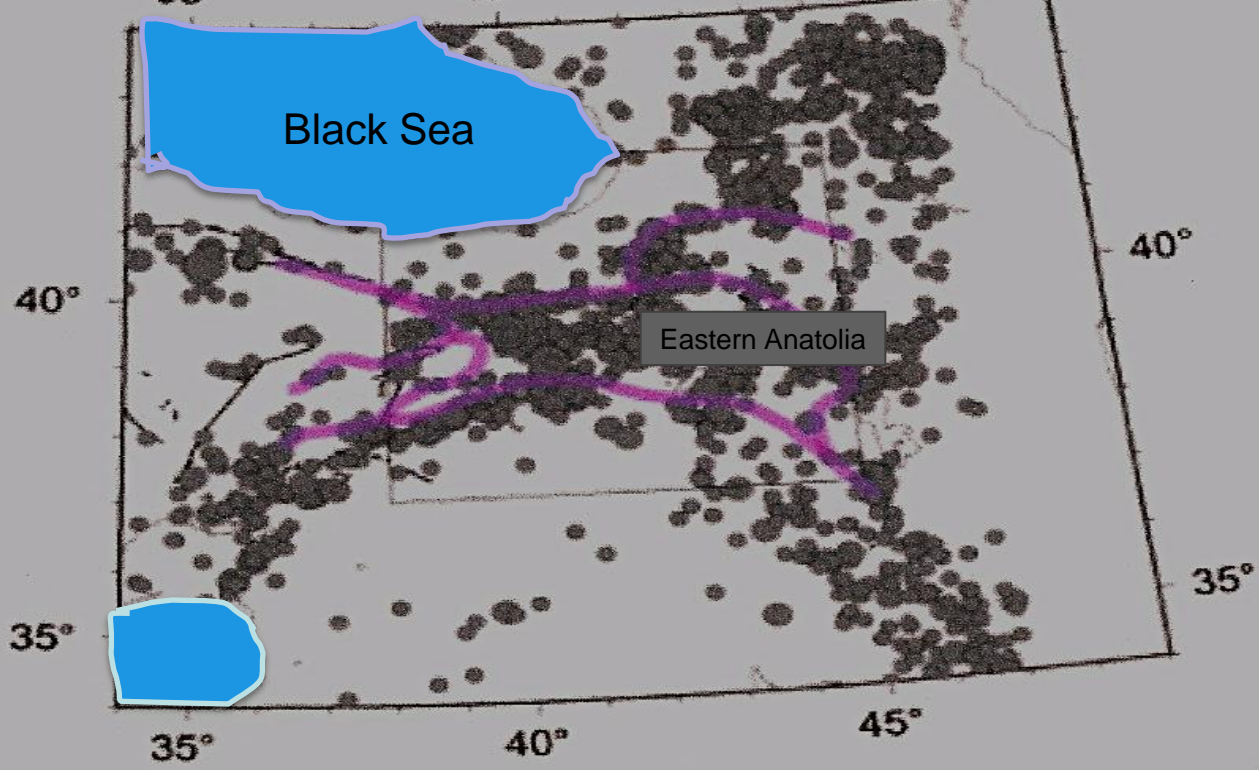




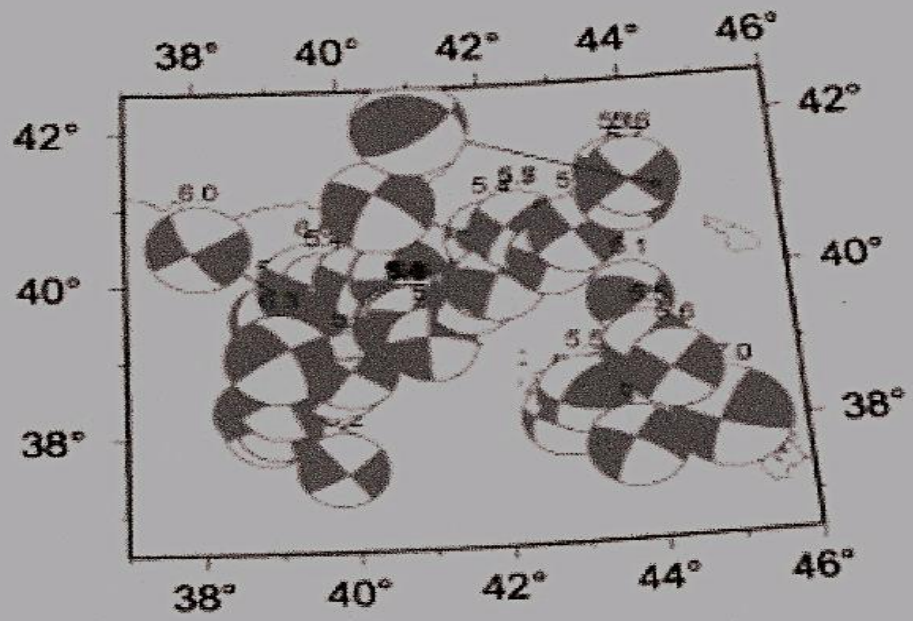
Surface rupture of the Earthquake which destroyed the village

How the earth crust deforms

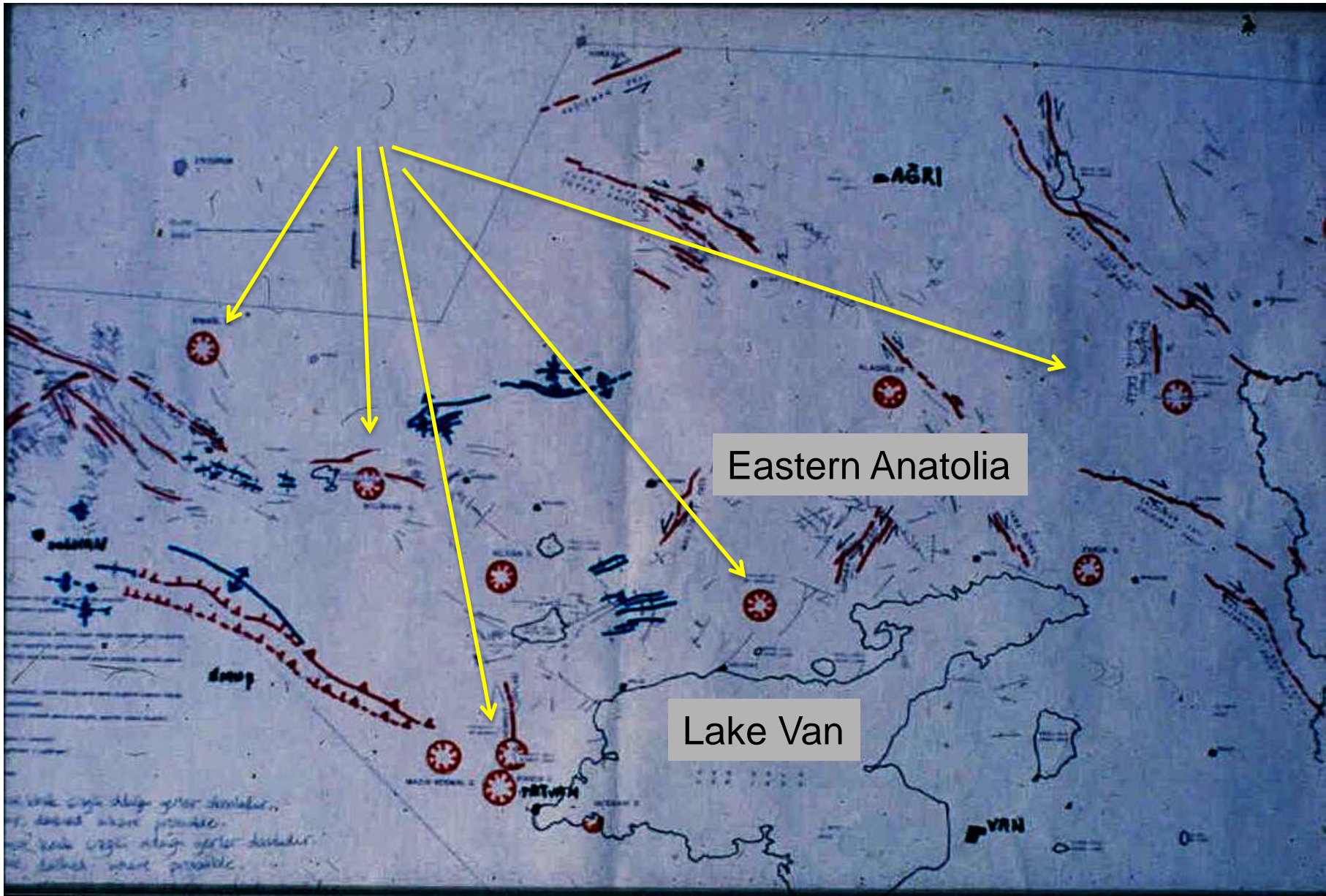




(B)



