Importance of Knowing Paleogeography in Order to Understand Opening of the Black Sea*

A. Sami Derman[1]

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Abstract

The Black Sea is an important element of the regional geology. Understanding its geology is like solving a puzzle because each country holds a different part of the geology and limited exposures. The Turkish part of the Black Sea has exposures that give important clues to the evolution and opening of the Black Sea. There are no marine Permian rocks in the western and central Pontide. The Marine Triassic is only present in the Kocaeli Peninsula, and toward the east only continental Late Triassic rocks are present. Early Jurassic rocks are not present in the western region except in Eastern Pontide where they are represented by the Ammonitico Rosso facies. The Middle Jurassic Sea advanced from the east toward the west and reached the Cide area in Bajocian-Bathonian time. An important deformational event occurred at the end of Middle Jurassic and alluvial fans developed facing toward the north. The Late Jurassic is a time of extensive carbonate deposition. This carbonate system formed a platform attached to the Palaeozoic of İstanbul, whereas an isolated platform was developed in the Middle Black Sea. The platform carbonate has a reefal margin in the Cide area and faces toward the east and north. In the Eastern areas, however, it is difficult to decide whether it is a platform or an isolated platform. The westernmost extension of the carbonate deposit is to the west of Zonguldak City.

The Early Cretaceous was a time of disintegration of the carbonate platform, which resulted in a horst and graben system. The zero line of the Early Cretaceous sea was around Ereğli. As can be seen from the advancement of the shoreline, the sea advanced from east and north toward the west and south. The stratigraphic framework and evolution of the units suggest that there was a seaway much before the Early Cretaceous. That seaway probably began to form in Early Jurassic in the Eastern Black Sea, but reached to the western areas in Middle Jurassic. It may be speculated that opening of the Black Sea started in Triassic or even in Permian Time.

IMPORTANCE OF KNOWING PALEOGEOGRAPHY IN ORDER TO UNDERSTAND OPENING OF THE BLACK SEA

İPEK ENERJİ

A. Sami DERMAN

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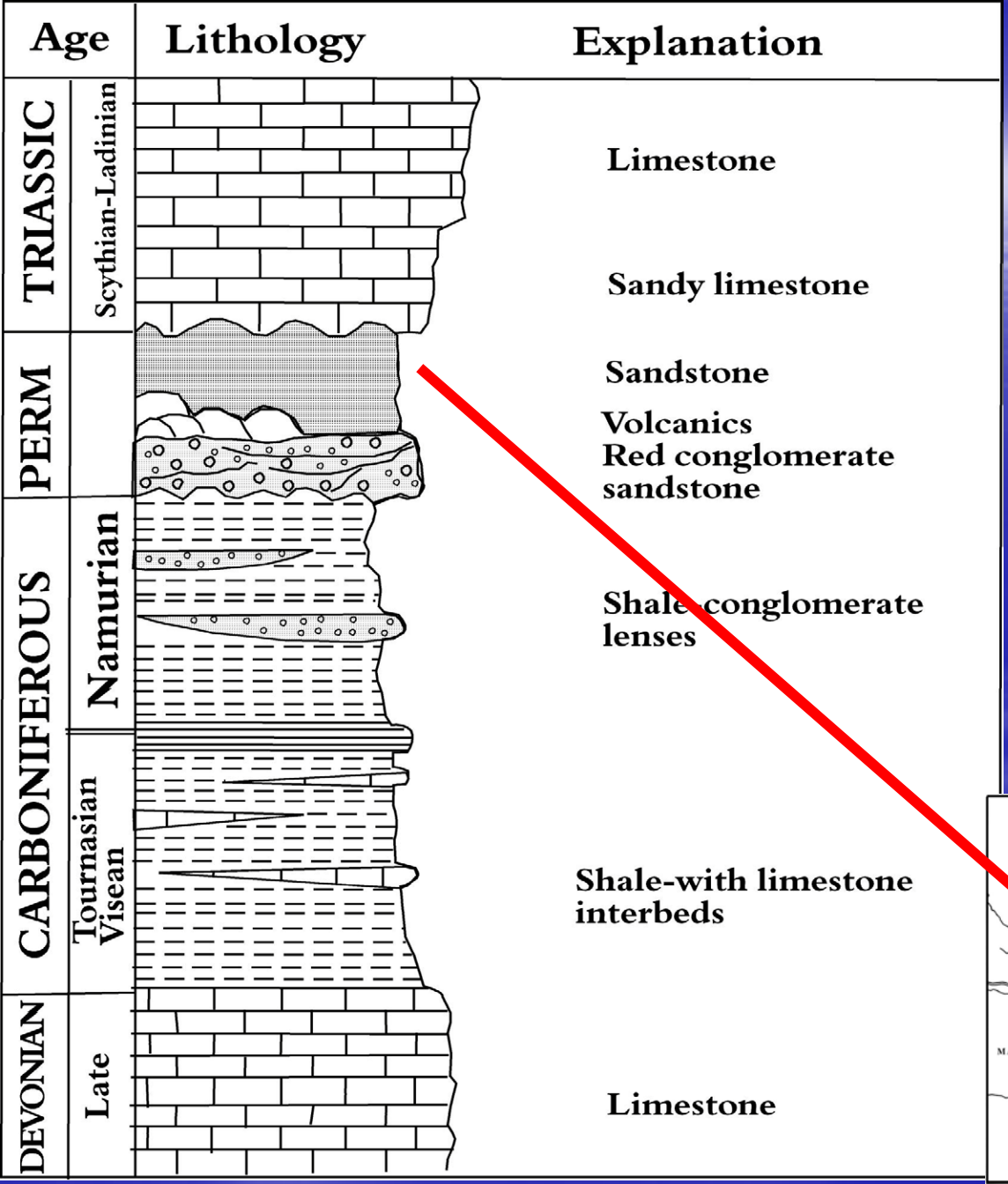