Tectonically very



Eastern Anatolia

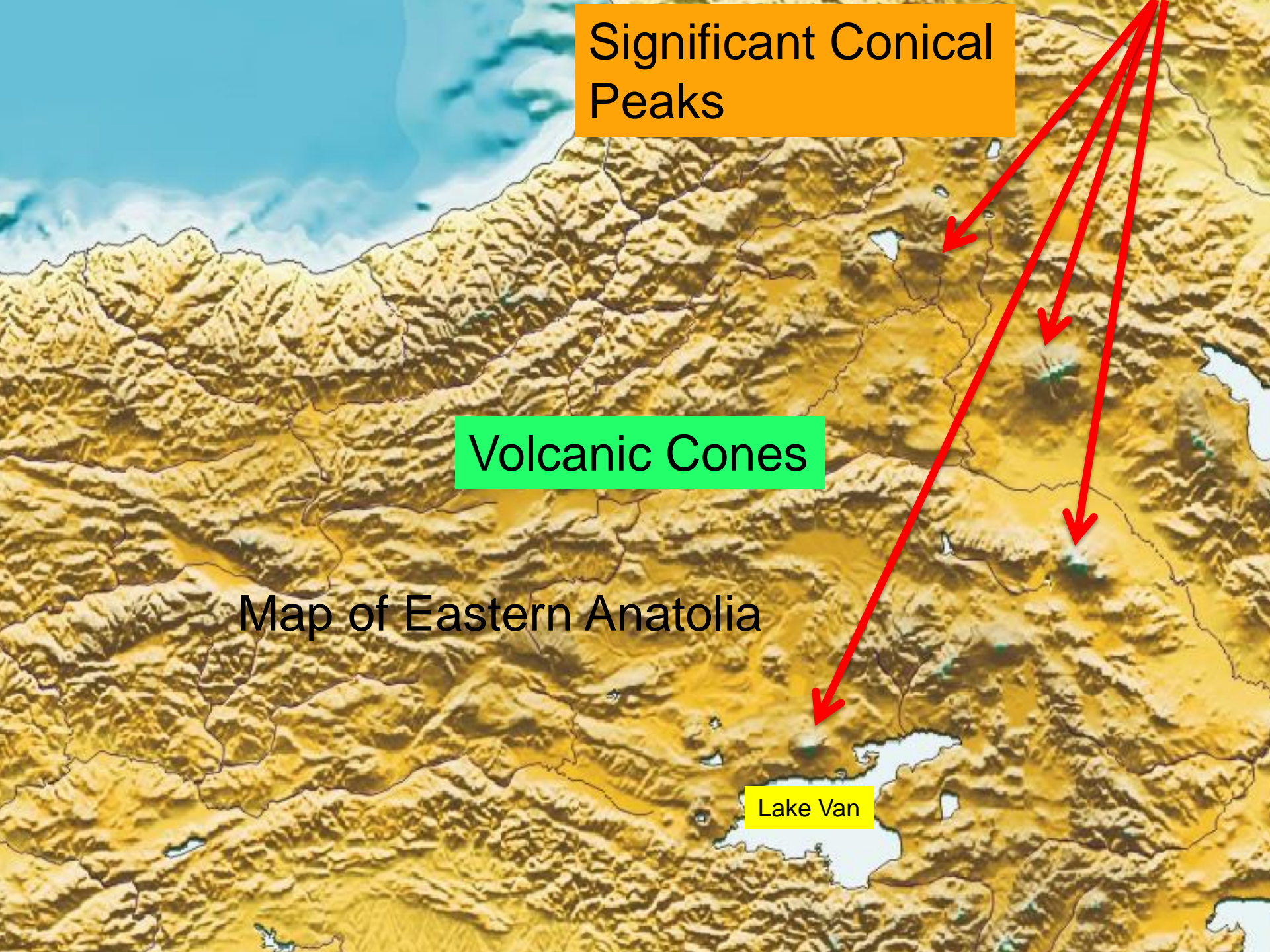
Lake Van

Significant Conical Peaks

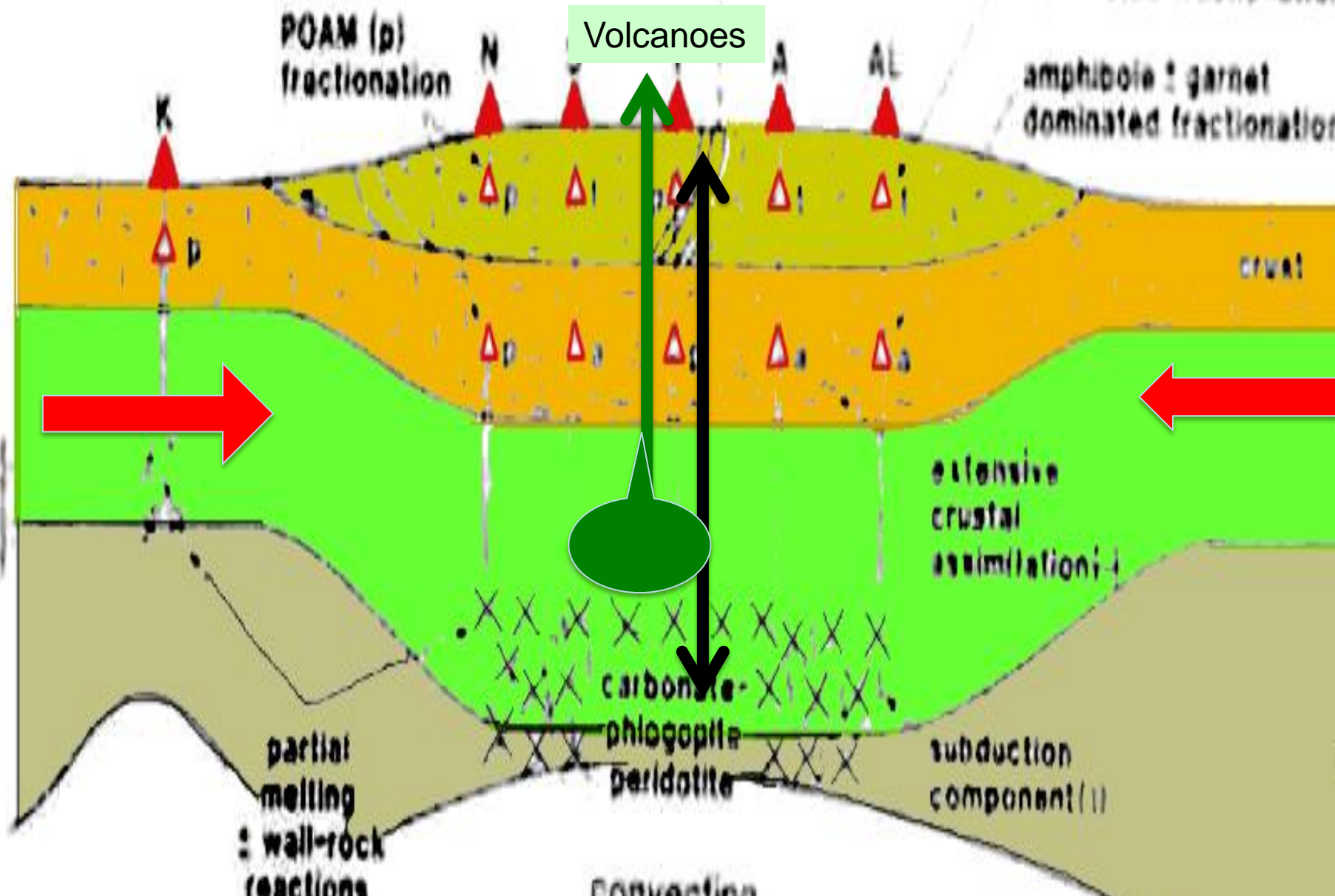
Volcanic Cones

Map of Eastern Anatolia

Lake Van



Compression Changes Physical State of the Lithosphere



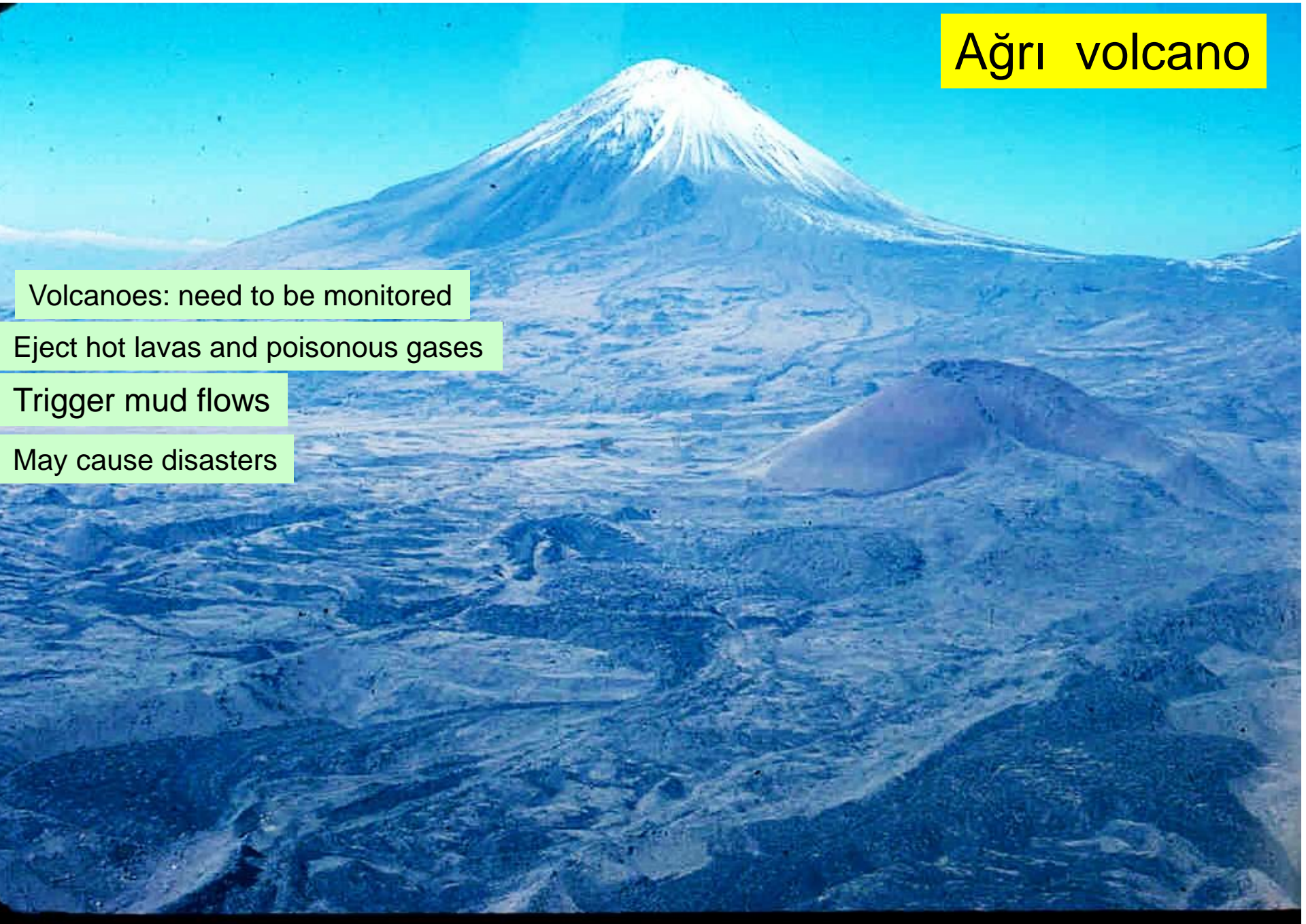
Ağrı volcano

Volcanoes: need to be monitored

Eject hot lavas and poisonous gases

Trigger mud flows

May cause disasters

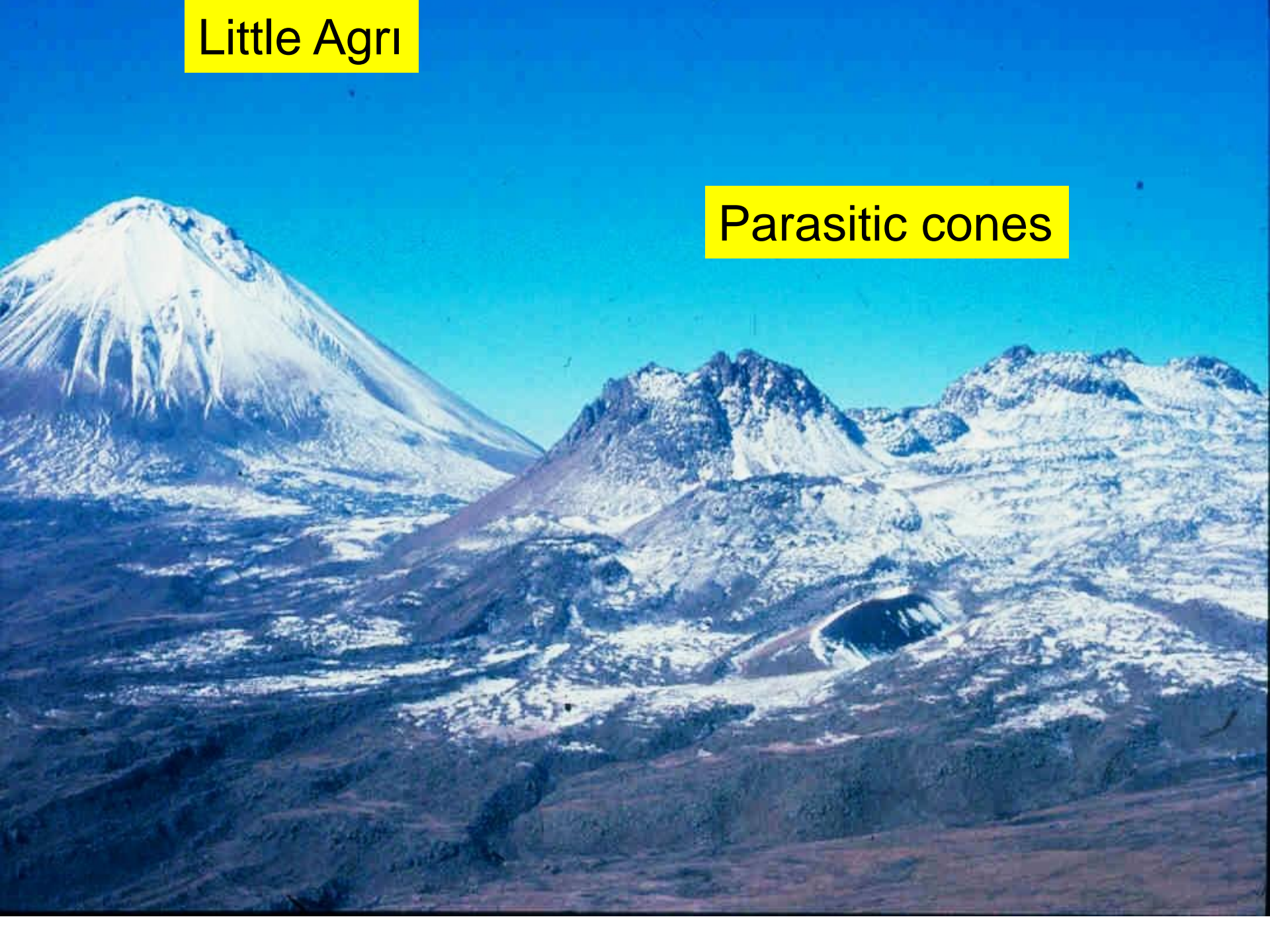


The Tendurek volcano emitting gas: Fumarole

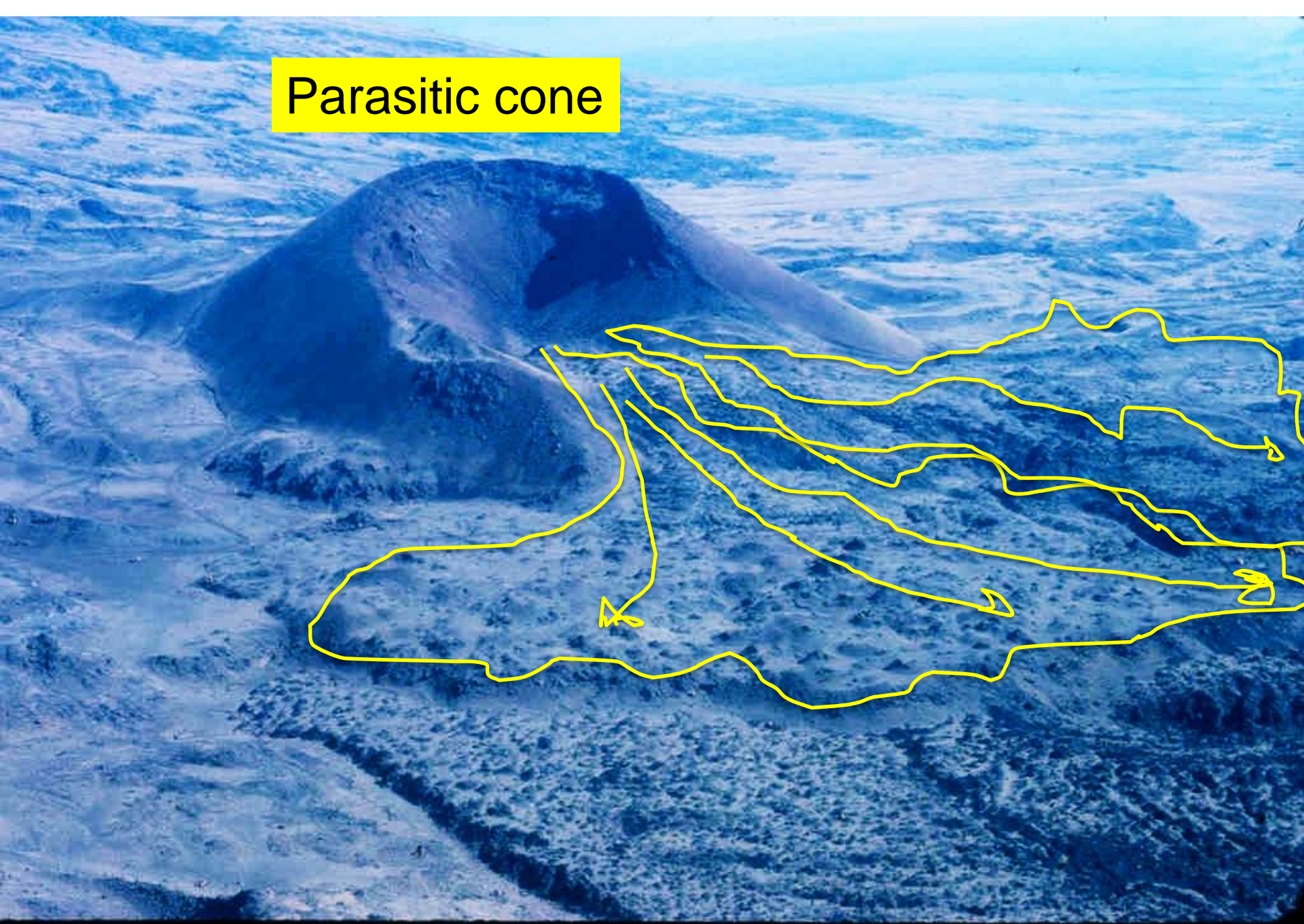


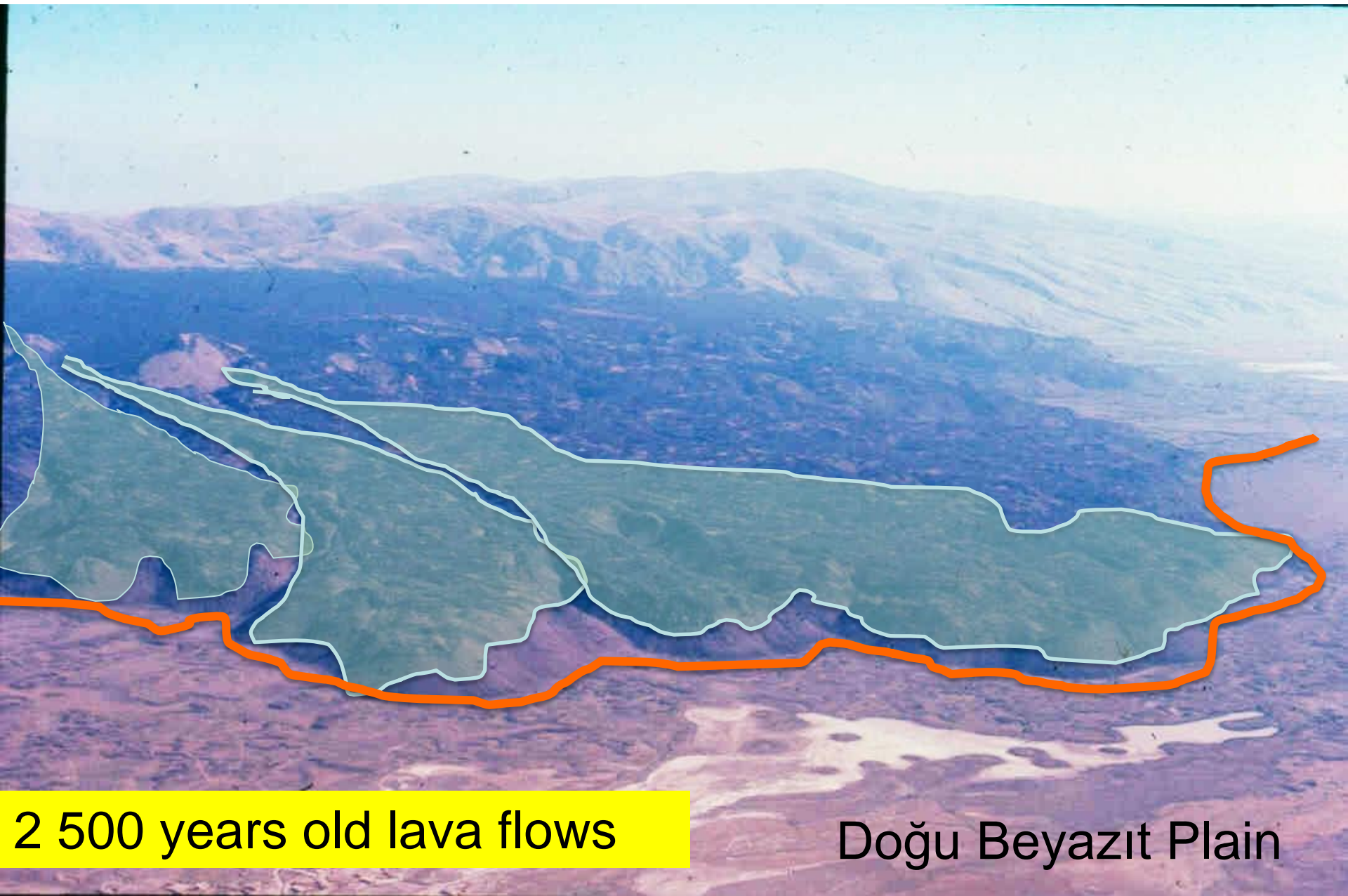
Little Agri

Parasitic cones



Parasitic cone





2 500 years old lava flows

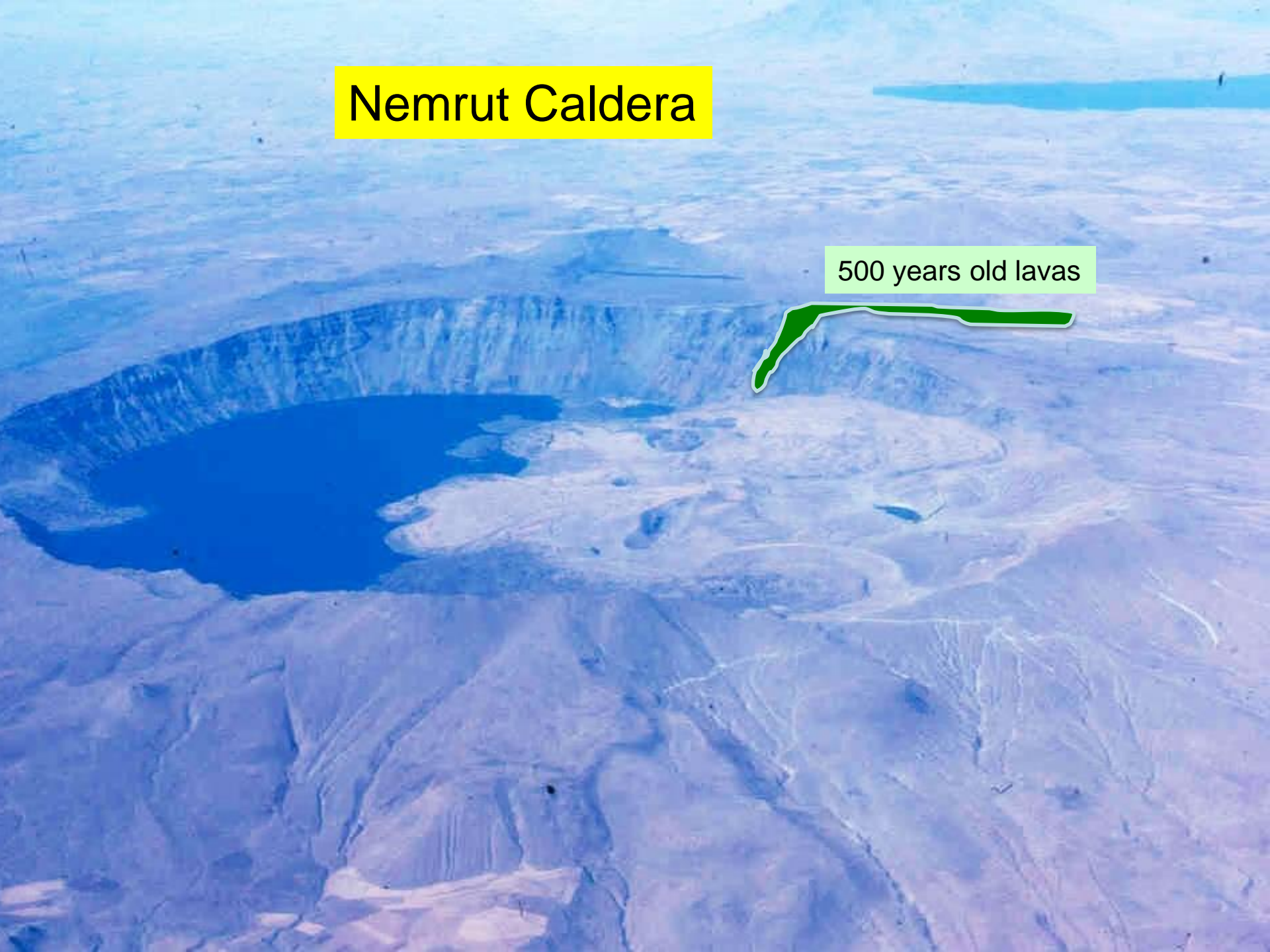
Doğu Beyazıt Plain

Noah's Arc: Nuh un Gemisi



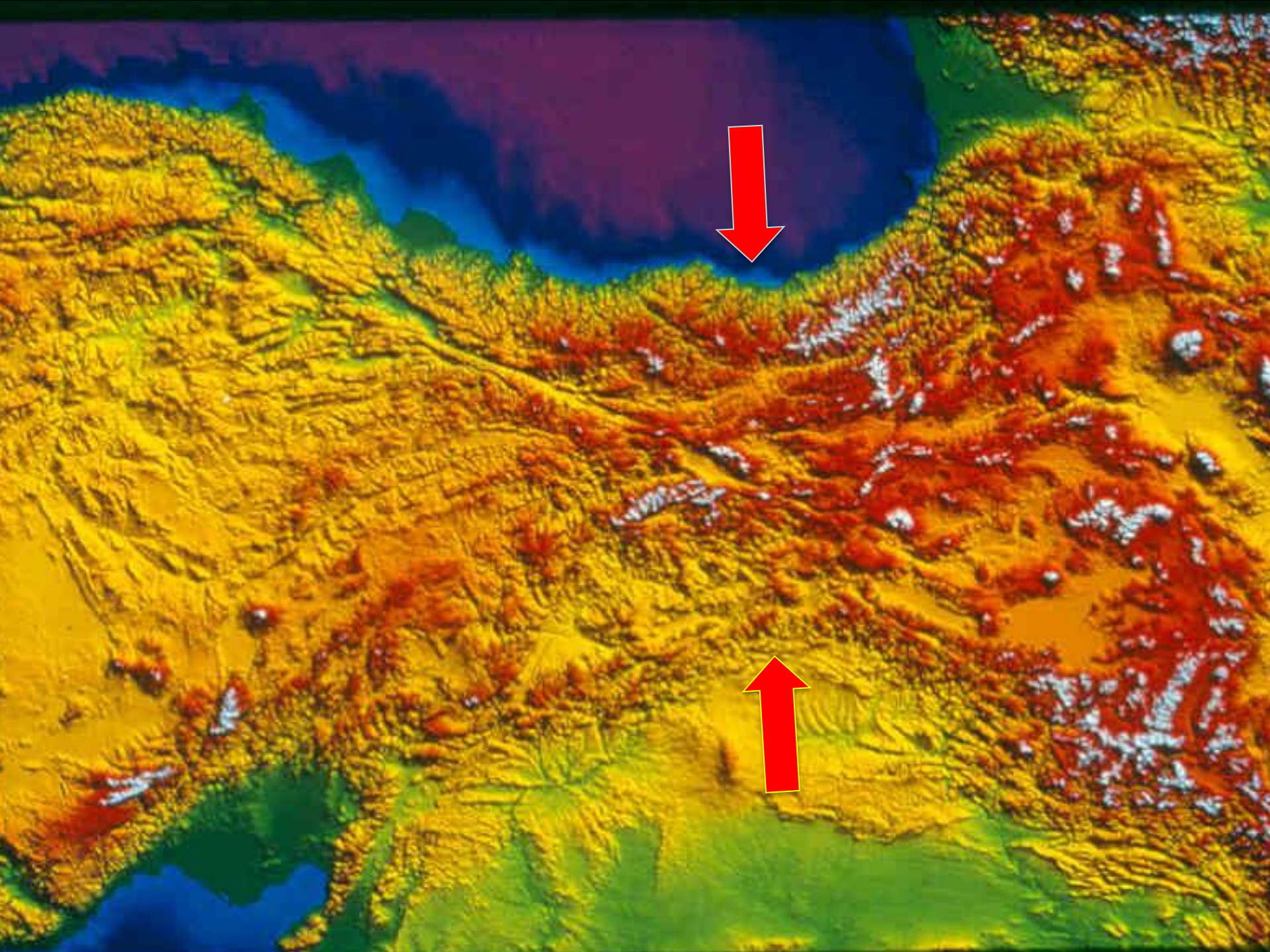
Nemrut Caldera

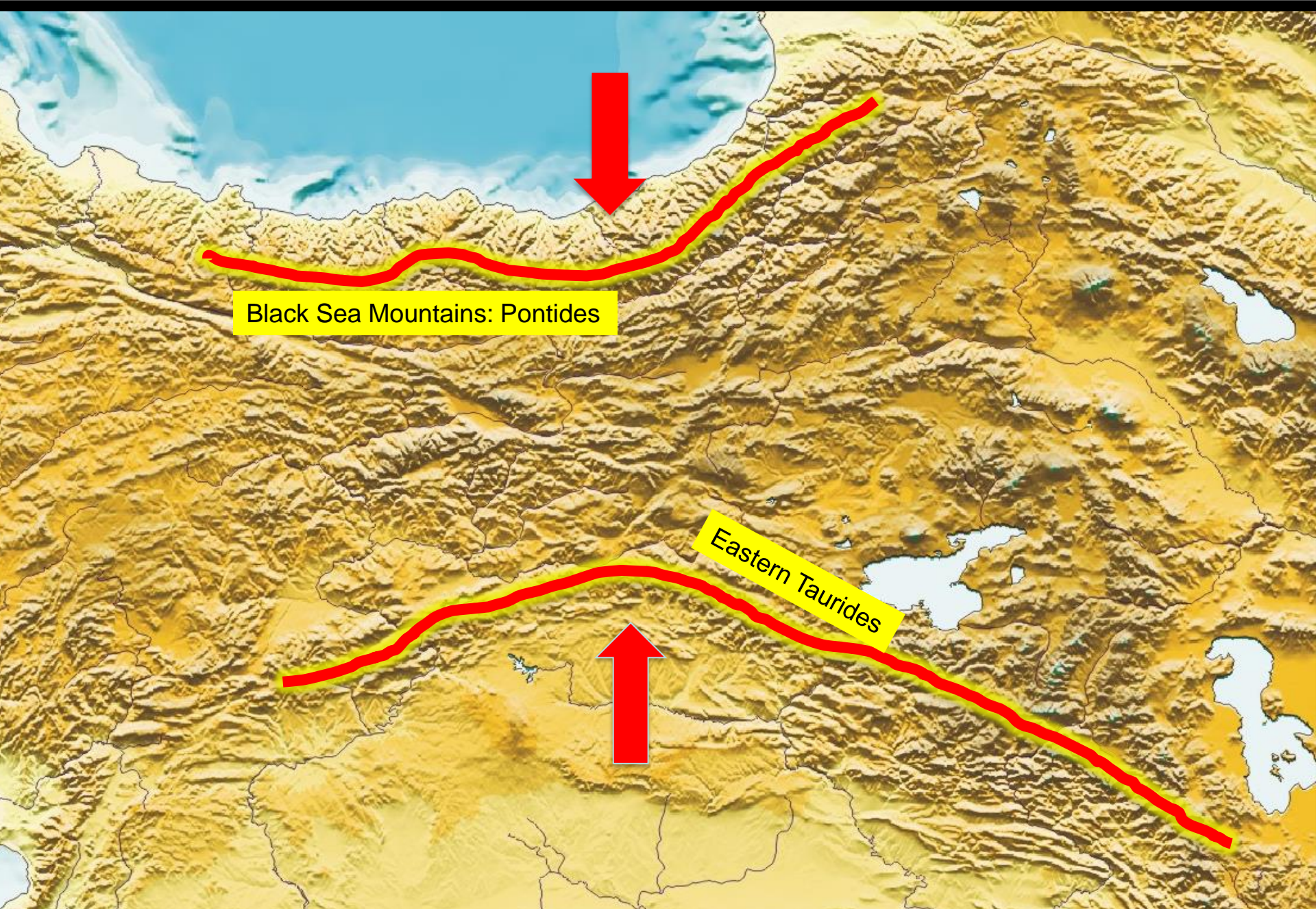
500 years old lavas



Suphan volcano





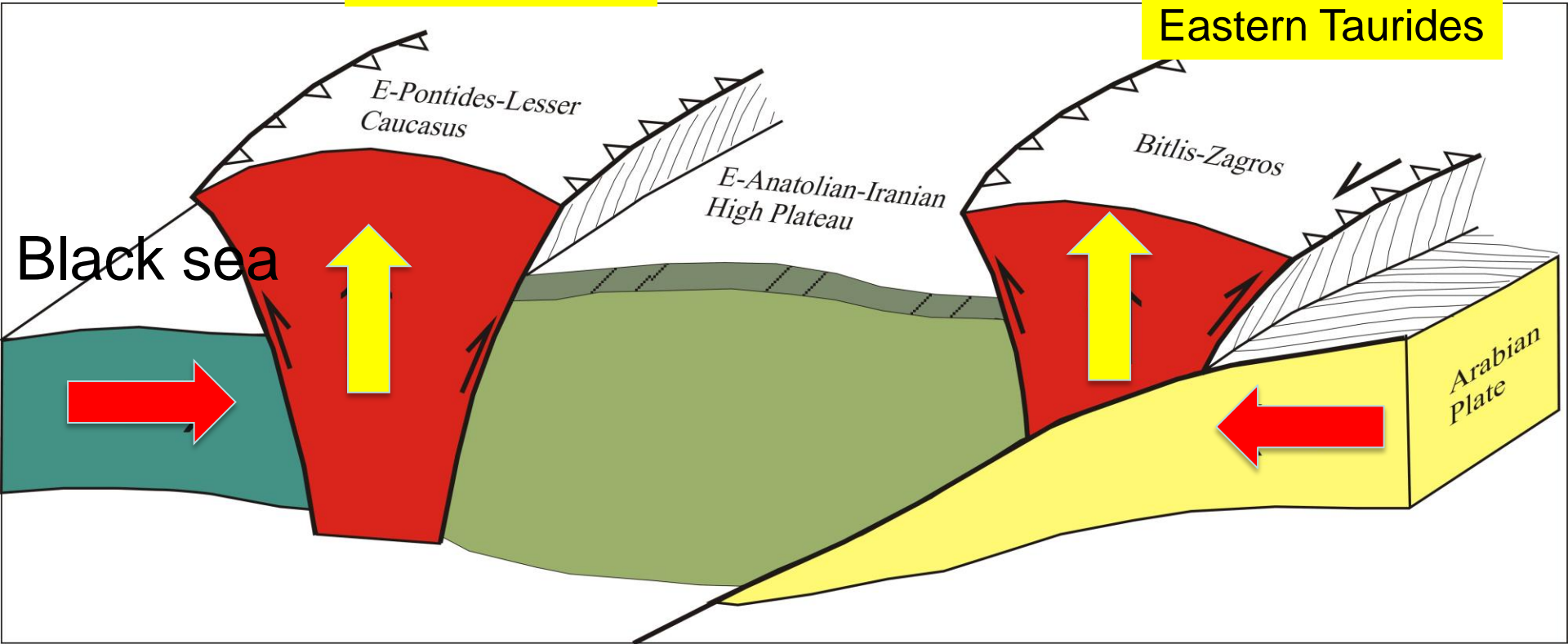


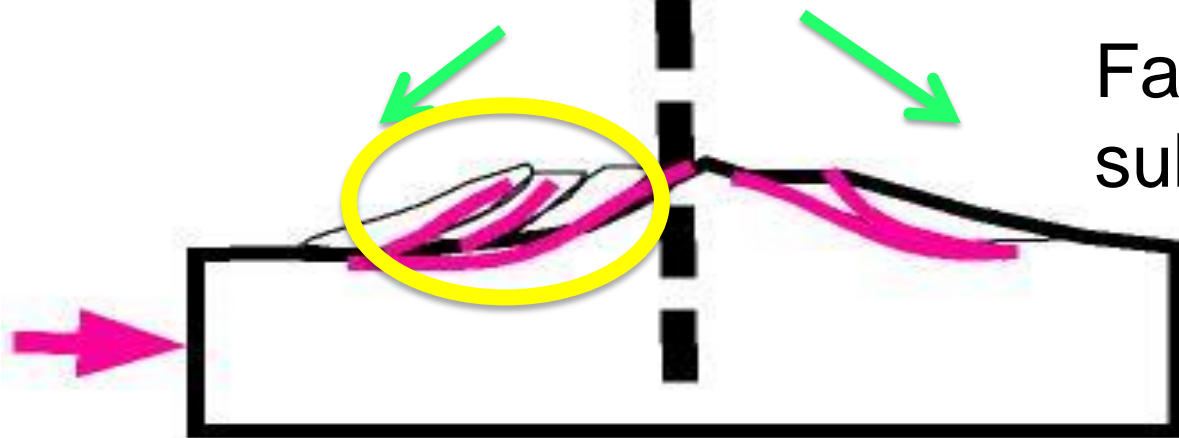
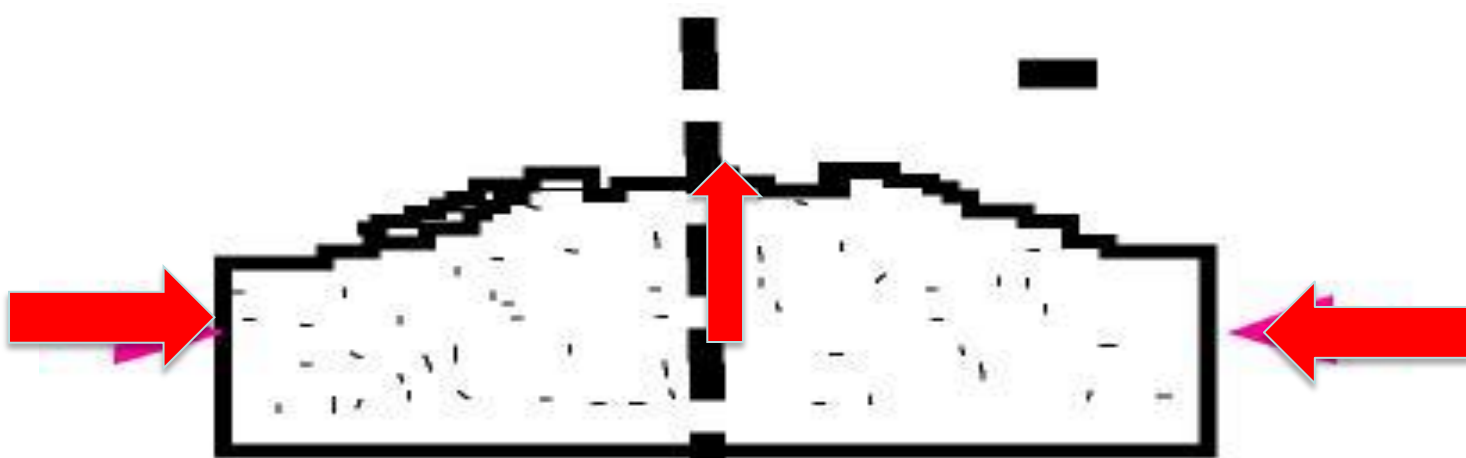
Black Sea Mountains: Pontides

Eastern Taurides

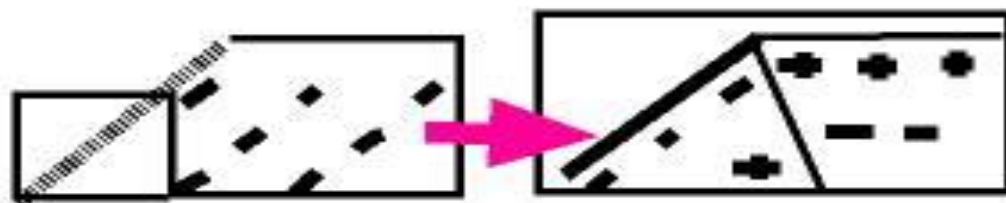
Black Sea Mts

Eastern Taurides





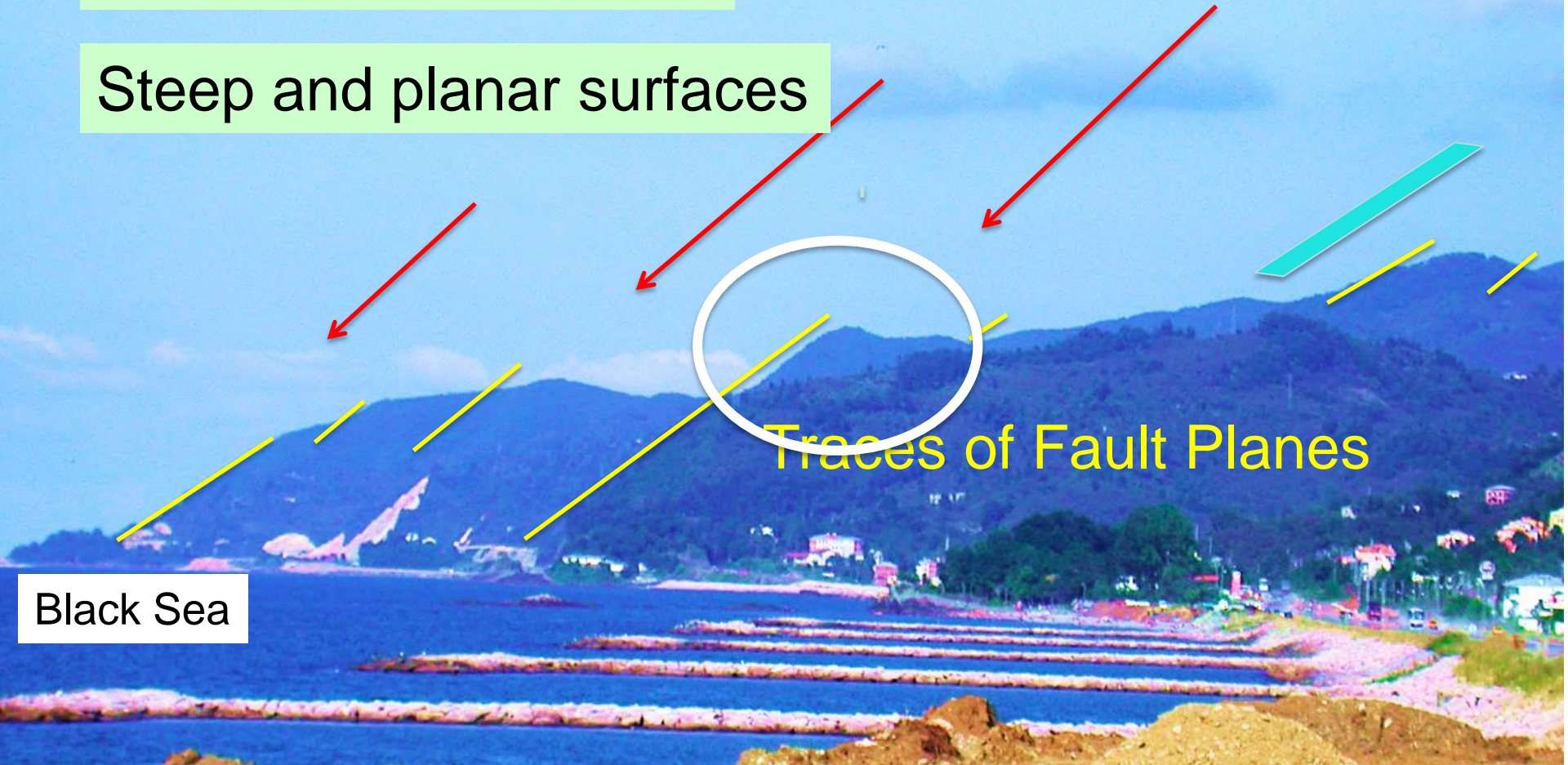
Fault-bounded block
subside as step fault