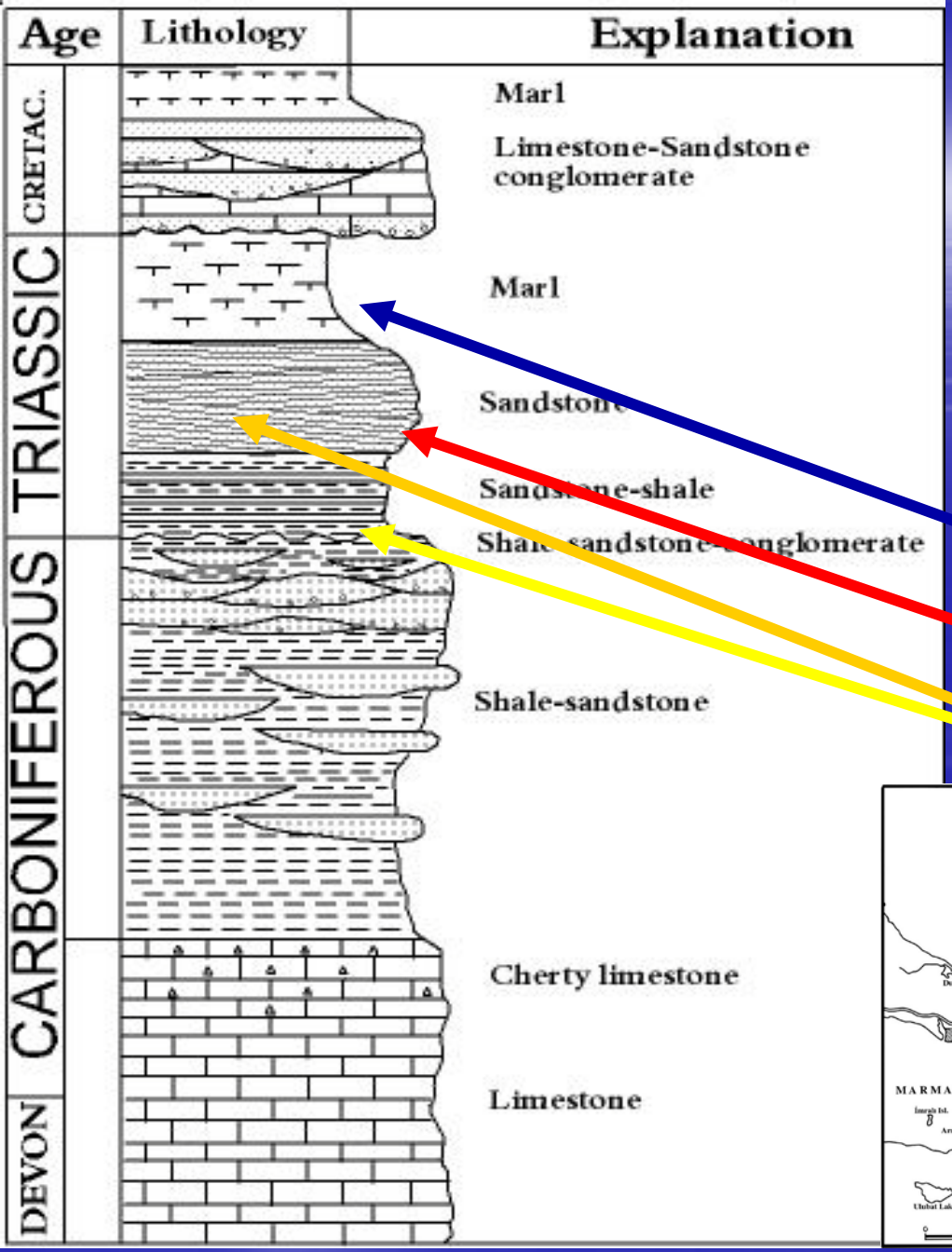
Marine Triassic

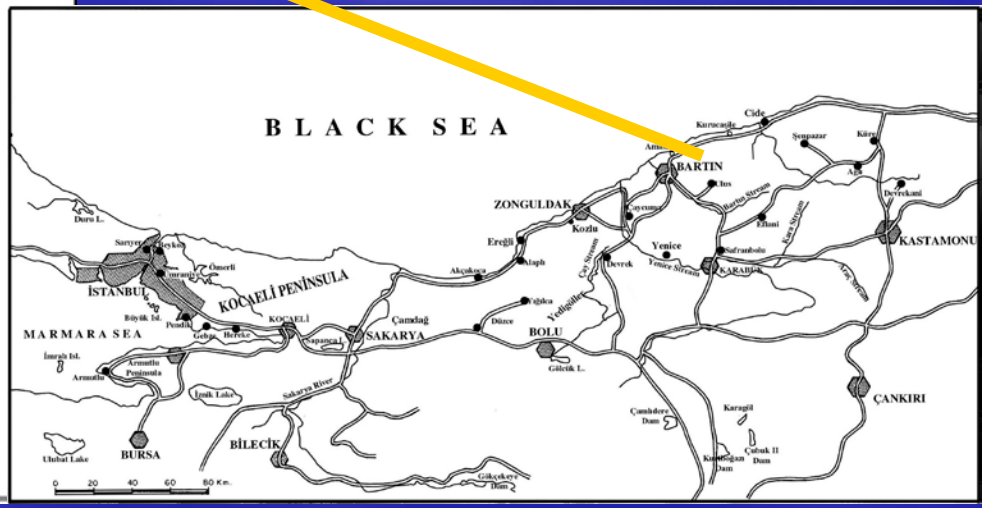
In Hereke, Triassic marine sediments overlie Permian continental clastics with an unconformity