NORTHERN FLANK OF THE BLACK SEA MOUNTAINS

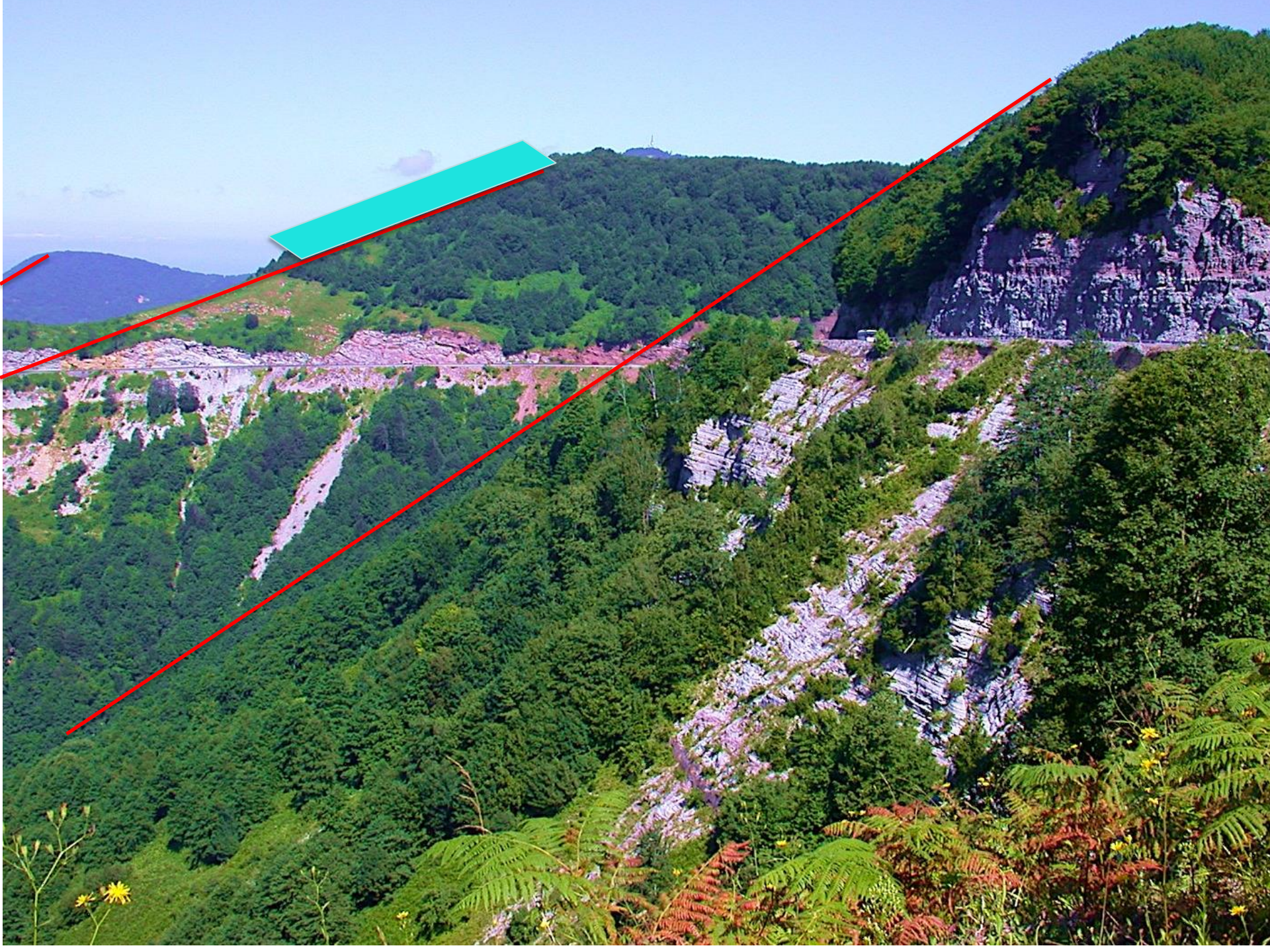
Stairs like slope: Steps

Steep and planar surfaces



Black Sea

Traces of Fault Planes





Water Fall

Cascade

STEEP SLOPS TRIGGER MANY FORMS OF LAND SLIDES



Land Slide

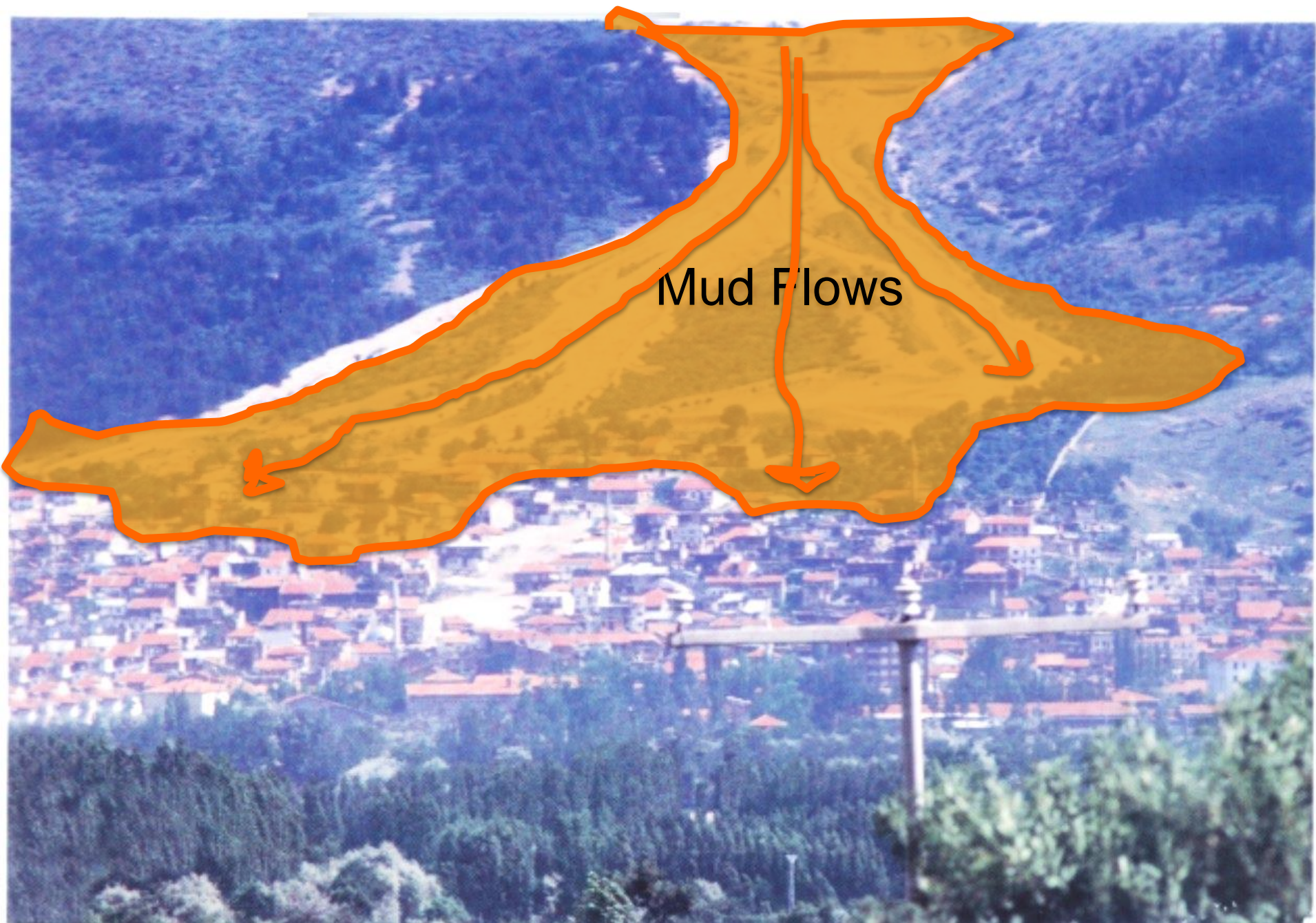


Land slides may cause disasters





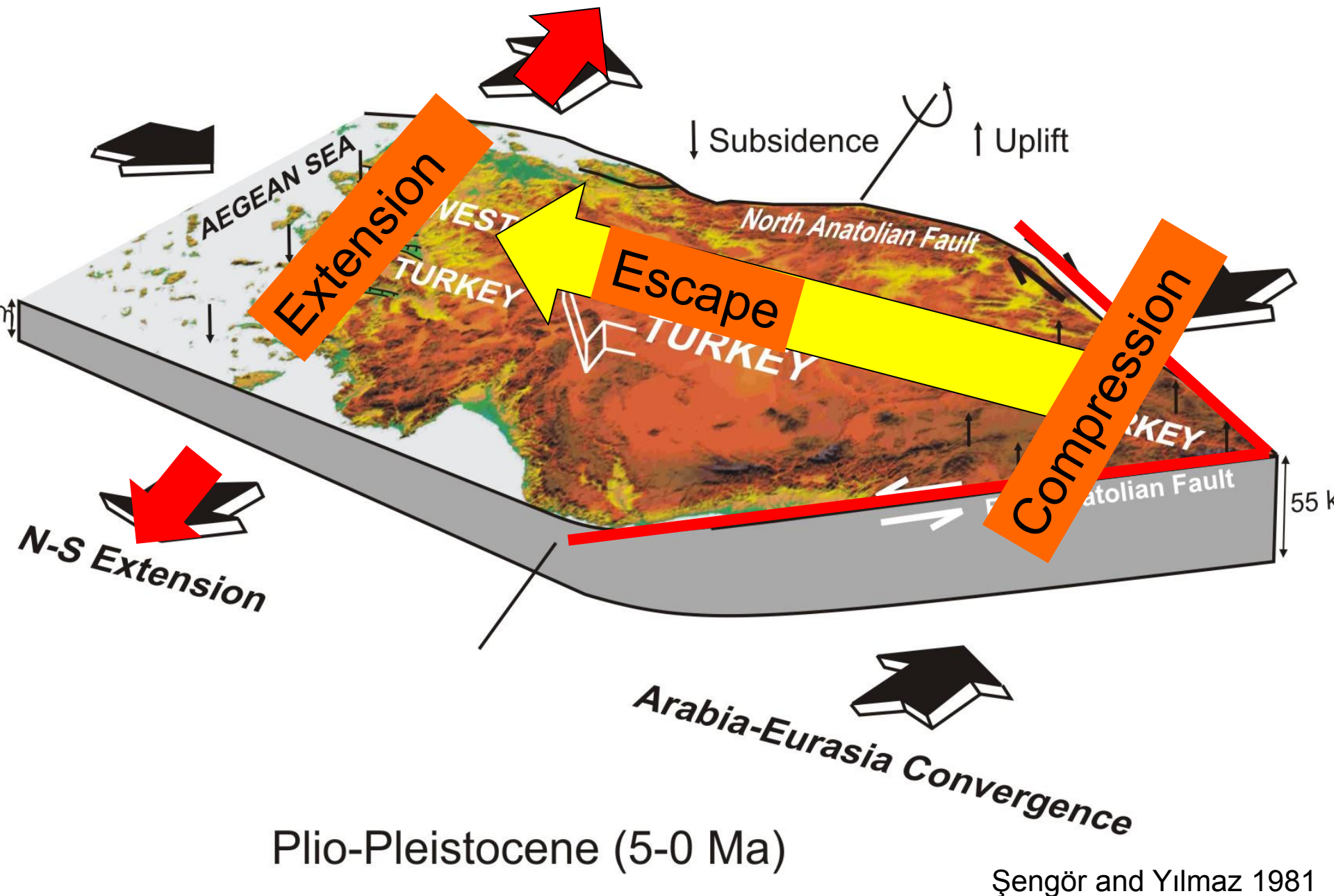


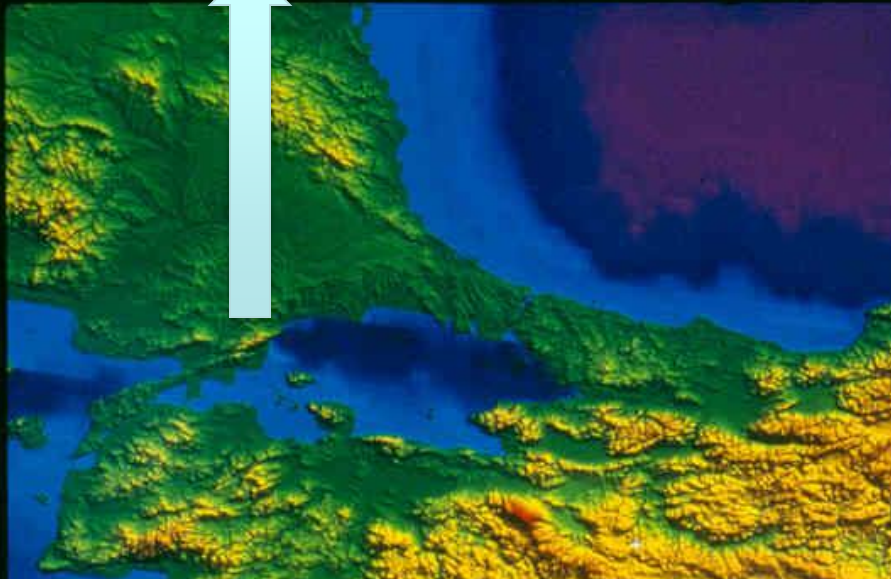


Mud Flows

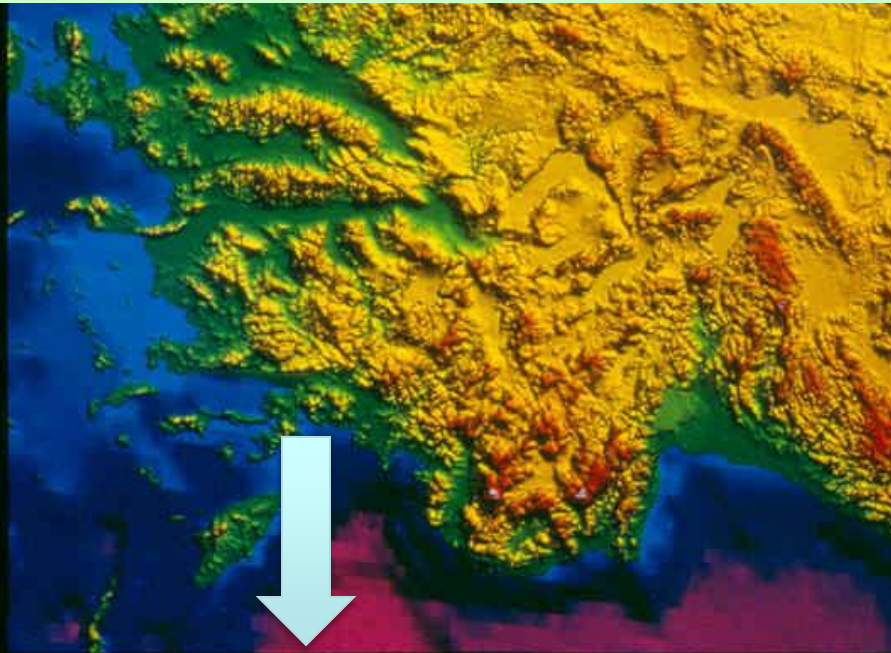
Roads and villages suffer most from the land slides



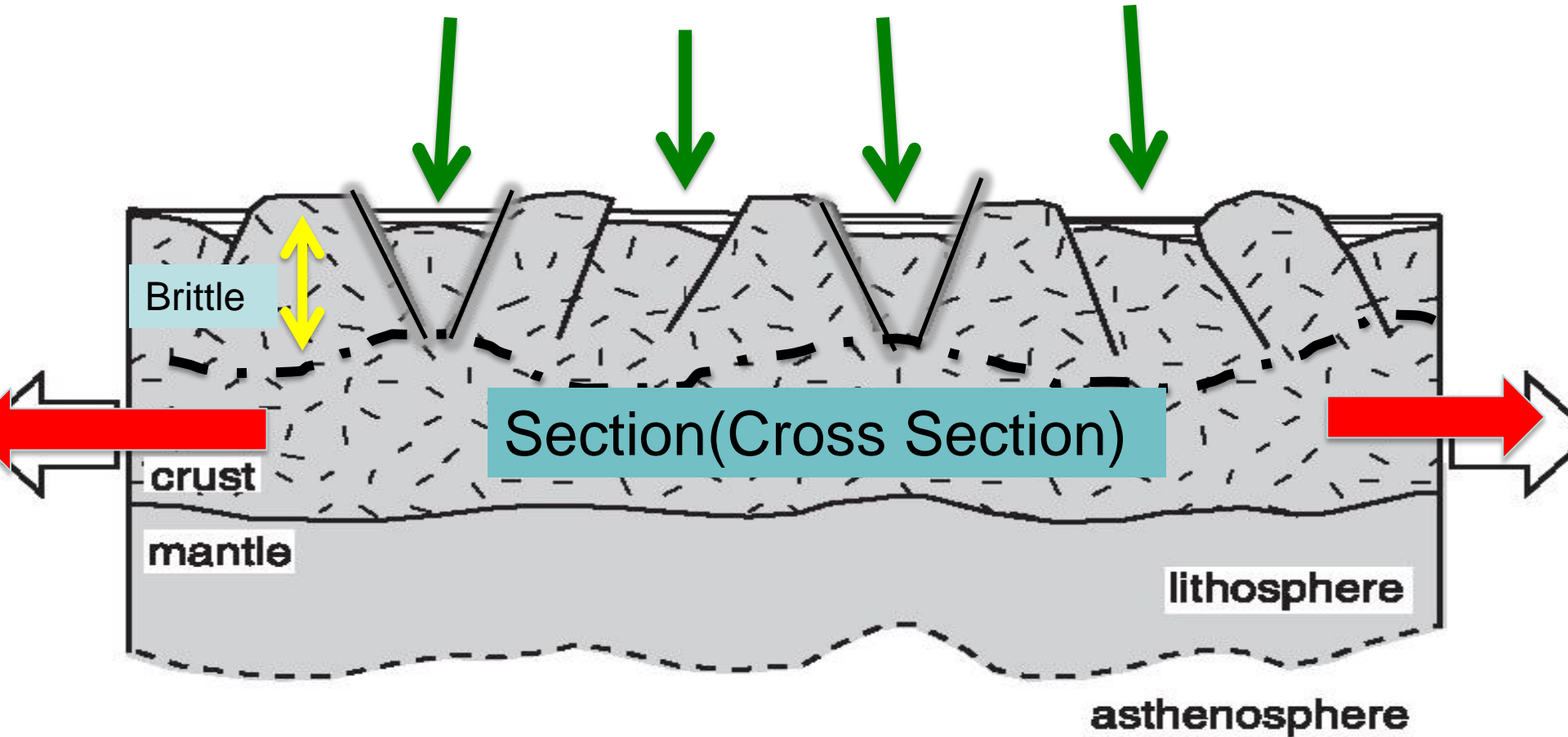




Western Anatolis is one of the fastest extending continental regions in the world: $> 2 \text{ cm/y}$