Triassic
Permian

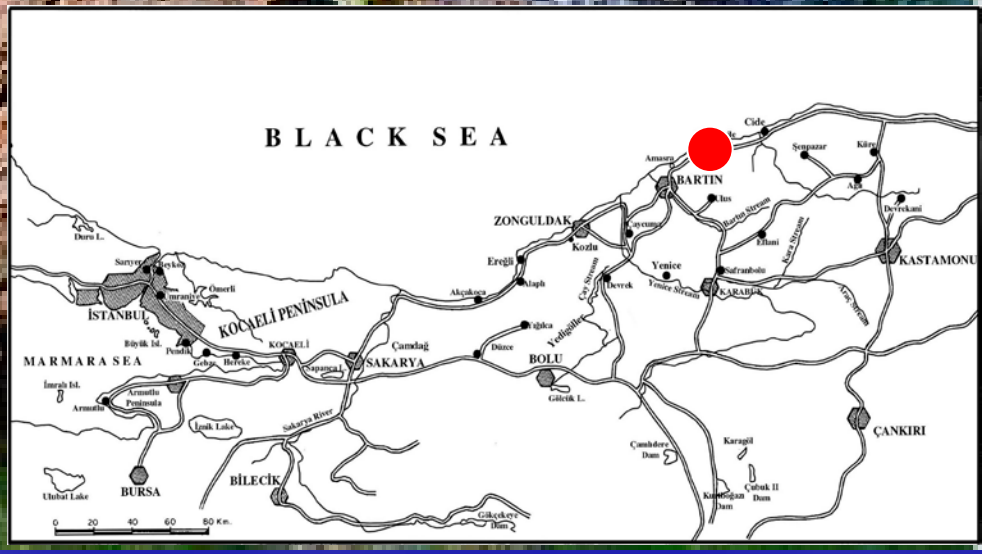
Continental Triassic

Tripartate division:
Upper lacustrine unit
Middle Eolian unit
Lower fluvial unit

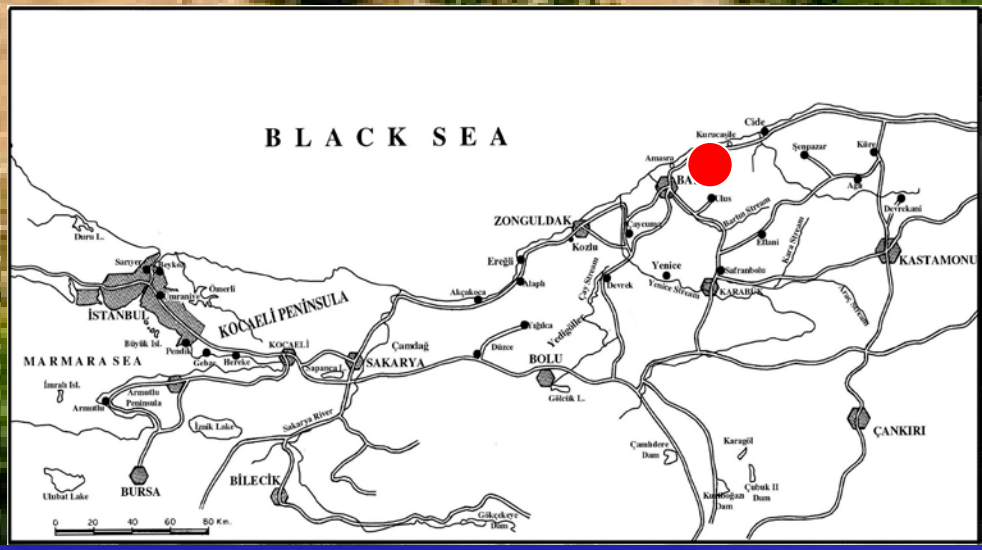




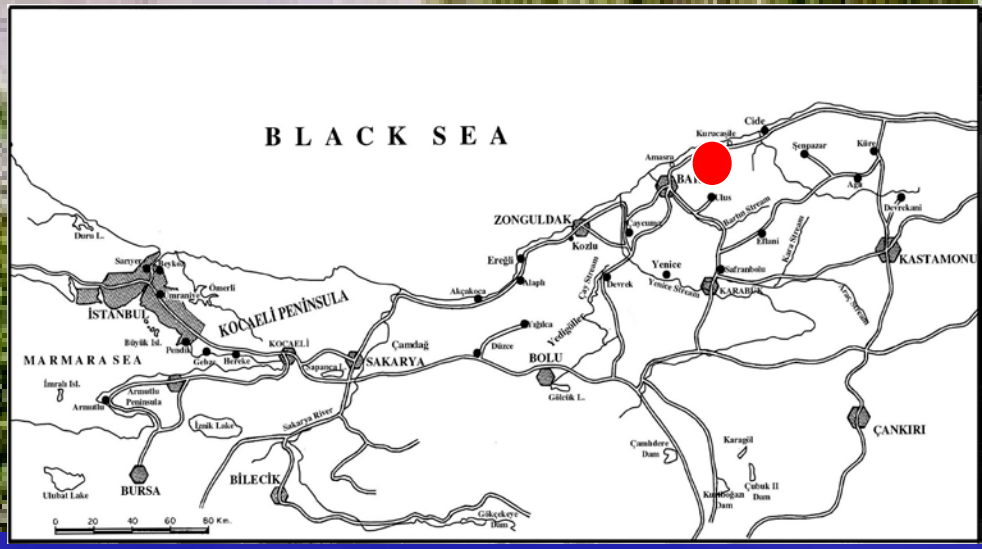
Lower fluvial



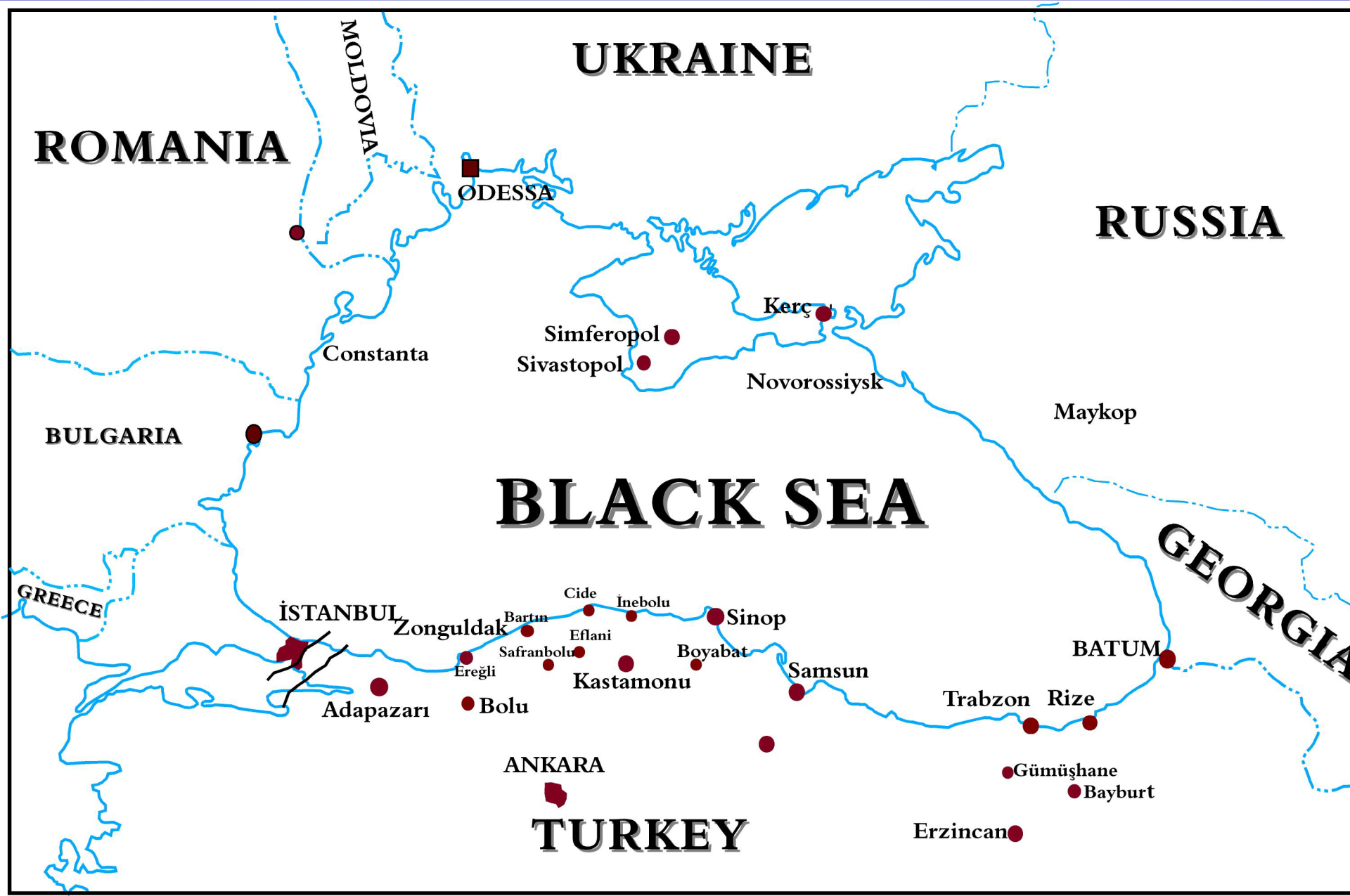
Middle Eolian



Upper Lacustrine



Triassic Paleogeography



Early Jurassic

Early Jurassic sediments are not present onshore of the western Black Sea region.

They are present in the Eastern Black sea Region

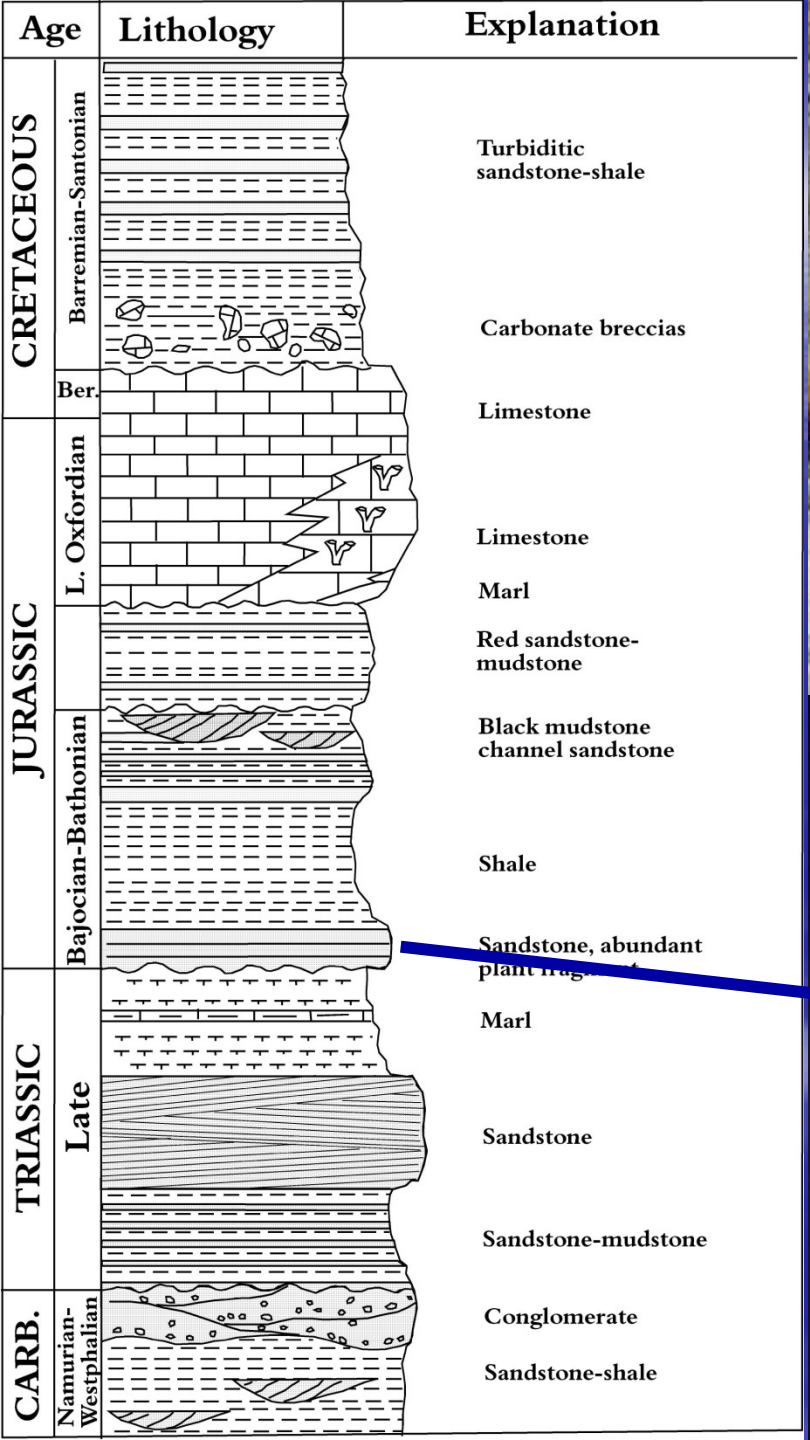
EARLY JURASSIC

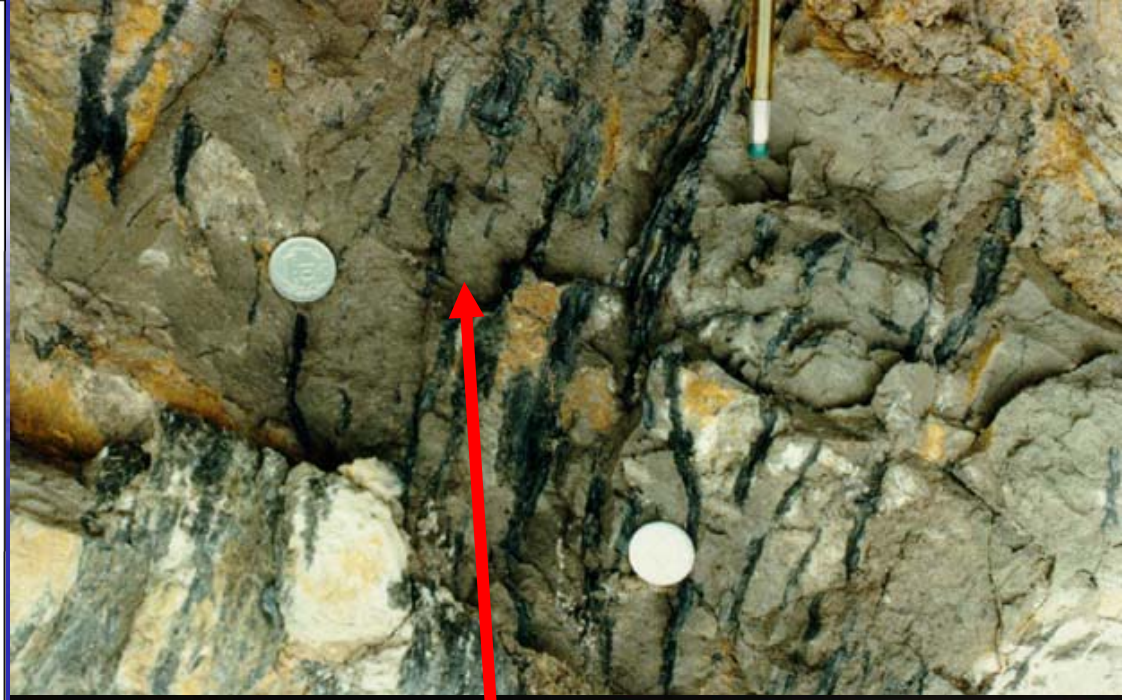
MIDDLE JURASSIC

Middle Jurassic sediments are present in the western Black Sea as well as Eastern Black Sea.

Shoreline in the Western Black Sea is around Cide-Kurucaşile towns

Shoreline in the Eastern Black Sea is not defined due to insufficient facies data.


Age
Lithology
Explanation
CRETACEOUS
JURASSIC
TRIASSIC
CARB.
Barremian-Santonian
Ber.
L. Oxfordian
Bajocian-Bathonian
Late
Namurian-Westphalian
Turbiditic sandstone-shale
Carbonate breccias
Limestone
Limestone
Marl
Red sandstone-mudstone
Black mudstone channel sandstone
Shale
Sandstone, abundant
Marl
Sandstone
Sandstone-mudstone
Conglomerate
Sandstone-shale



MIDDLE JURASSIC


UKRAINE
MOLDOVIA
Nikolayev
ODESSA
Galata
ROMANIA
BUCHAREST
Constanta
BULGARIA
Varna
Burgaz
Edirne
GREECE
THRACE
Tekirdağ
İSTANBUL
Adapazarı
Bolu
ANKARA
TURKEY
Zonguldak
Çide
İnebolu
Bartın
Sinop
Safranbolu
Ereğli
Kastamonu
Boyabat
Samsun
Simferopol
Sivastopol
Kerç
Rostov
Azov
RUSSIA
Krasnador
Stavropol
Novorossiysk
Maykop
Tuapse
BLACK SEA
GEORGIA
BATUM
Trabzon
Rize
Gümüşhane
Bayburt
Erzincan

LATE JURASSIC

Late Jurassic sediments show a facies trend from tidal flat, platform, reef to basin in western Black Sea. Some areas they show an isolated platform that surrounded by deeper water facies (Haramidağ-Yaralıgöz). Some other similar facies may be represented in the middle Black Sea. Another land attached platform is described from eastern Black Sea.

Shoreward facies

Platform

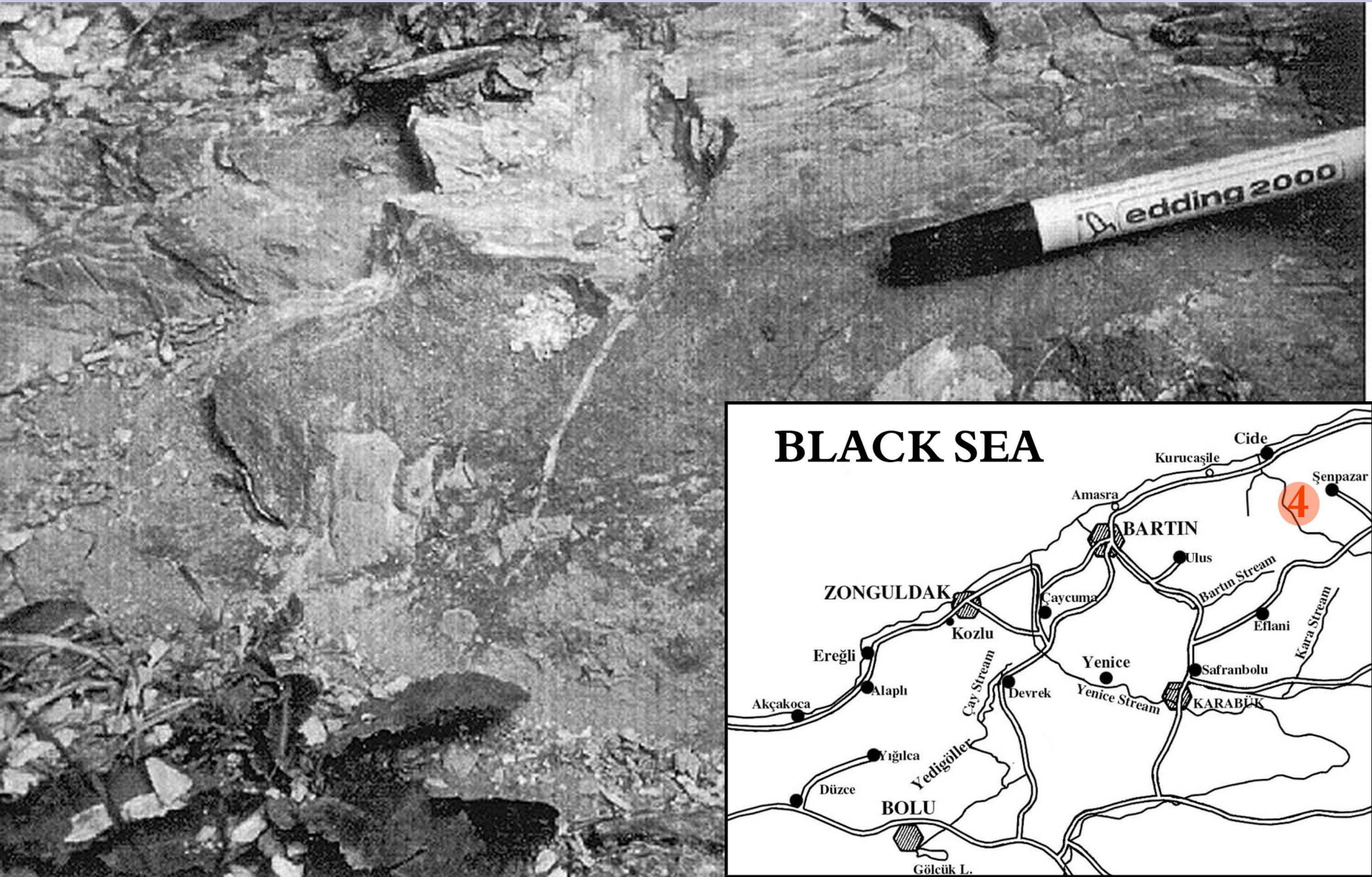

BLACK SEA
Cide
Kurucaşile
Şenpazar
Amasra
BARTIN
2
Ulus
Bartın Stream
ZONGULDAK
Çaycuma
Kozlu
Eflani
Kara Stream
Ereğli
Yenice
Safranbolu
Çay Stream
Devrek
Yenice Stream
KARABÜK
Akçakoca
Alaplı
Yığılca
Yedigöller
Düzce
BOLU
Gölcük L.

Margin

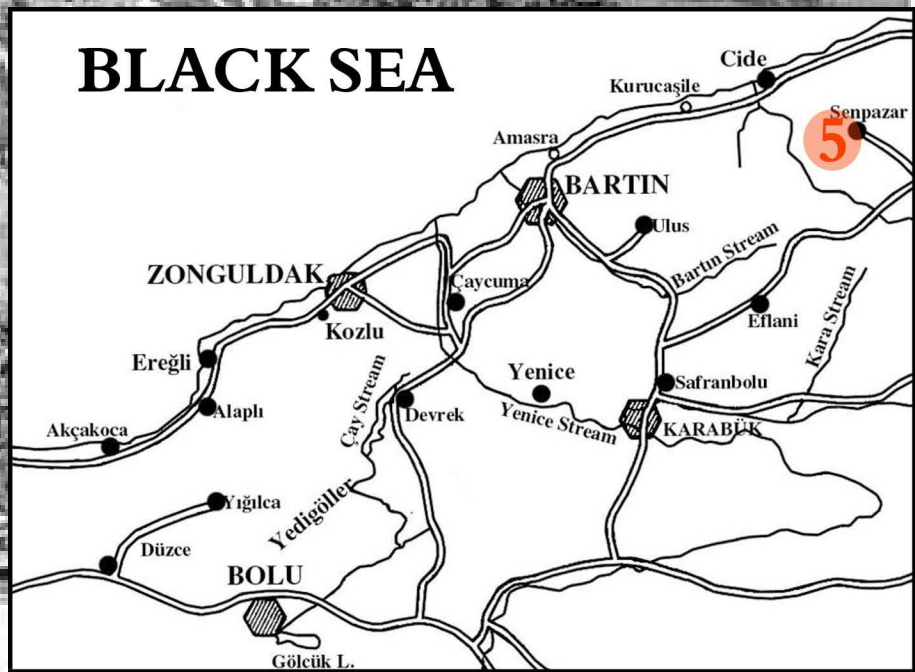

BLACK SEA
Cide
Kurucaşile
Şenpazar
Amasra
3
BARTIN
Ulus
Bartın Stream
ZONGULDAK
Çaycuma
Kozlu
Eflani
Kara Stream
Ereğli
Yenice
Safranbolu
Çay Stream
Devrek
Yenice Stream
KARABÜK
Akçakoca
Alaplı
Yığılca
Yedigöller
Düzce
BOLU
Gölcük L.