Extension: Thinning and Elongation

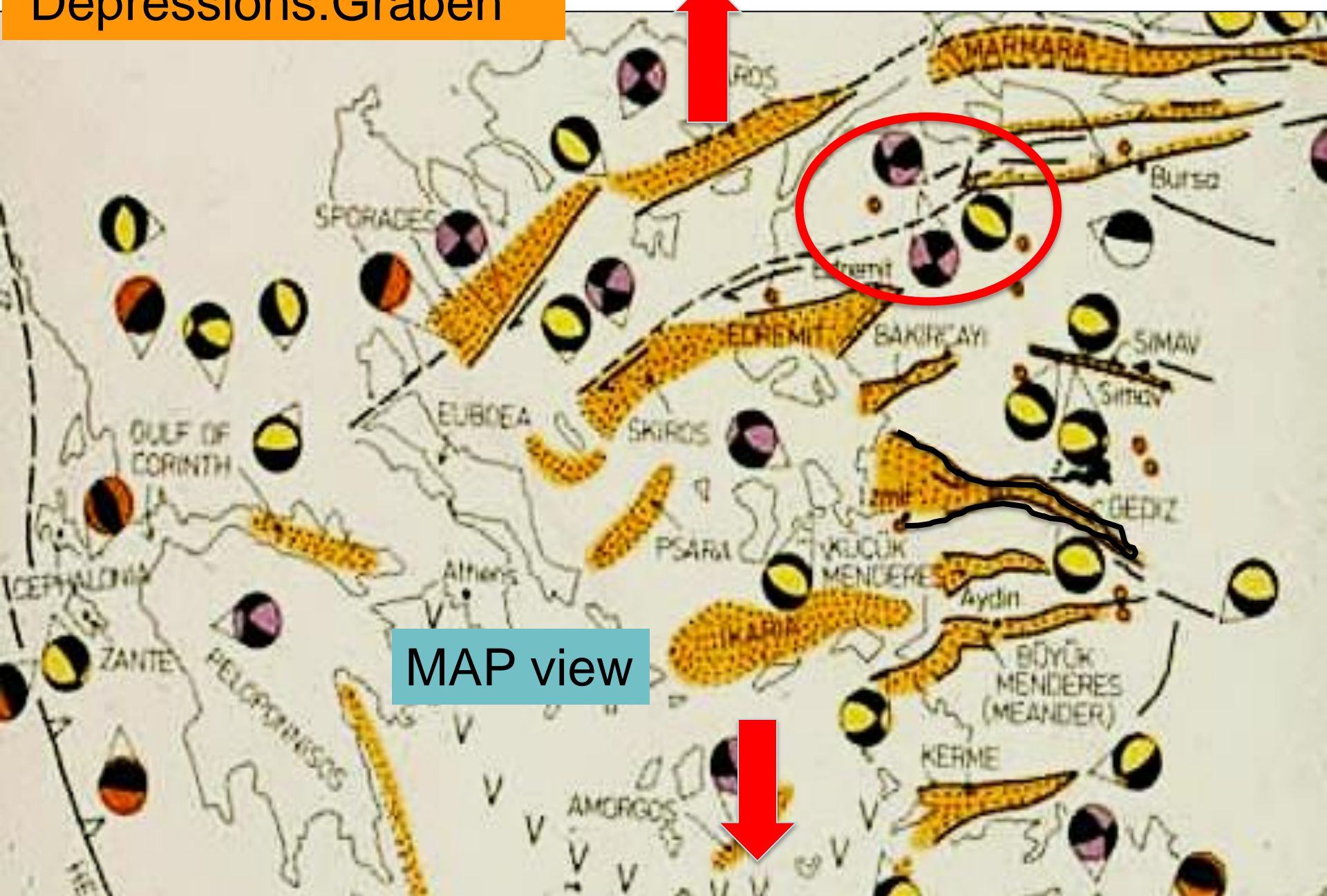


Straining region

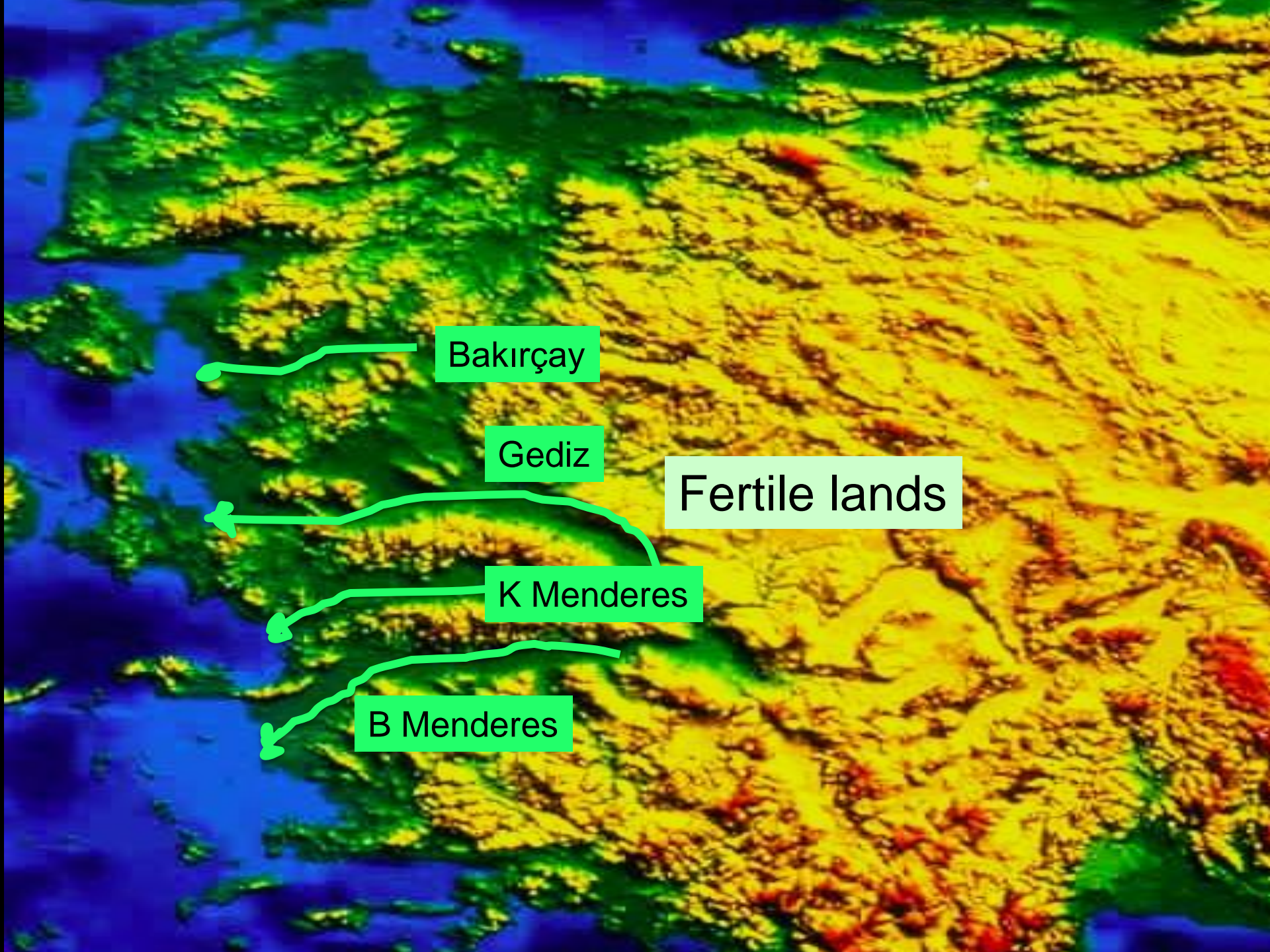
40 KM

Fault bounded areas of
Depressions: Graben

Fault movements generates earthquakes



MAP view



Bakırçay

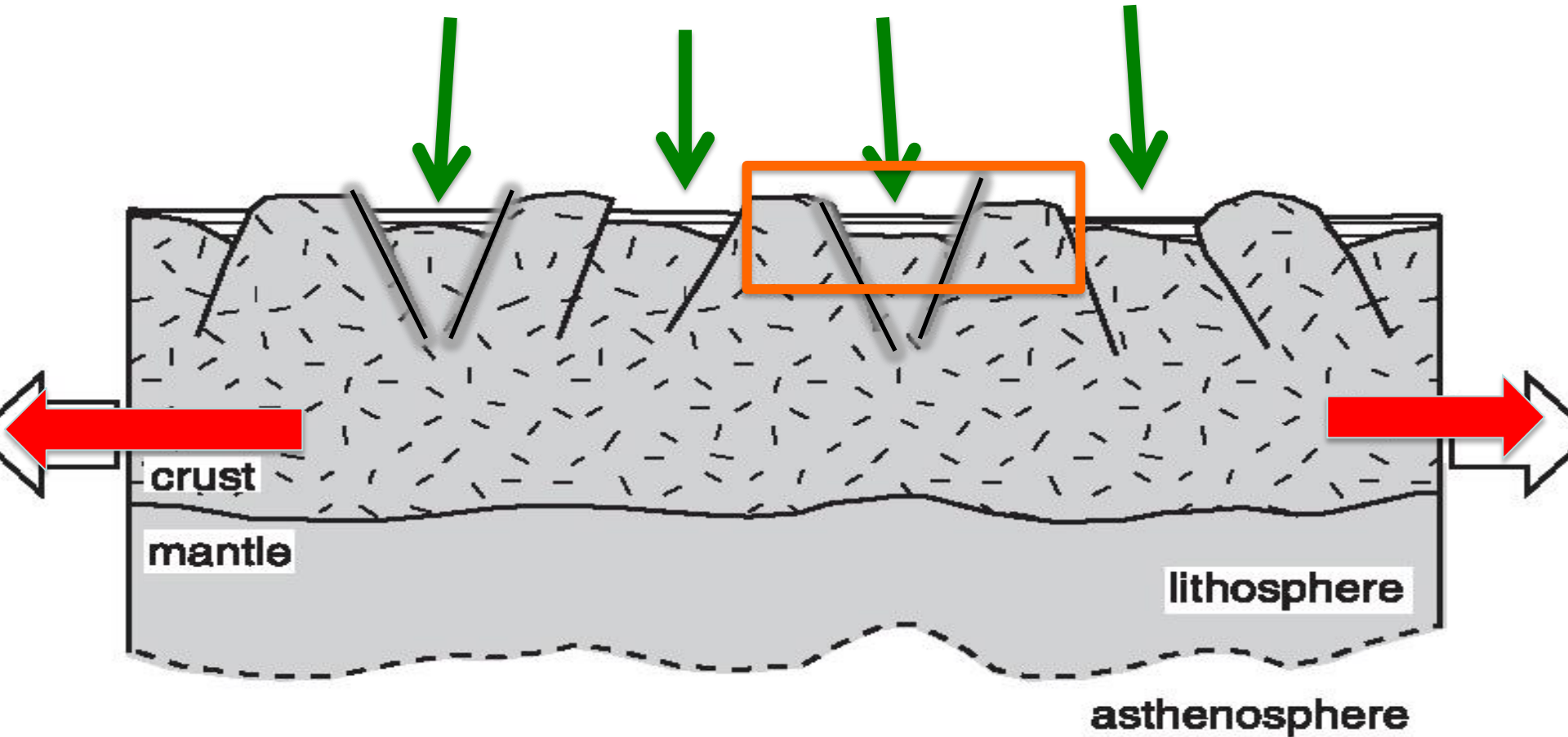
Gediz

Fertile lands

K Menderes

B Menderes

Extension: Thinning and Elongation

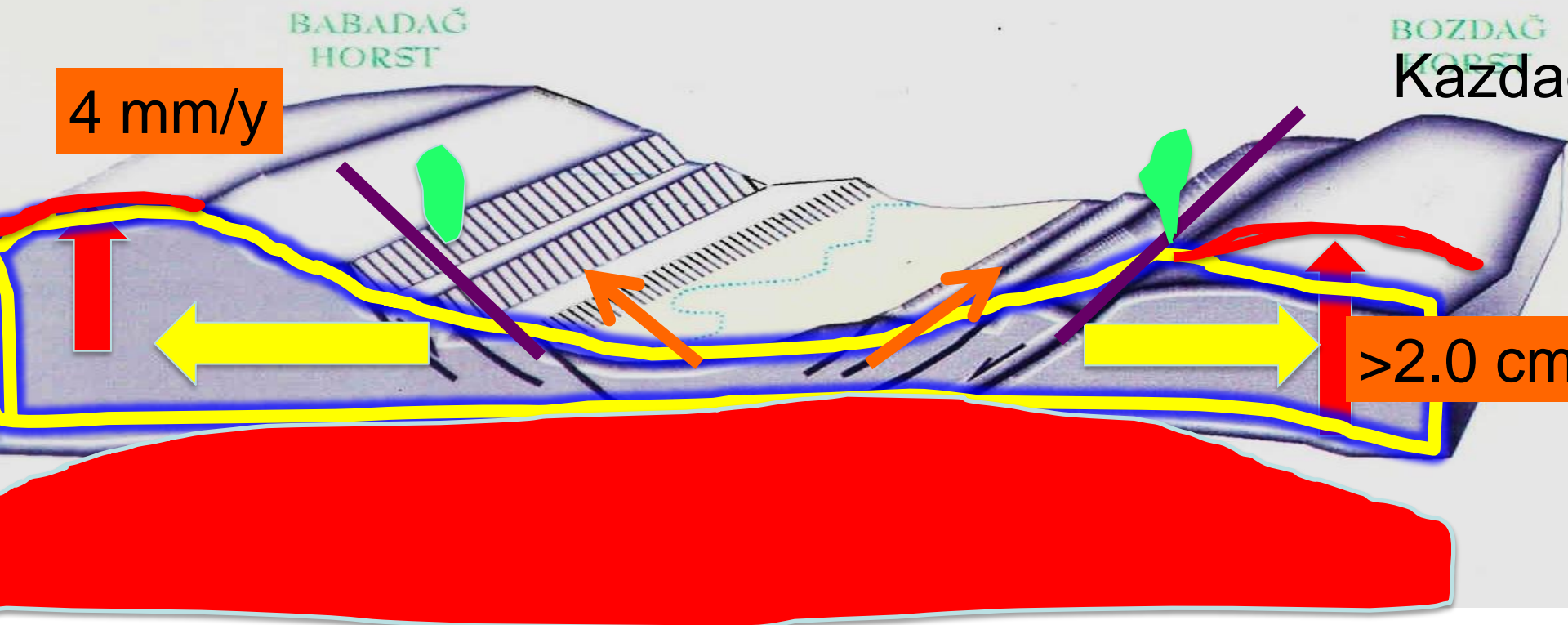


 Straining region

40 KM



Thinning and elongation. Lithosphere thins, Asthenosphere a

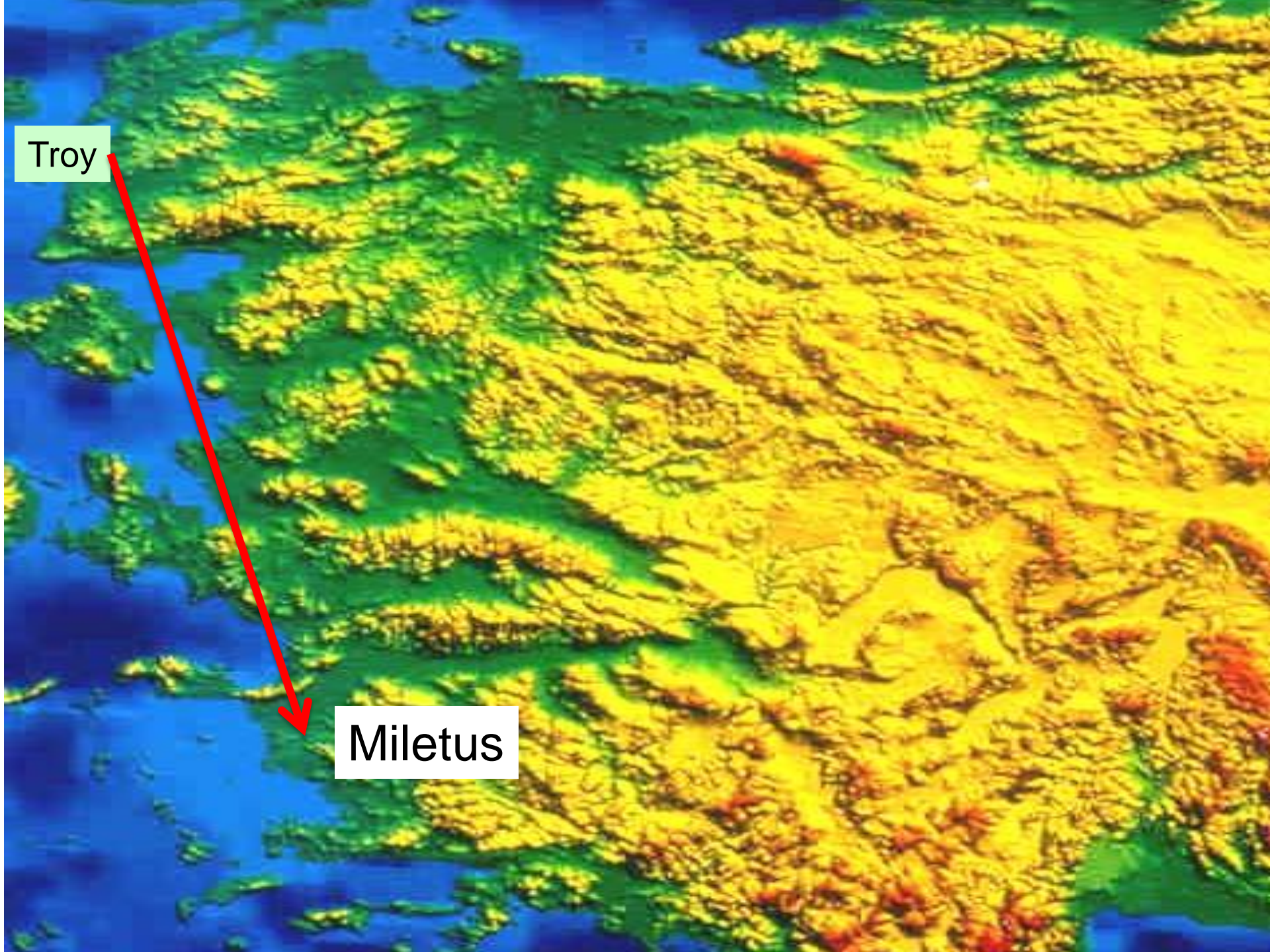


High Heat flow: Geo-thermal energy
Hot spring water-Thermal water



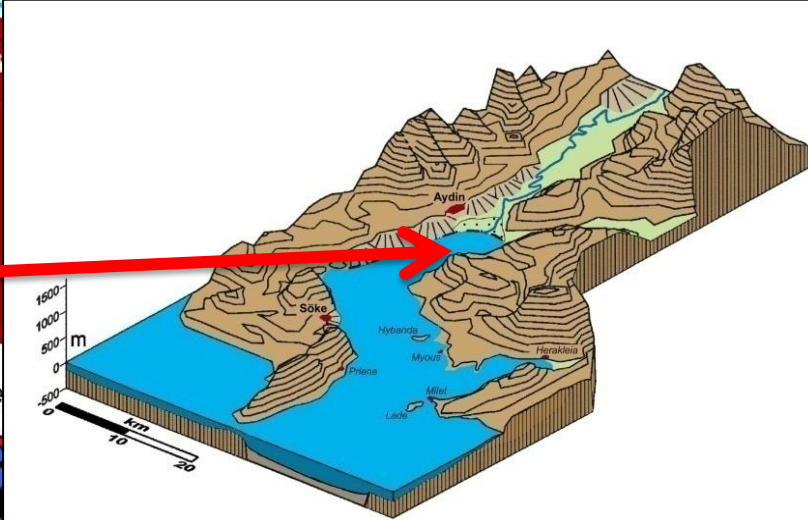
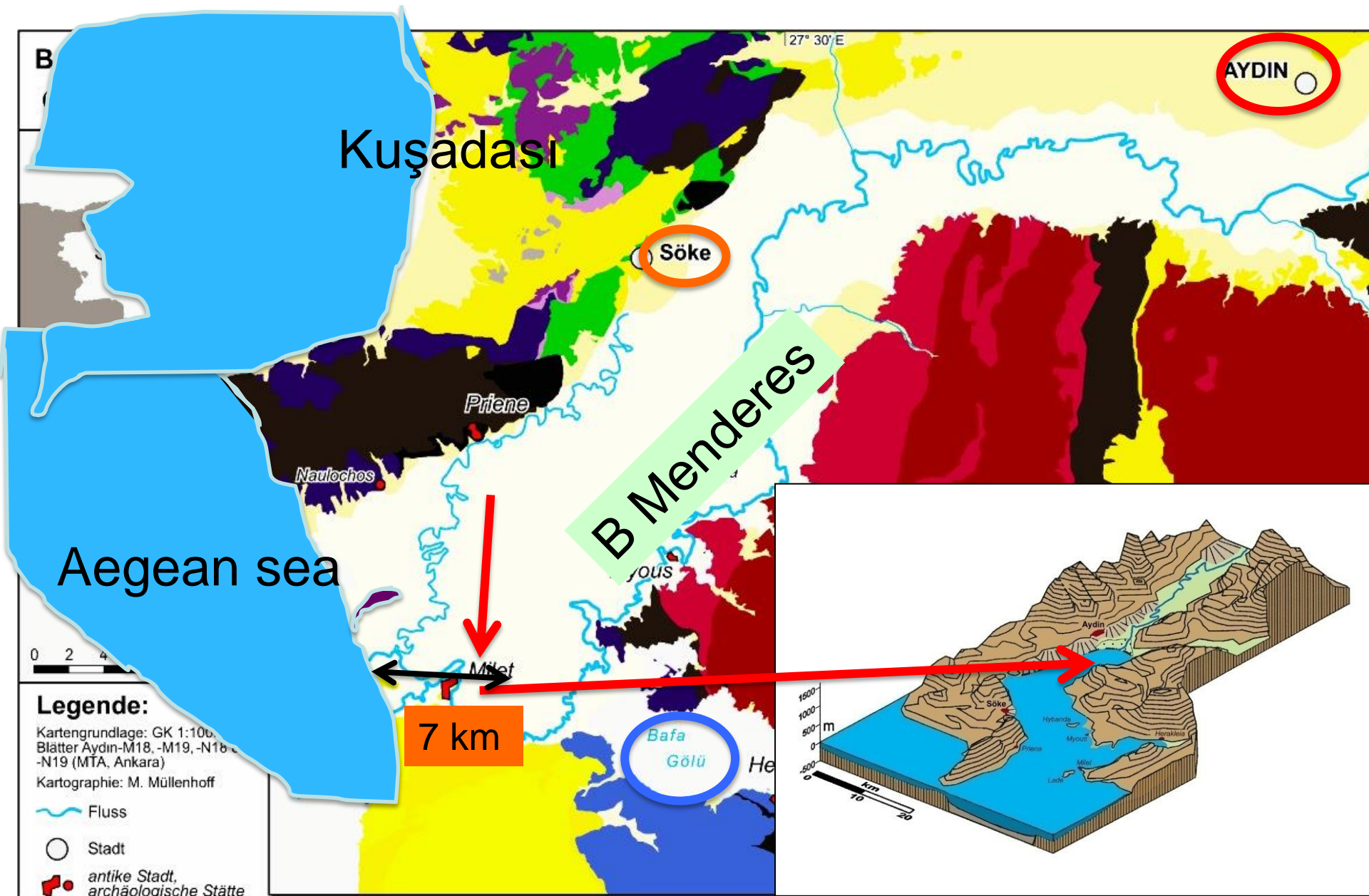
Thinning and elongation. Lithosphere thins, Asthenosphere a



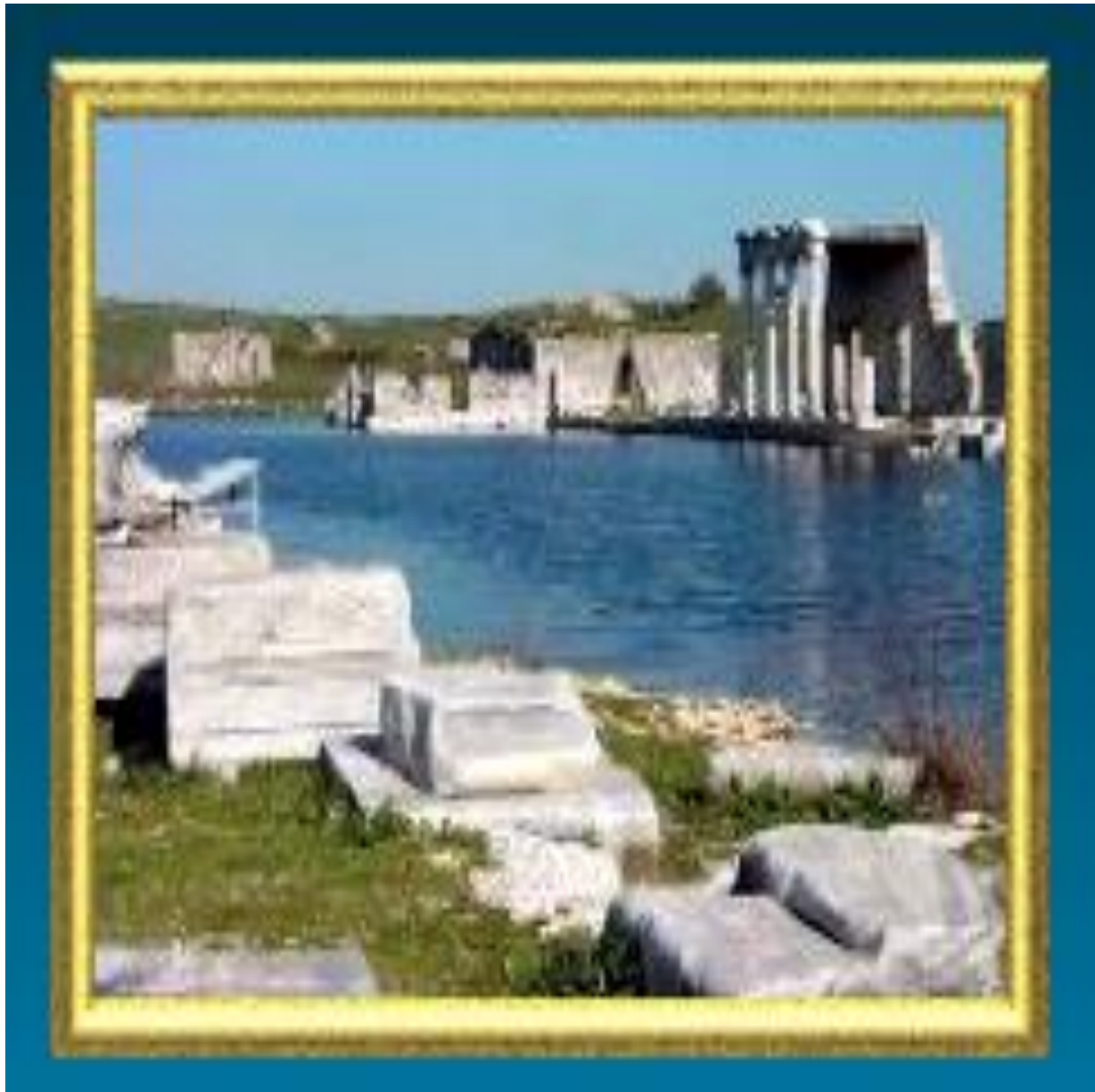


Troy

Miletus



Holocene transgression maximum circa 6.000 years B.P.