Reefal facies observed along Devrekani River valley.

Close up of Slope facies



Slope to basin



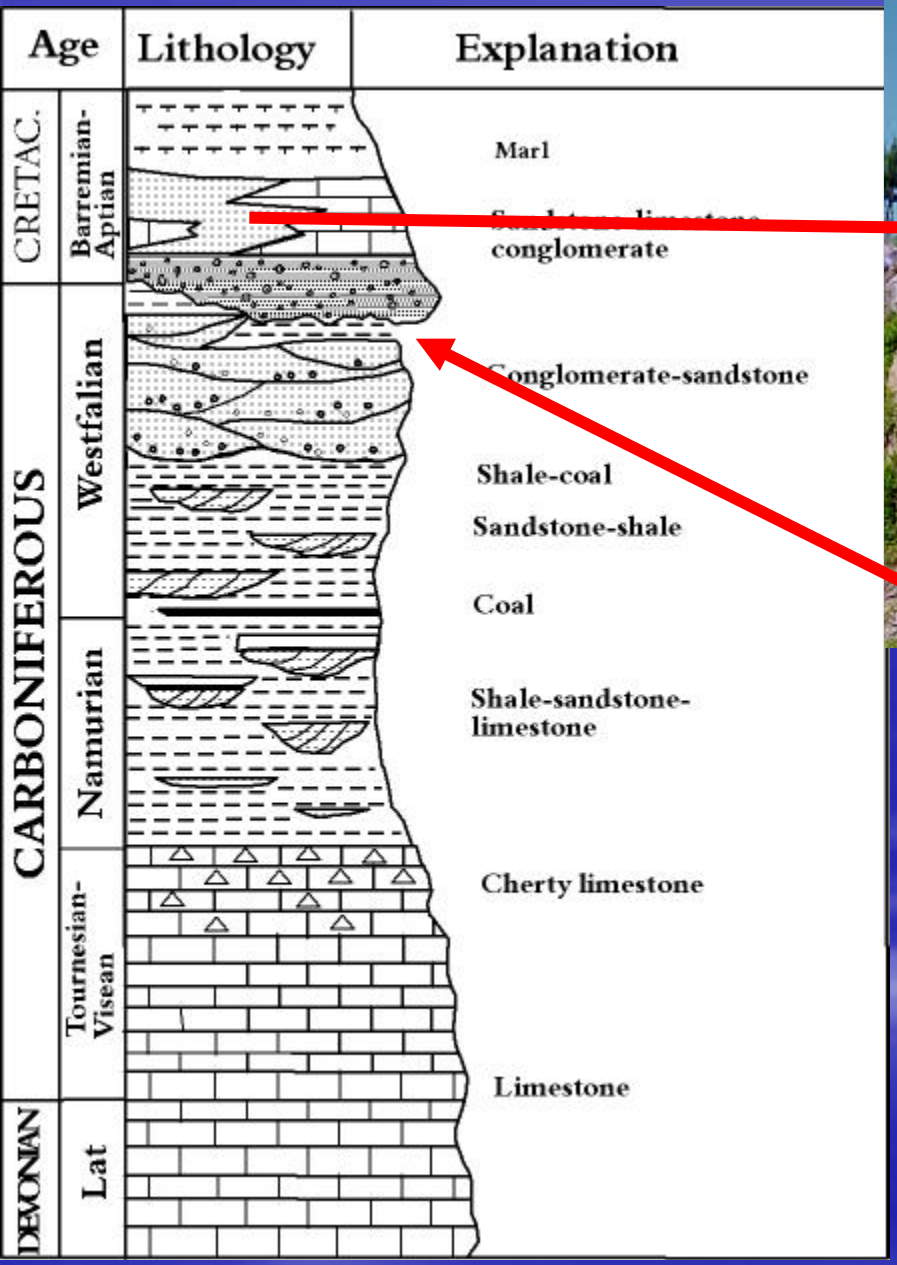
YARALIGÖZ MOUNTAIN

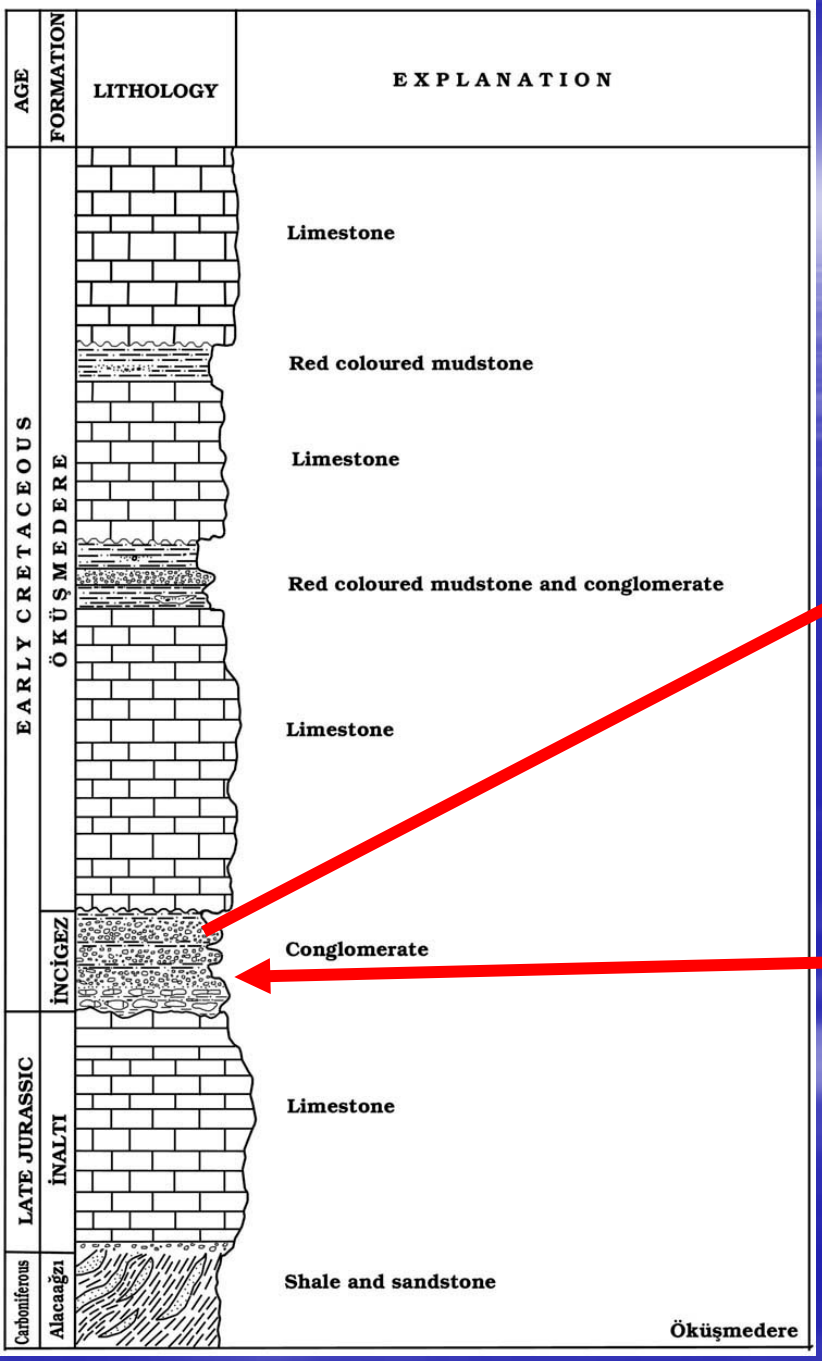
YARALIGÖZ MOUNTAIN

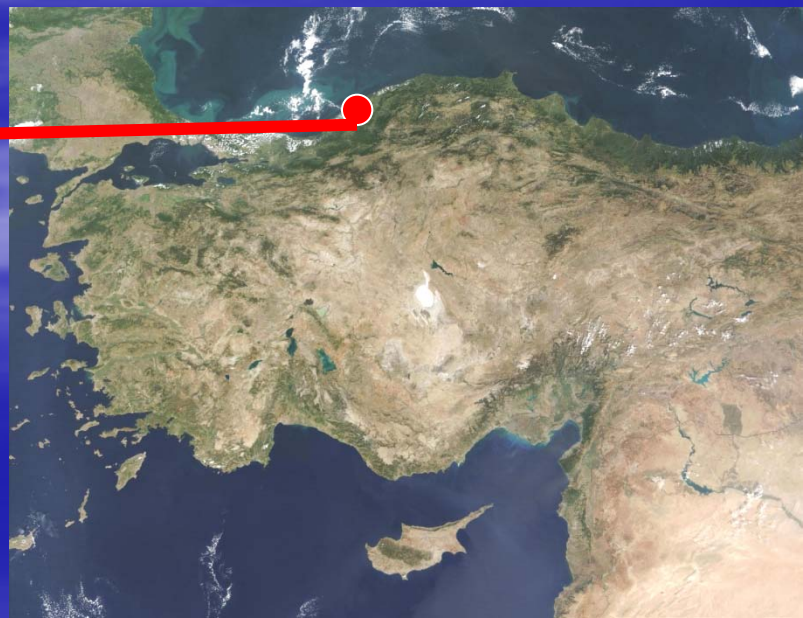
Late Jurassic

EARLY CRETACEOUS

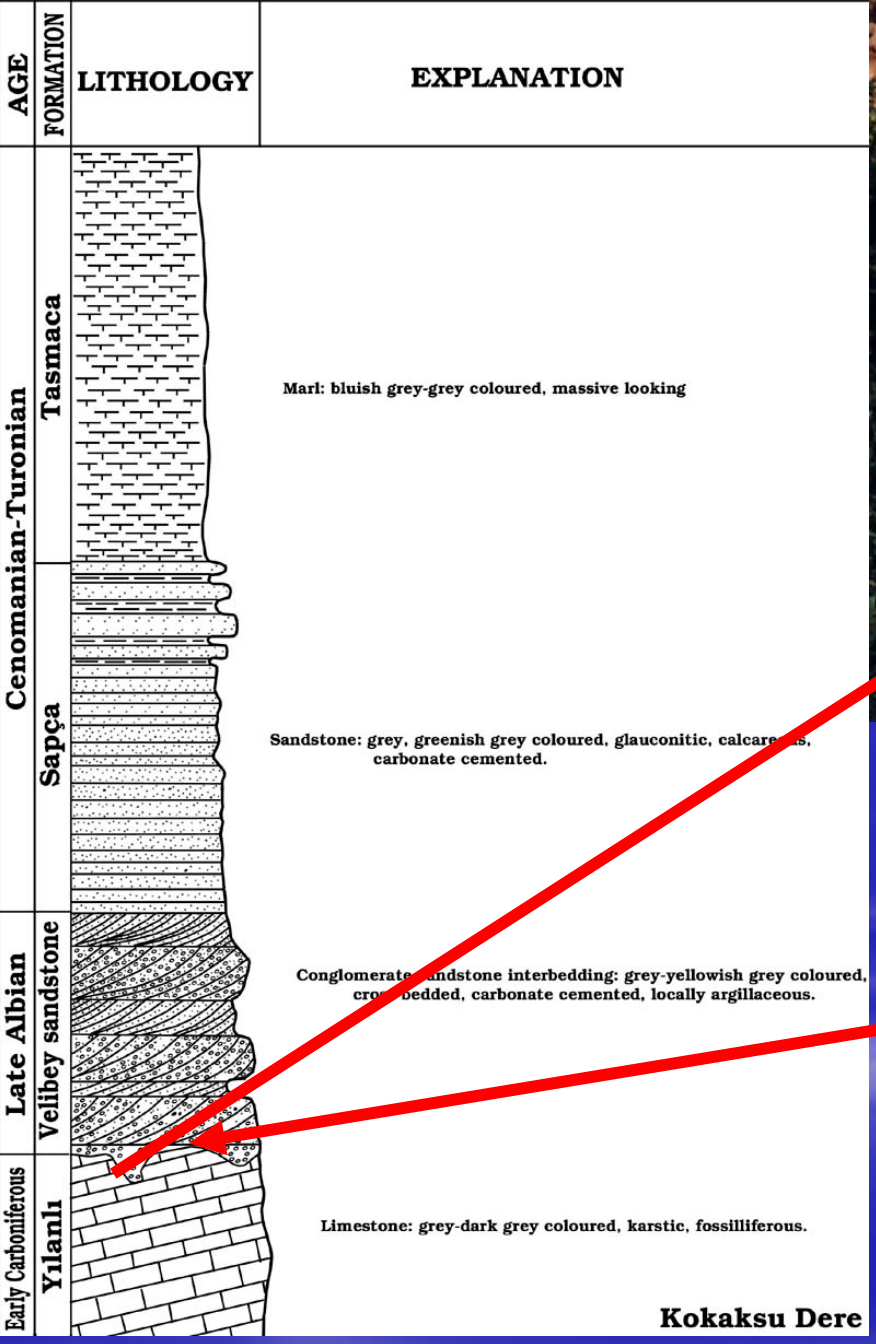
Time of disintegration of Paltforma, formation of marginal graben areas and much facies change

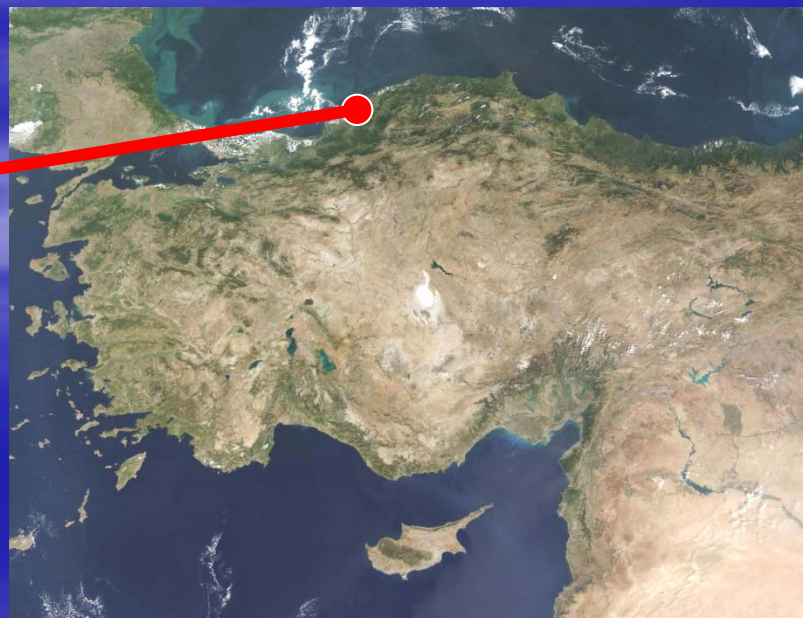

Age
Lithology
Explanation
CRETAC.
Barremian-Aptian
CARBONIFEROUS
Westfalian
Namurian
Tournesian-Visean
DEVONIAN
Lat
Marl
conglomerate
Conglomerate-sandstone
Shale-coal
Sandstone-shale
Coal
Shale-sandstone-limestone
Cherty limestone
Limestone

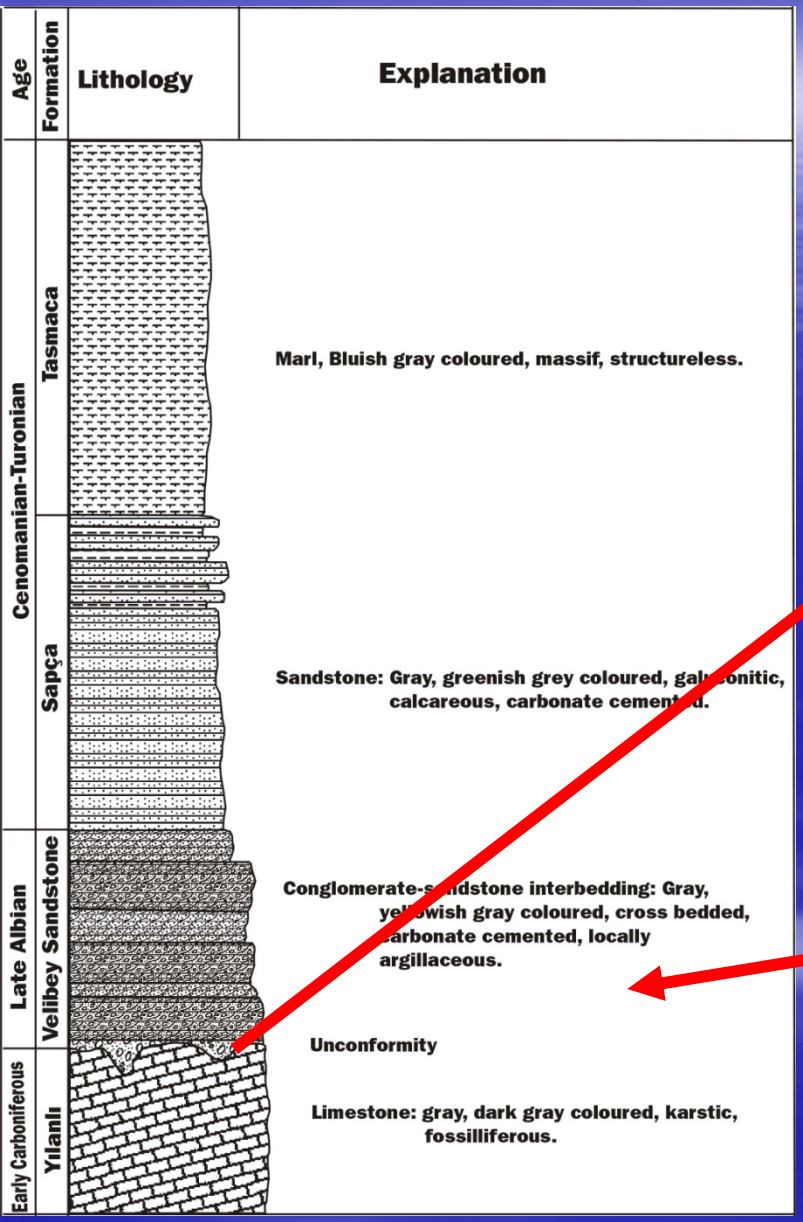

AGE
FORMATION
LITHOLOGY
EXPLANATION
EARLY CRETACEOUS
ÖKÜŞMEDERE
İNCİGEZ
LATE JURASSIC
İNALTI
Carboniferous
Alacaağzı
Limestone
Red coloured mudstone
Limestone
Red coloured mudstone and conglomerate
Limestone
Conglomerate
Limestone
Shale and sandstone
Öküşmedere