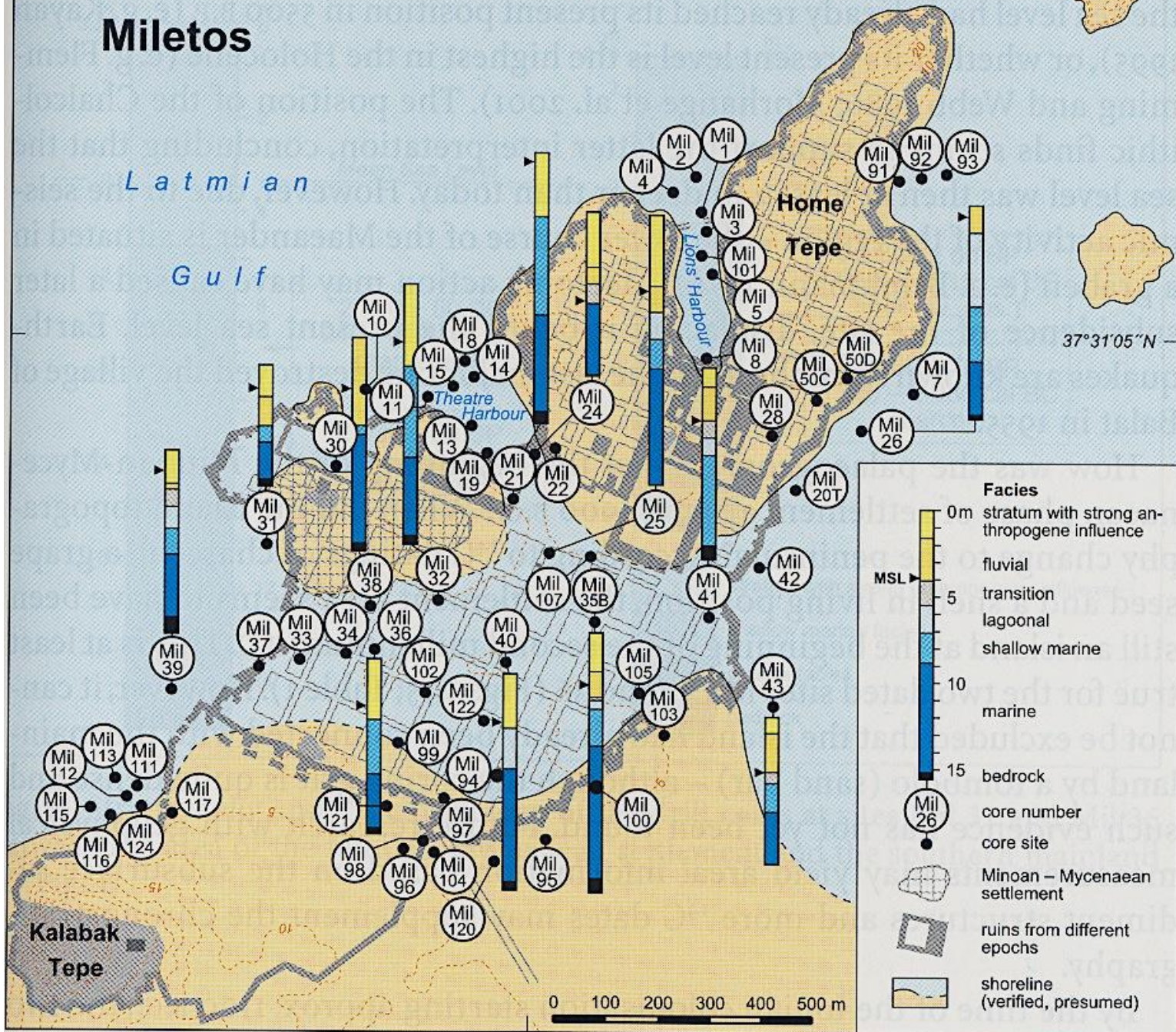


27°18'01"E

Miletos

Latmian
Gulf

37°31'05"N

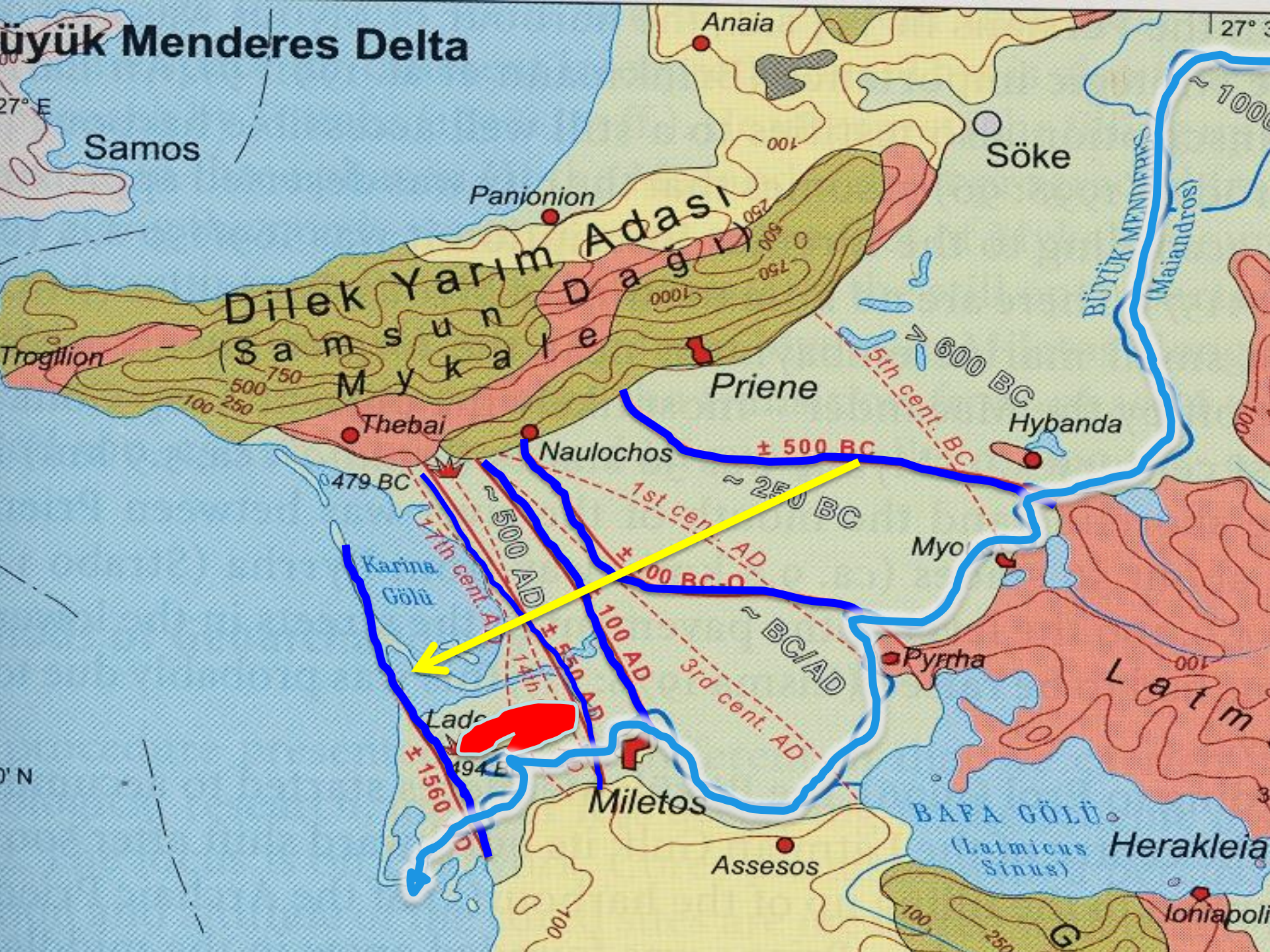


Facies

- 0m stratum with strong anthropogenic influence
- fluvial
- MSL transition
- lagoonal
- shallow marine
- 10 marine
- 15 bedrock
- Mil 26 core number
- core site
- Minoan – Mycenaean settlement
- ruins from different epochs
- shoreline (verified, presumed)

0 100 200 300 400 500 m

Büyük Menderes Delta



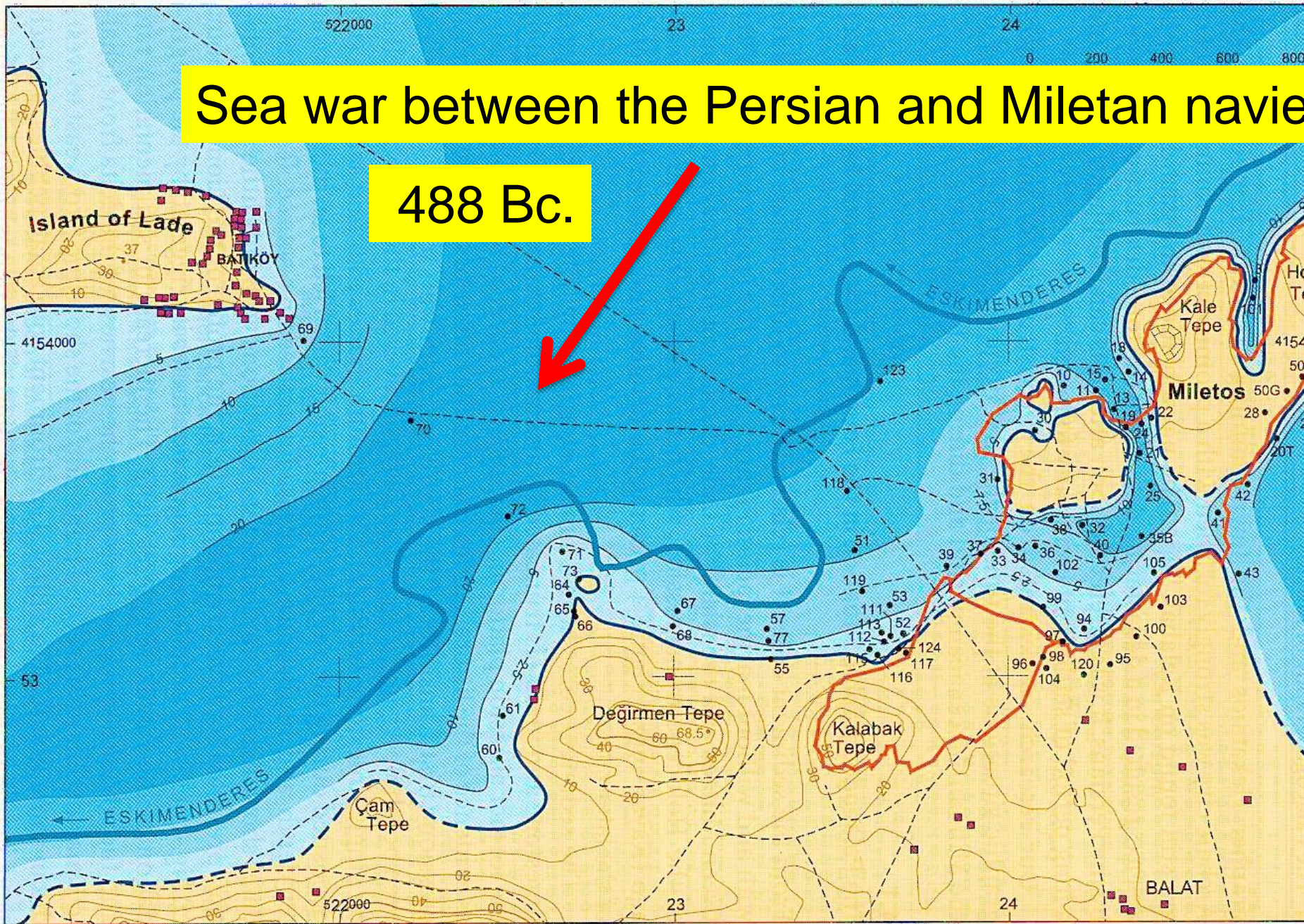
Lade Hills

Myletus



Sea war between the Persian and Miletan navies

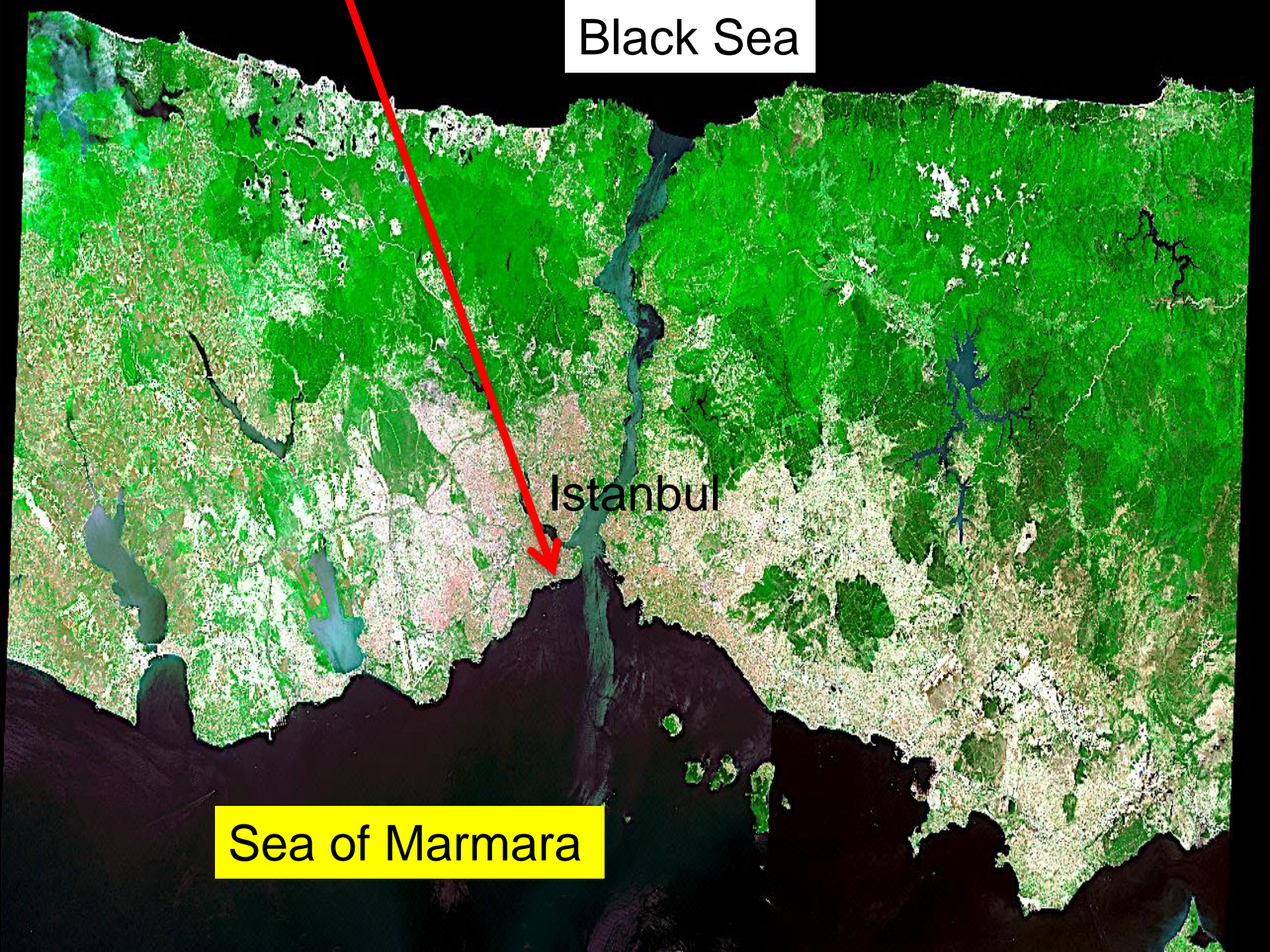
488 Bc.



Black Sea

Istanbul

Sea of Marmara





YENİKAPI

Marmaray Rail-Tube Tunnel Project



View to south



P1-P2

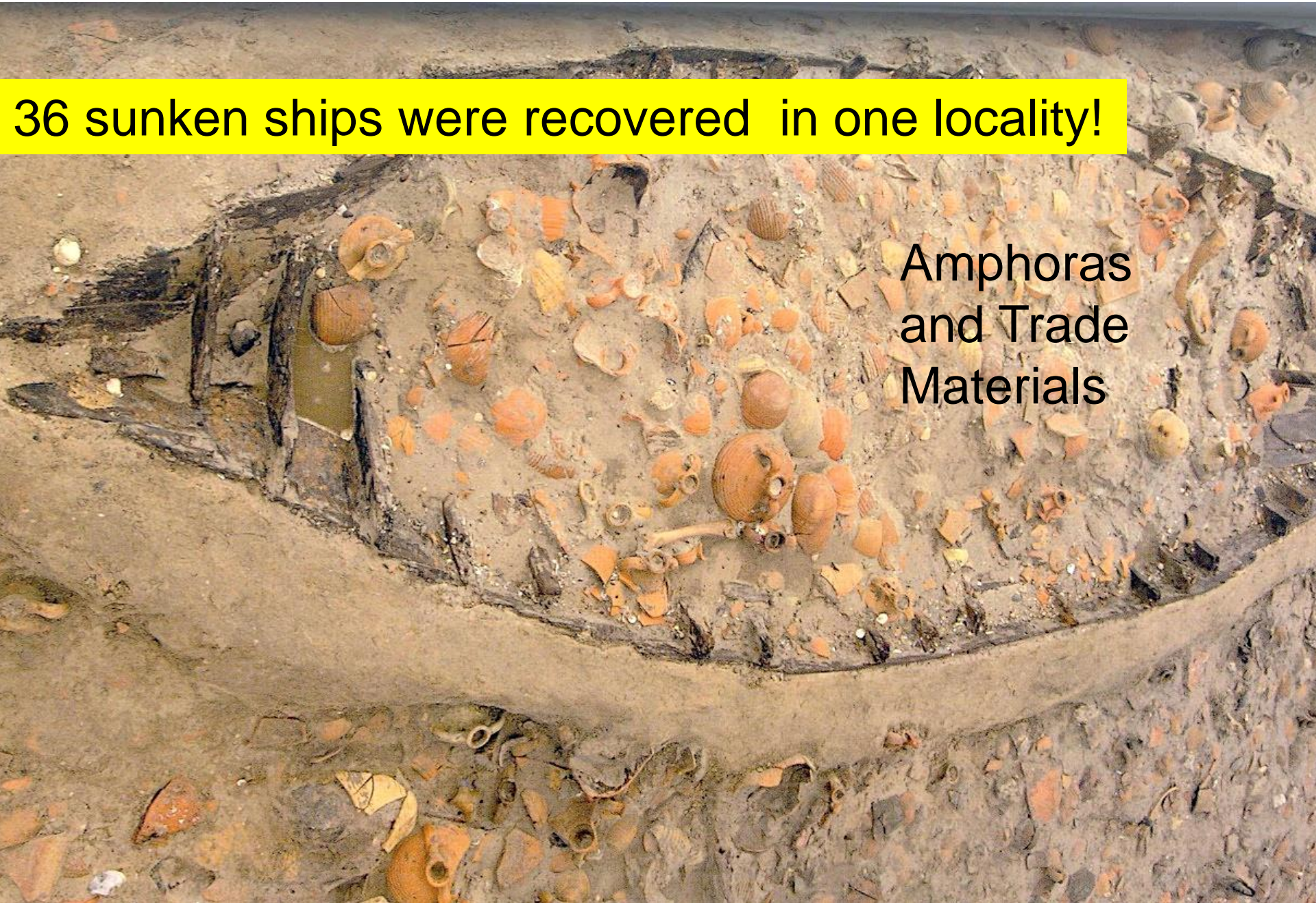
P3-P8

Invaluable section was exp

13 8 2018

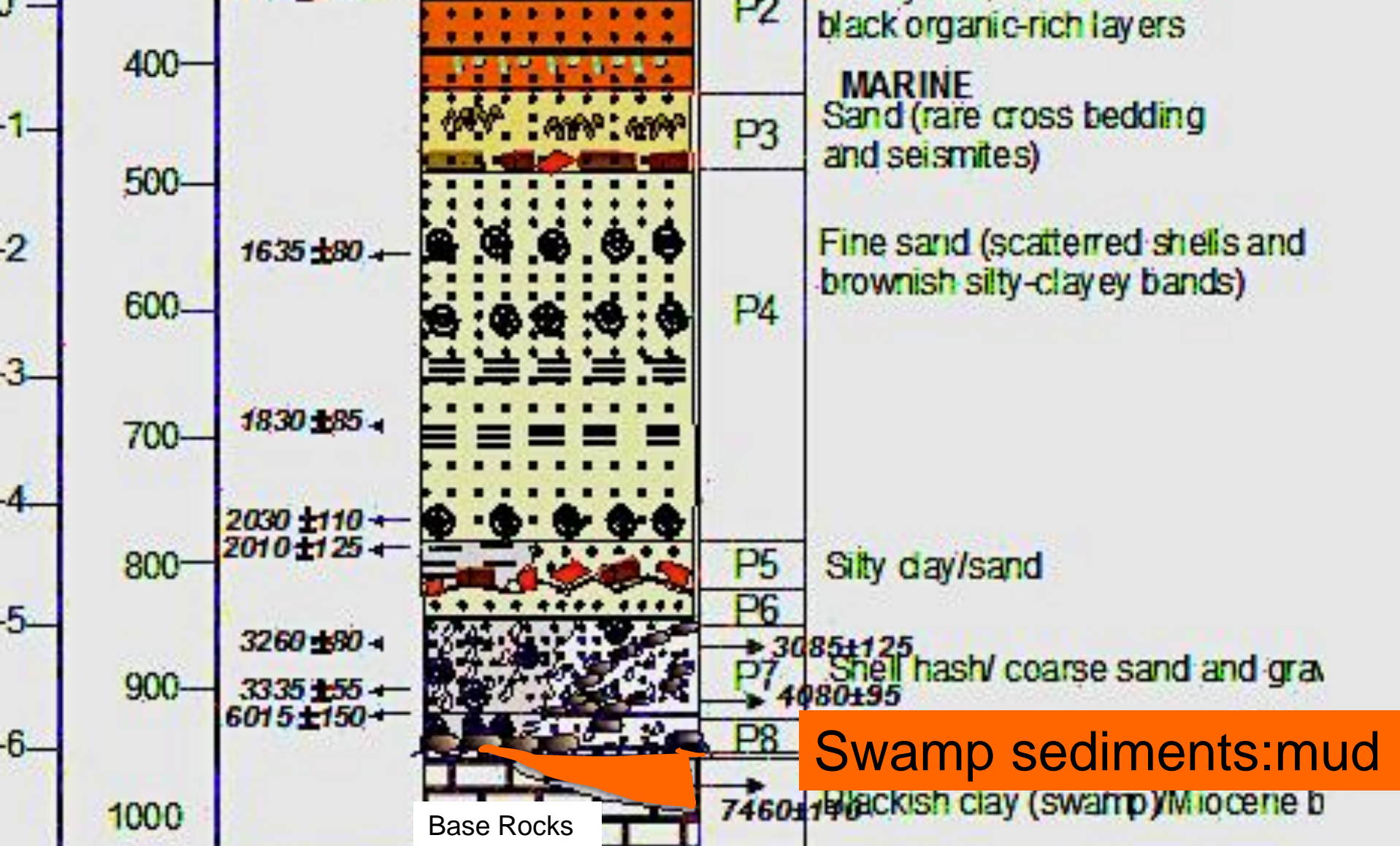
36 sunken ships were recovered in one locality!

Amphoras
and Trade
Materials



View to south





Swamp sediments: mud

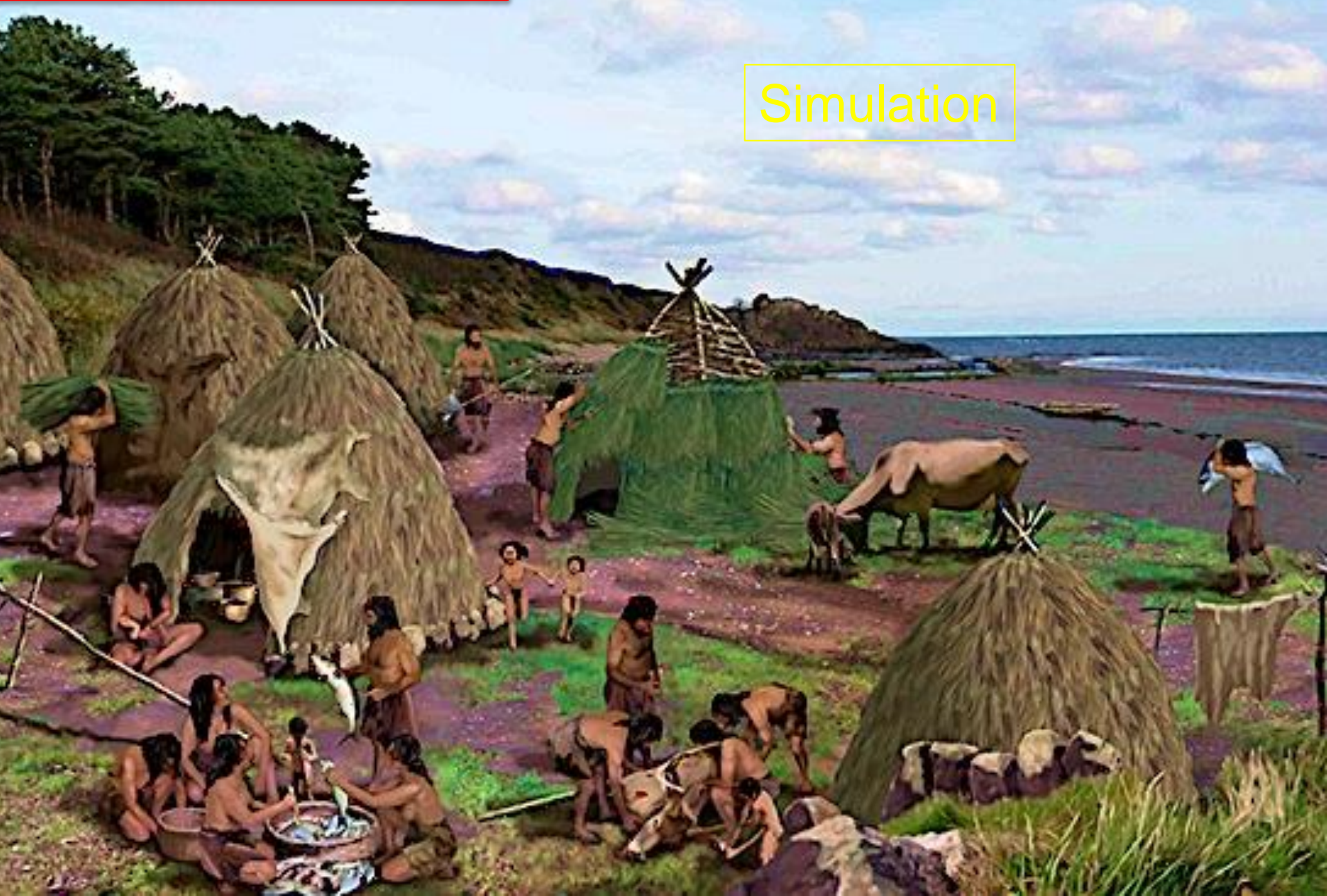


8400 yr BP in Yenikapi

Critically Important

by NTV-Te

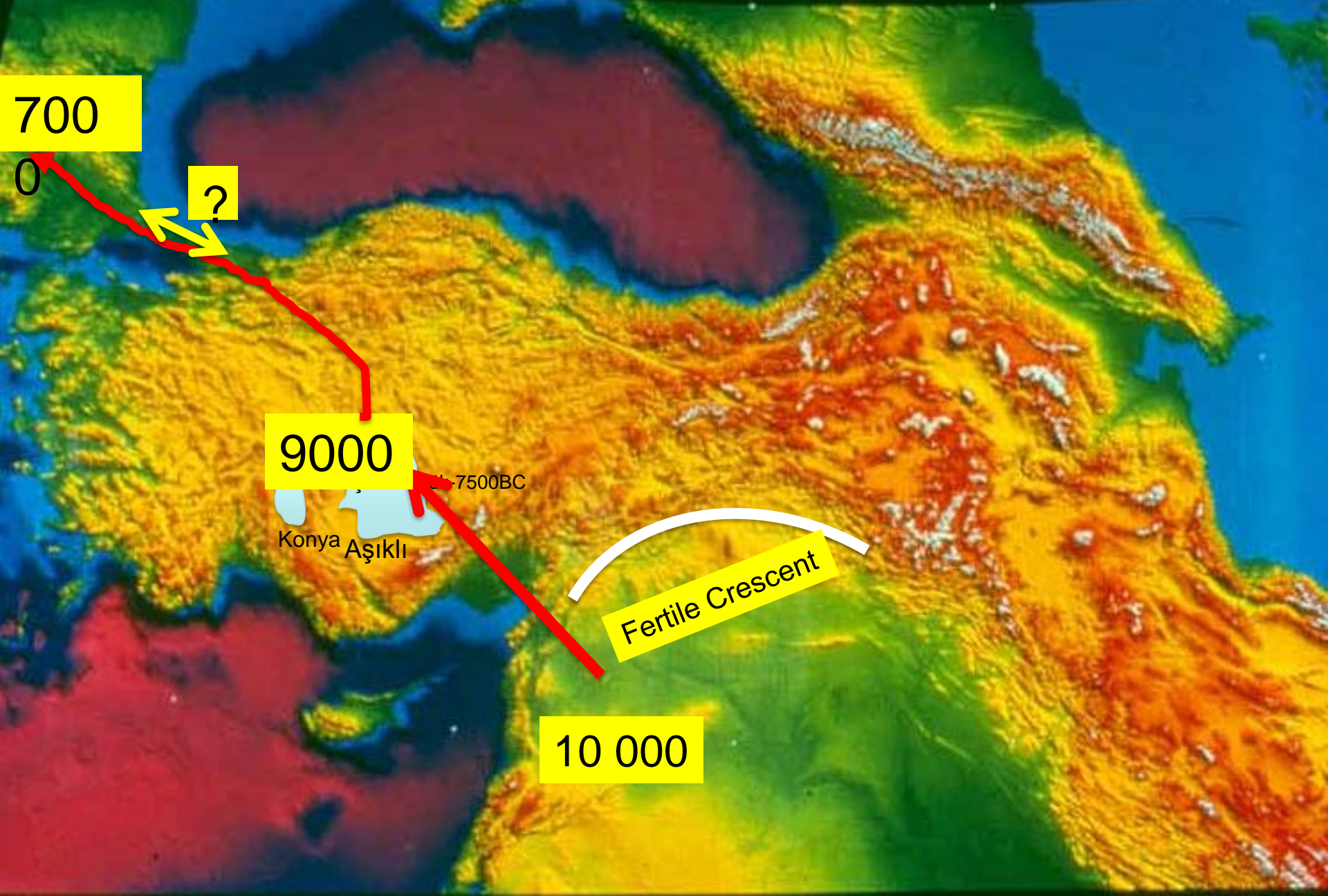
Simulation





First Farming began

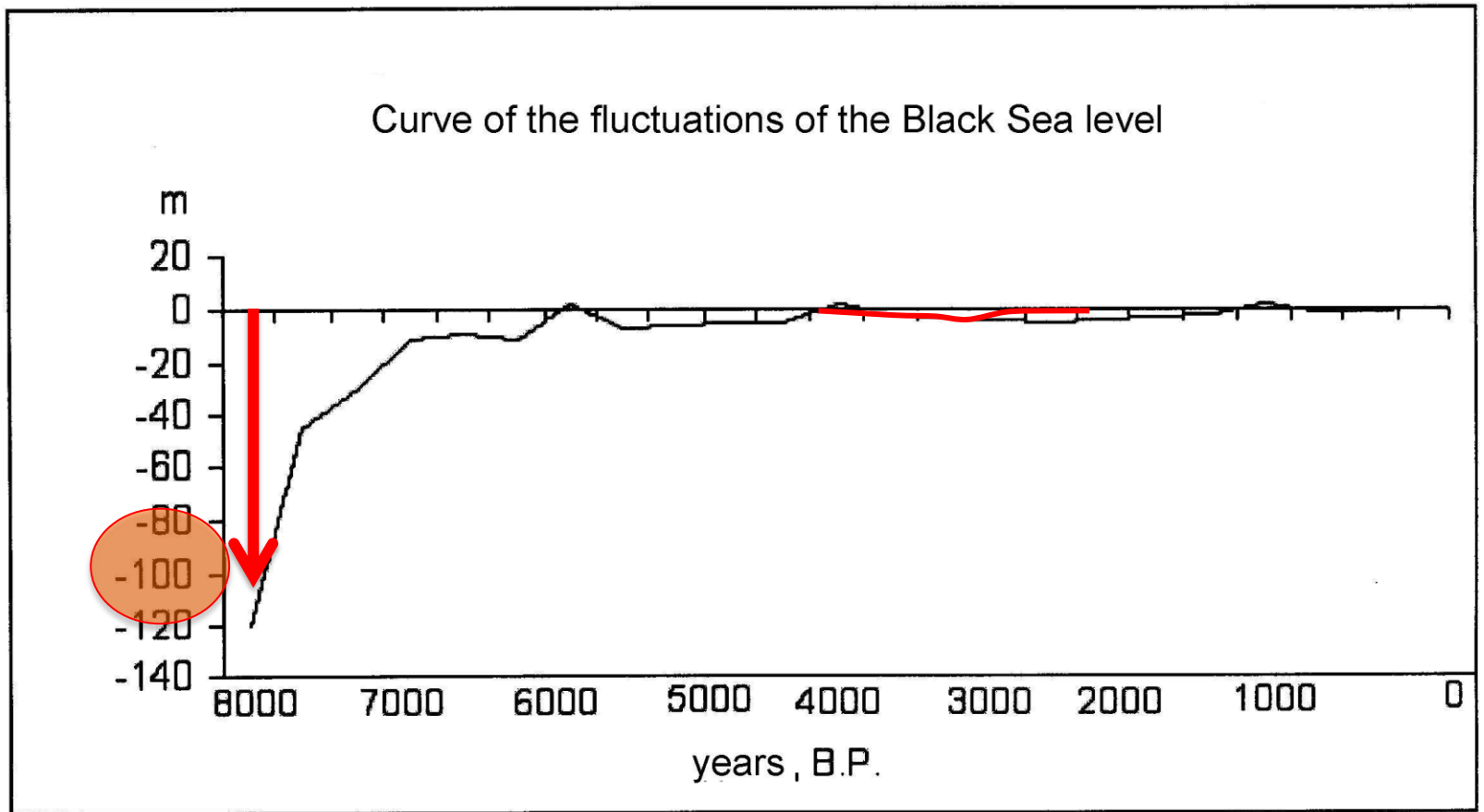
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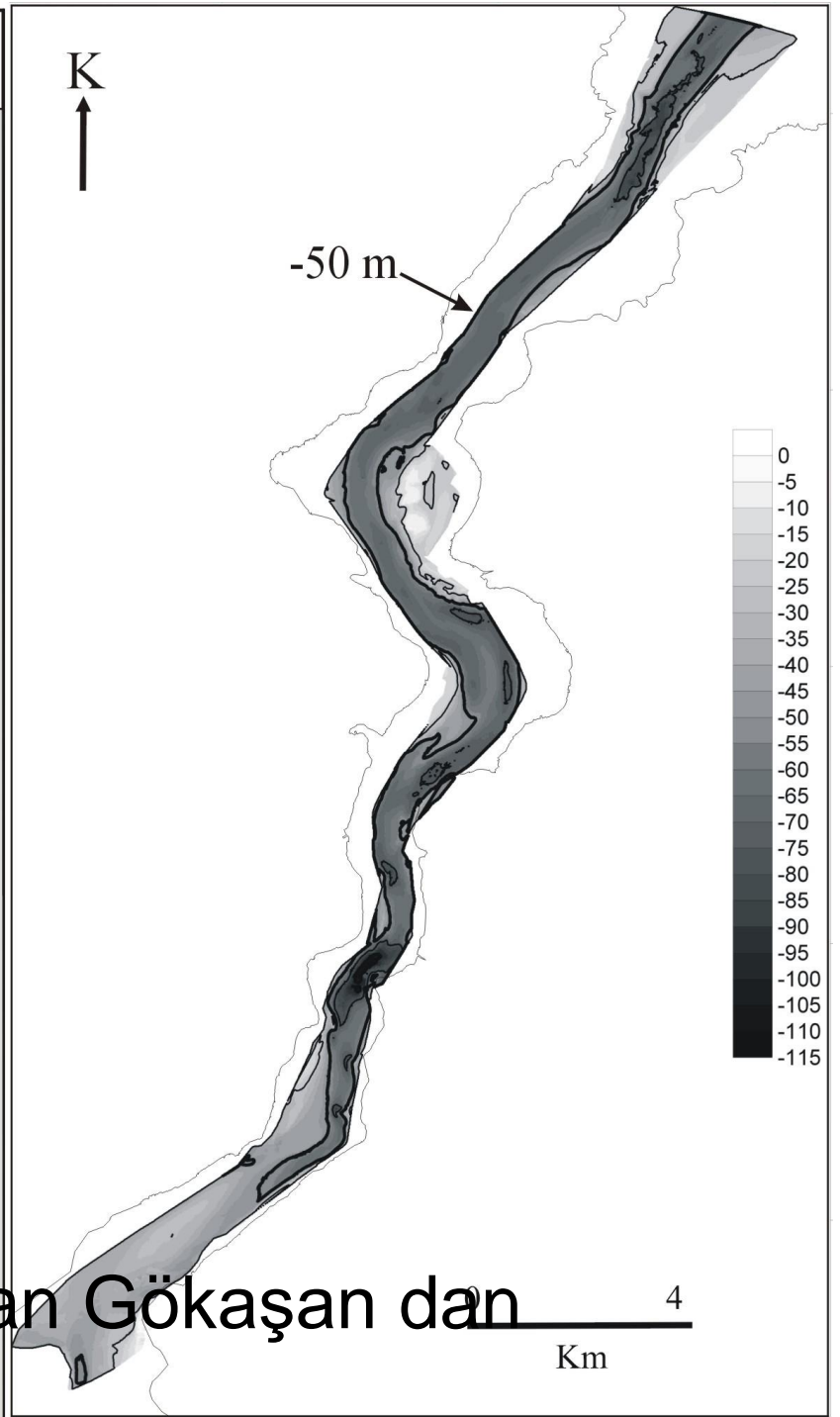
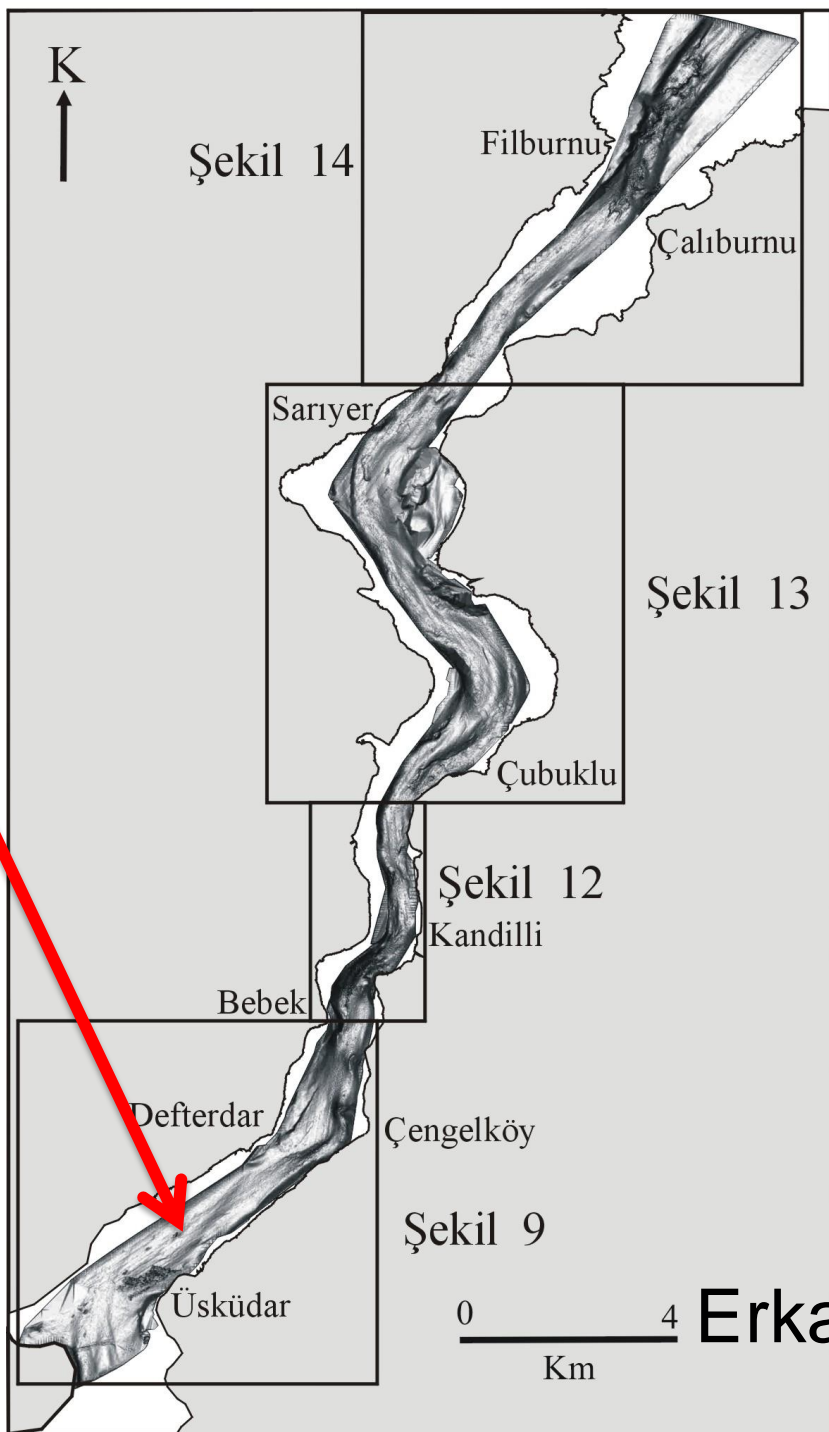
data.
by EPR remote sensing lab. Plotted at 40 microns.



Short spell of cold period!