Velibey Sandstone


AGE
FORMATION
LITHOLOGY
EXPLANATION
Cenomanian-Turonian
Tasmaca
Marl: bluish grey-grey coloured, massive looking
Sapça
Sandstone: grey, greenish grey coloured, glauconitic, calcareous, carbonate cemented.
Late Albian
Velibey sandstone
Conglomerate-sandstone interbedding: grey-yellowish grey coloured, cross bedded, carbonate cemented, locally argillaceous.
Early Carboniferous
Yılanlı
Limestone: grey-dark grey coloured, karstic, fossilliferous.
Kokaksu Dere




Age
Formation
Lithology
Explanation
Cenomanian-Turonian
Tasmaca
Marl, Bluish gray coloured, massif, structureless.
Sapça
Sandstone: Gray, greenish grey coloured, gal conitic, calcareous, carbonate cement d.
Late Albian
Velibey Sandstone
Conglomerate-s dstone interbedding: Gray, ye owish gray coloured, cross bedded, arbonate cemented, locally argillaceous.
Unconformity
Early Carboniferous
Yılanlı
Limestone: gray, dark gray coloured, karstic, fossilliferous.

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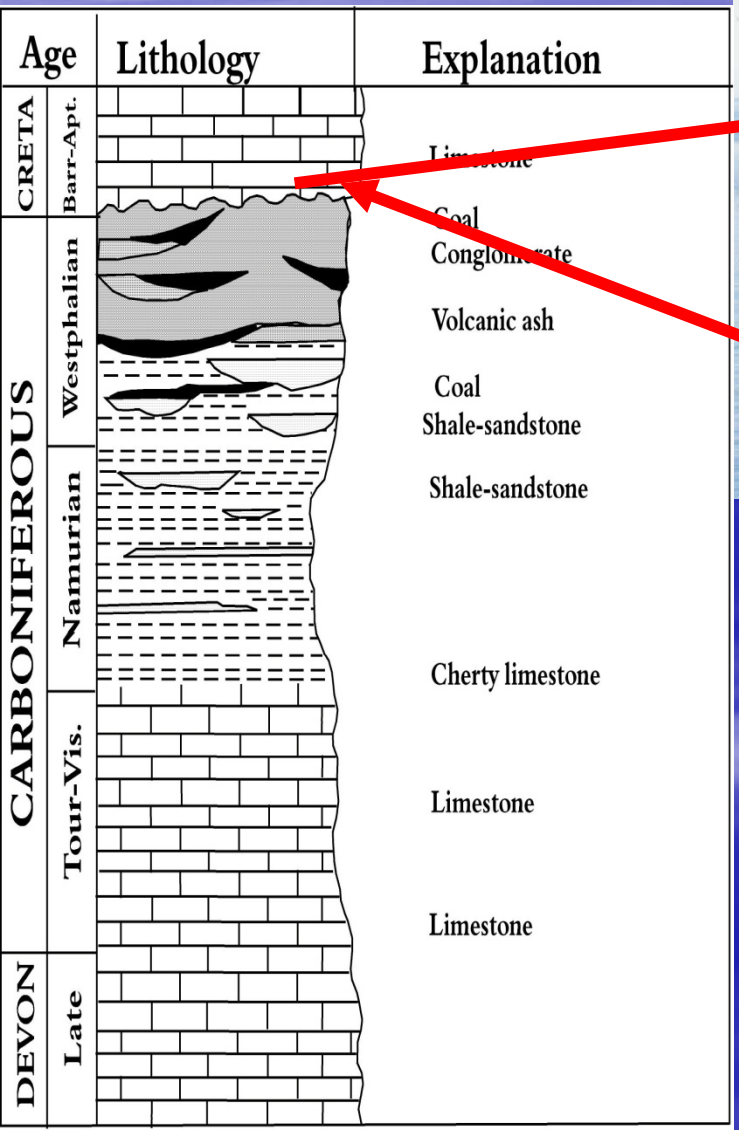

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10 cm.
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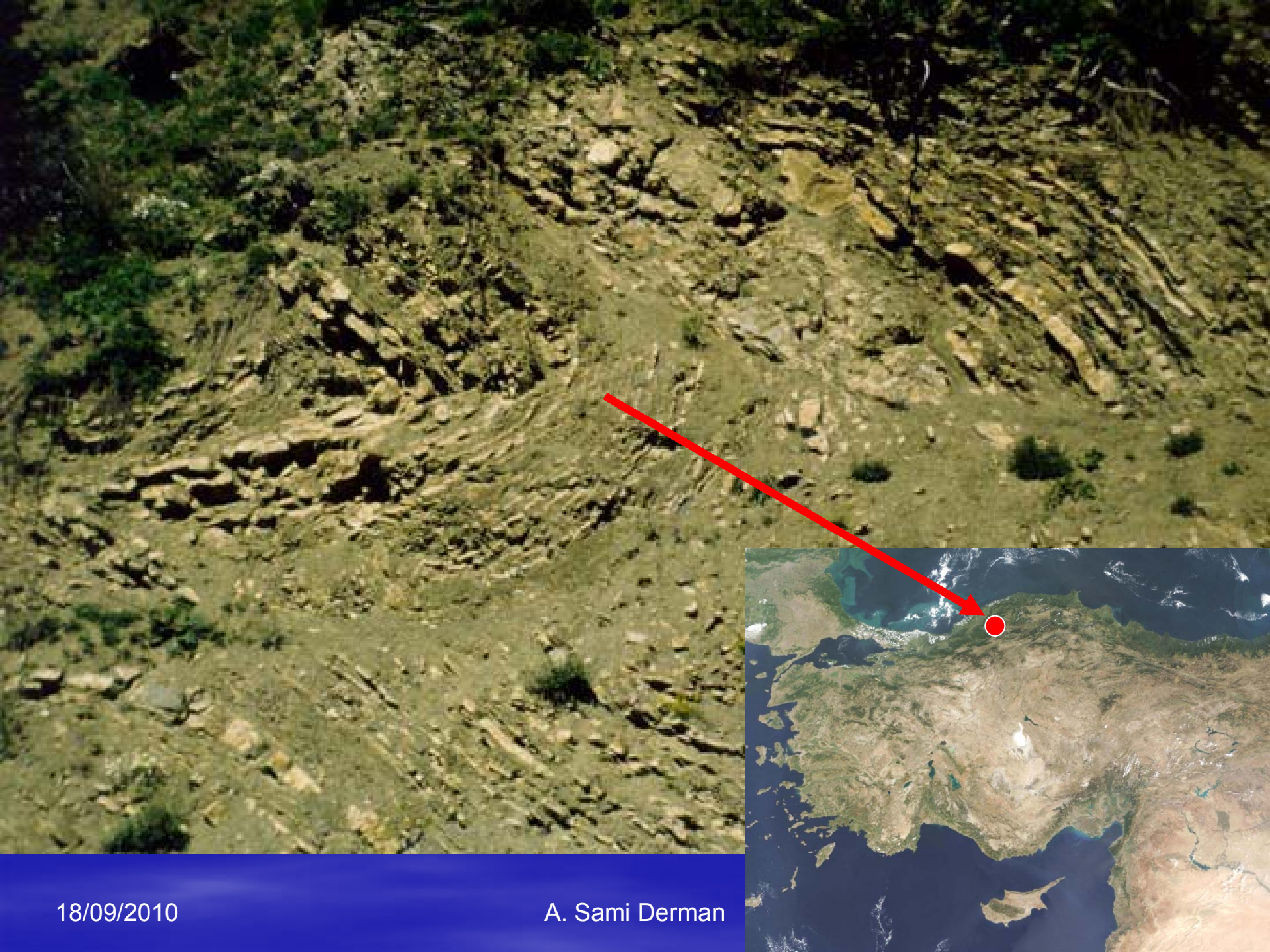
dol