Sea level in the Black sea dropped (-100m) below the sill level of the Bosphorous (-32m)



Erkan Gökaşan dan

Dam wall

32m

Sea level

K

3D(Dimensional)
Sismic tomography

F8

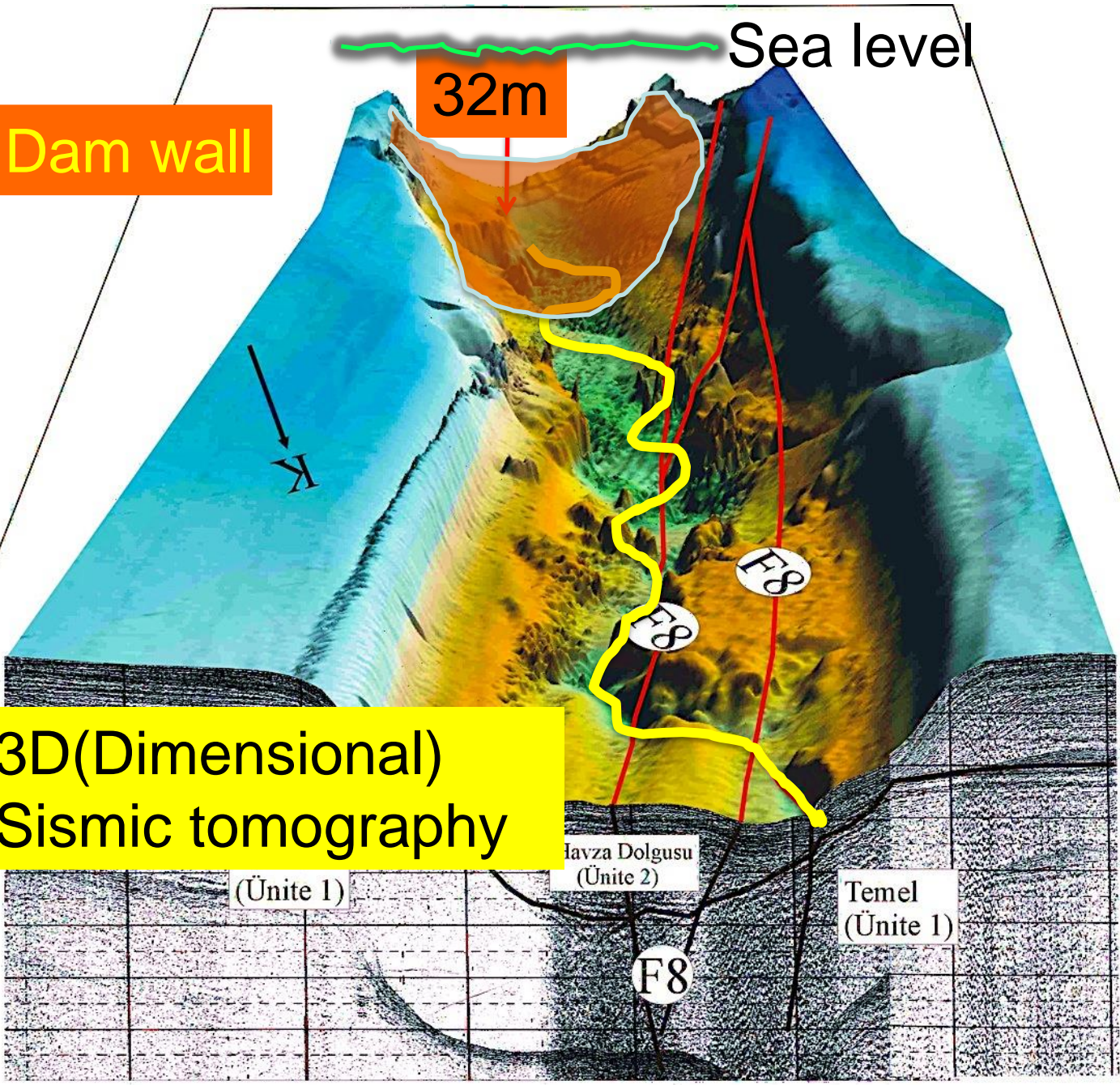
F8

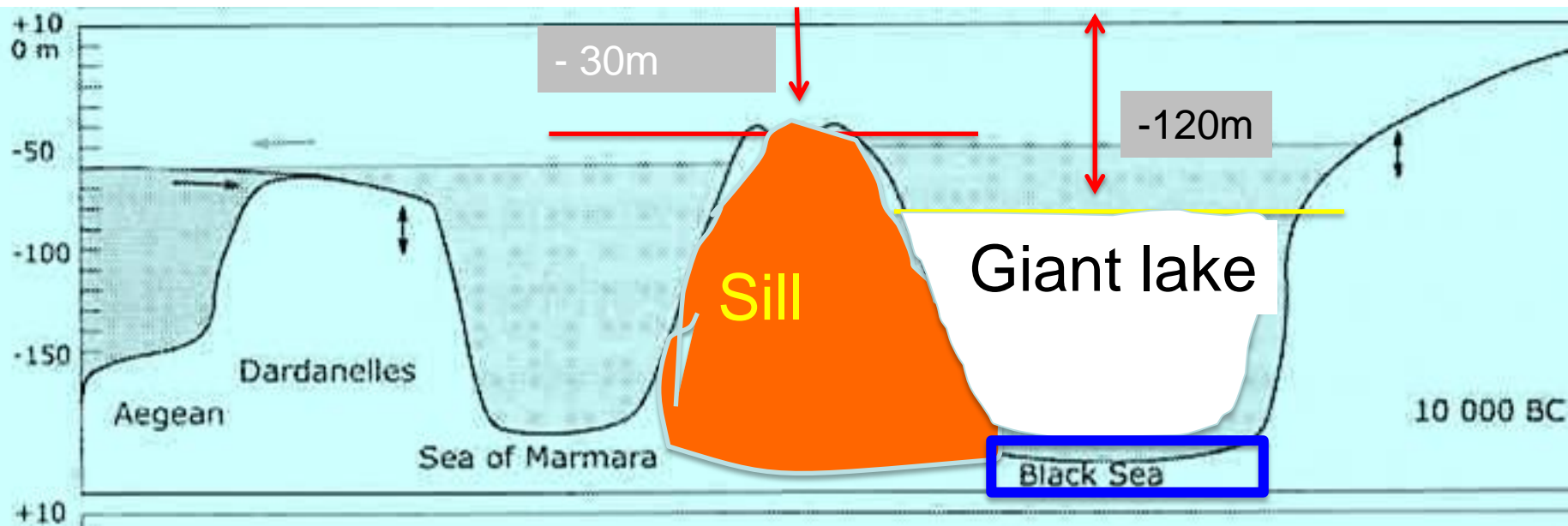
(Ünite 1)

lavza Dolgusu
(Ünite 2)

Temel
(Ünite 1)

F8





7800 climate changed; a new warm and wet period



-100 m



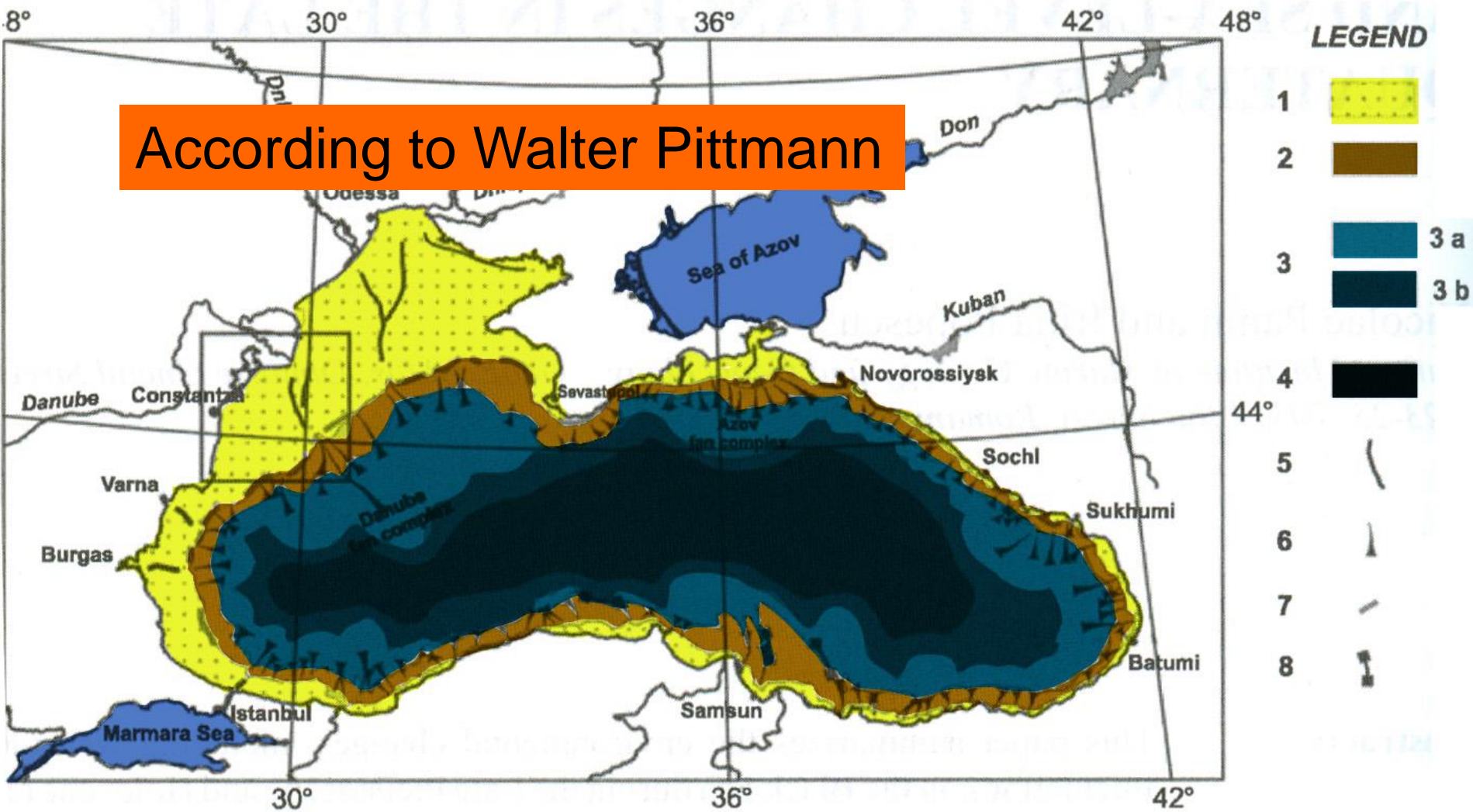
Aegean Sea



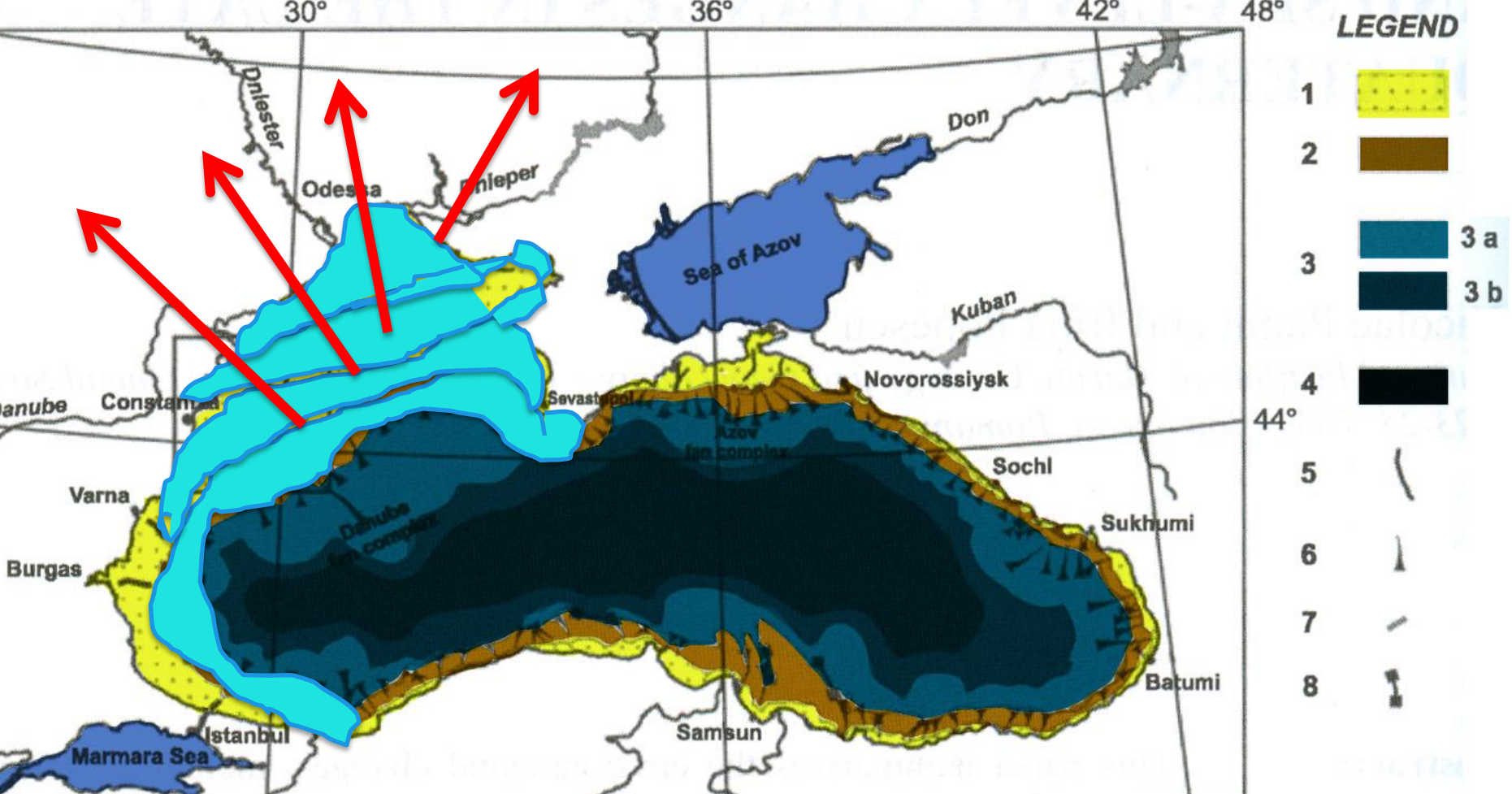
NOAH'S FLOOD

THE NEW SCIENTIFIC DISCOVERIES
ABOUT THE EVENT THAT CHANGED HISTORY

WILLIAM RYAN
& WALTER PITMAN

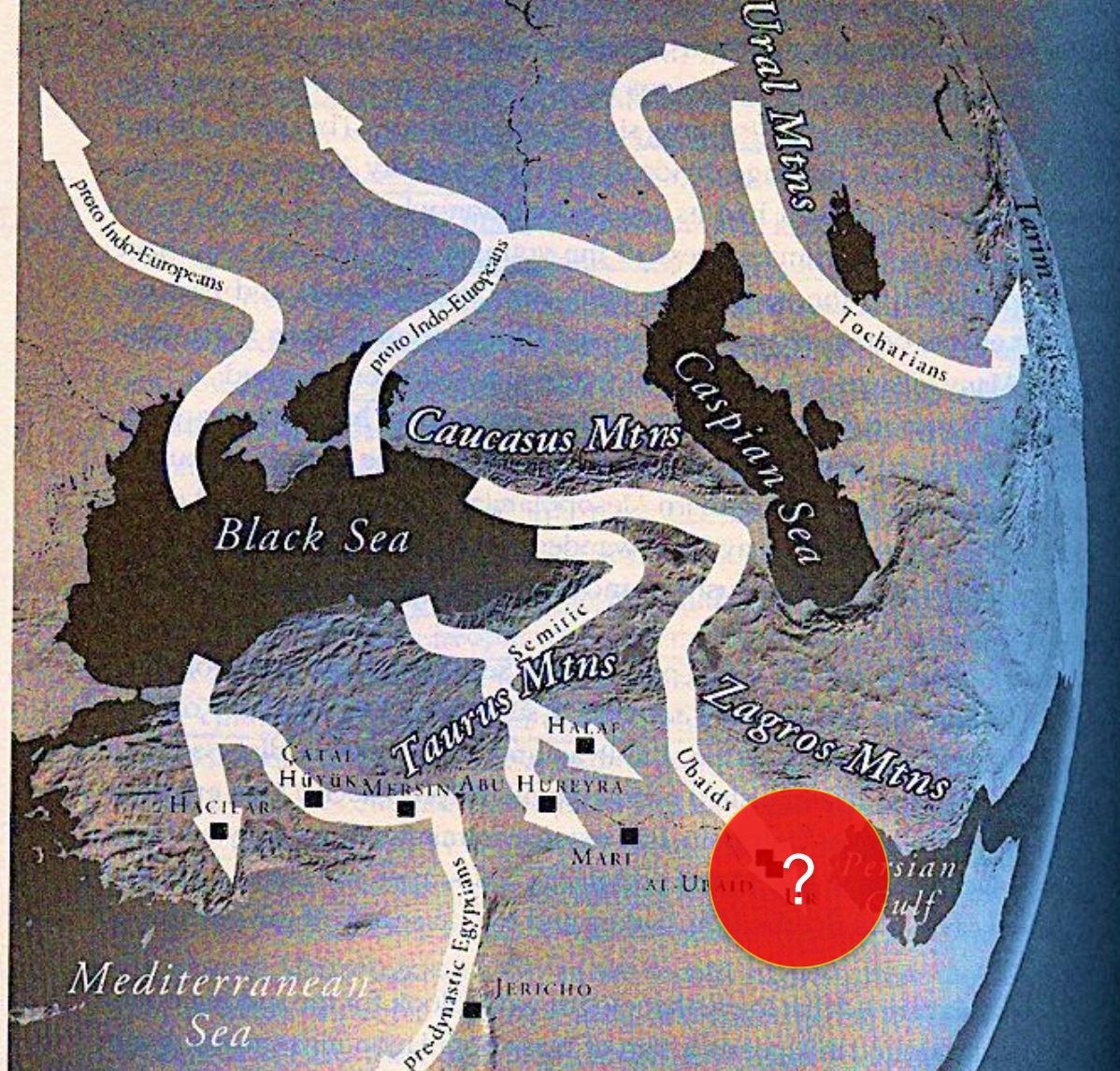


15 cubic km/day sea water passed accross the Bosporus to fill in the Black sea



According to Ryann and Pittman this event was the inspiration of the Noah's flood mythology

Sea invaded 1-1.5 kms of land everyday continuously for one year



According to the Sumerian mythology of Gilgamesh, before they settled in Mesopotamia, their ancestors escaped from a flood in the north



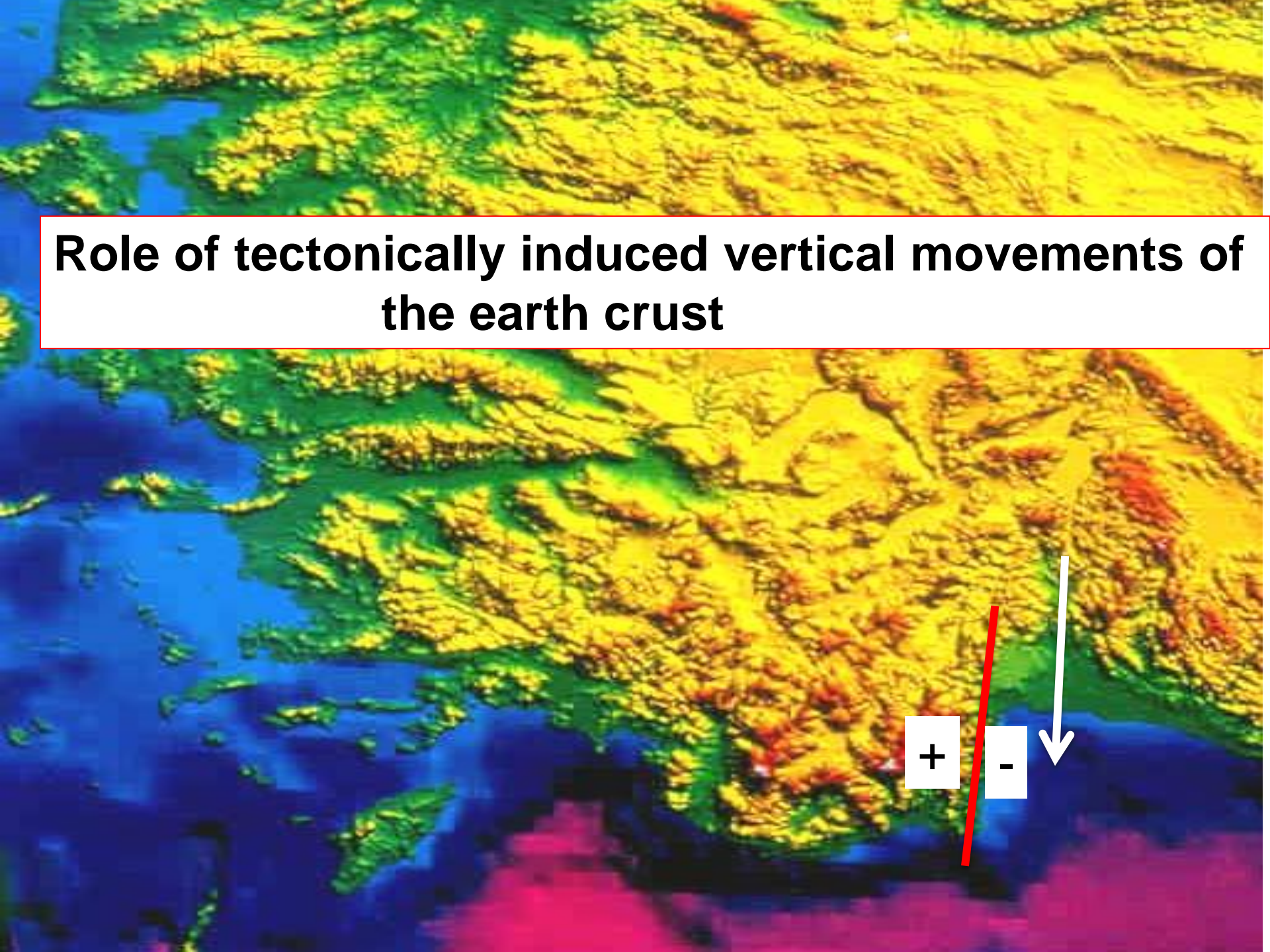
Noah's Arc: Nuh un Gemisi

We need to study the Earth Motions closely and Carefully

Otherwise

**Earth crust motions
may cause disasters**

Role of tectonically induced vertical movements of the earth crust



ON DEMISE OF SETTLEMENTS:

- Frequent devastating earthquakes ;destruction, damage and fires;
- Increased rate of land erosion leading to filling of depressions & coastal areas;
- Submergence or emergence of coastal cities.