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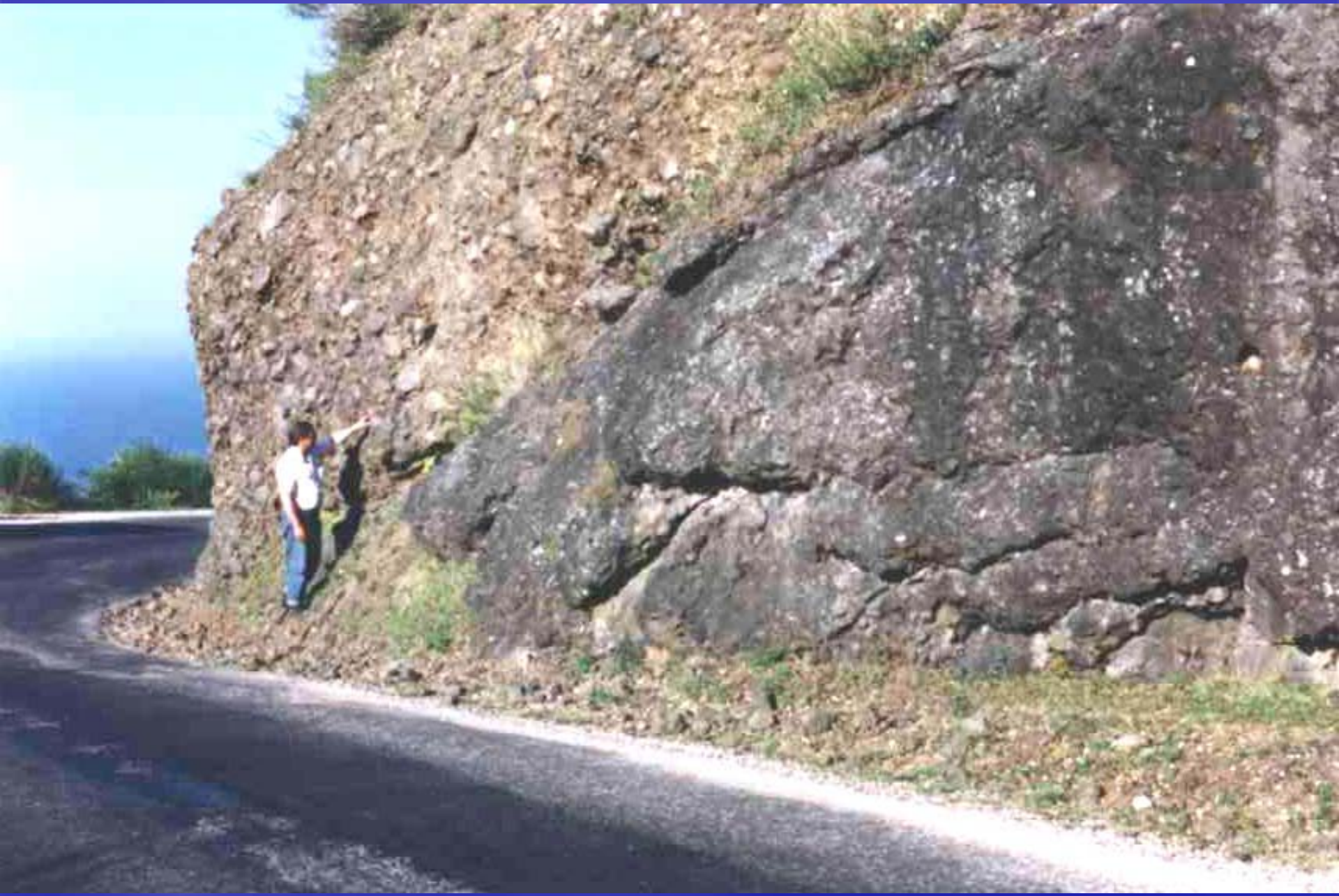
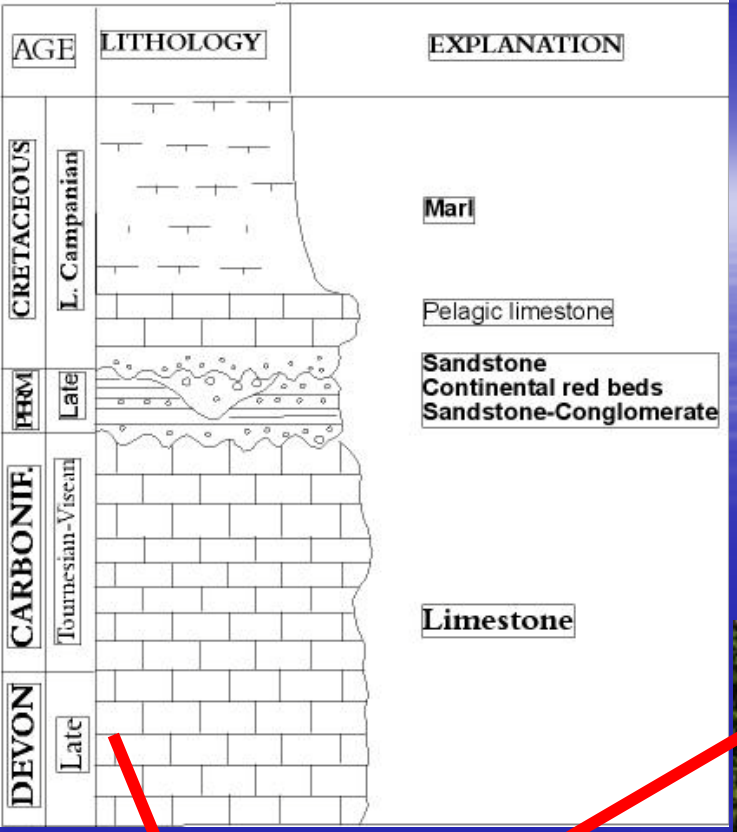
Early Cretaceous

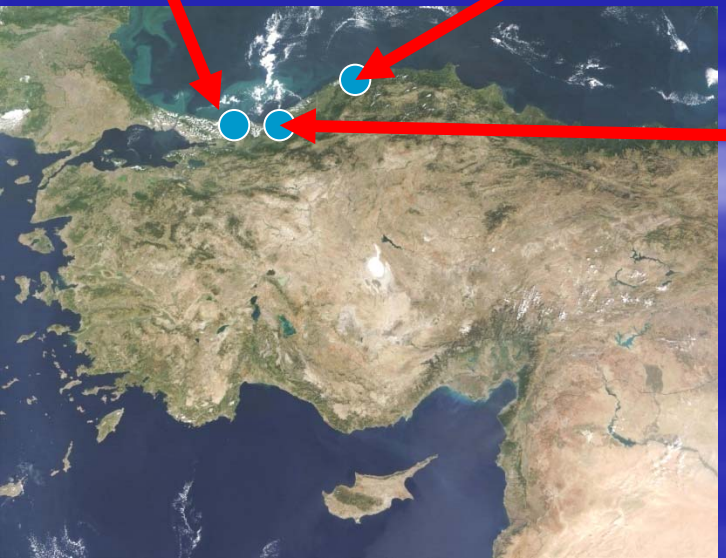
Volcanic and volcaniclastics



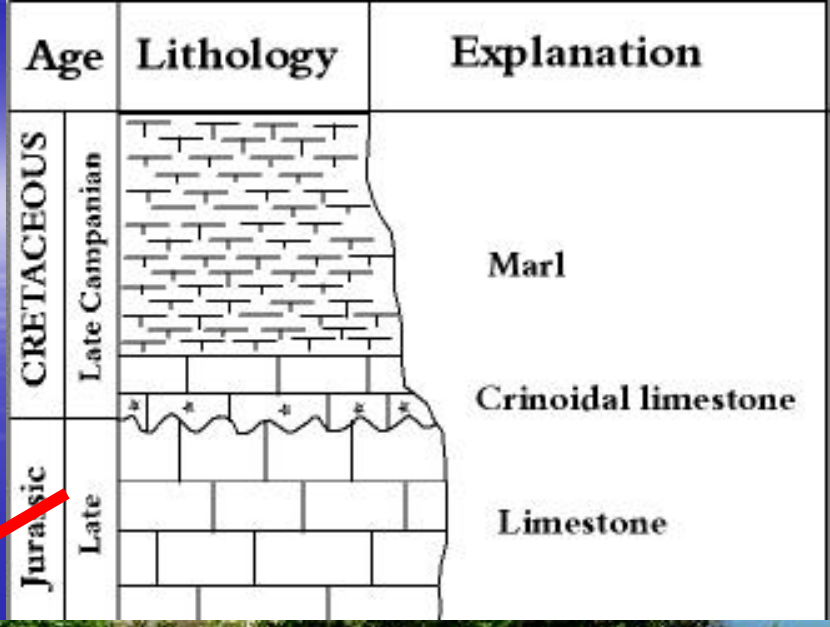
Coniacian-EarlyCampanian


AGE
LITHOLOGY
EXPLANATION
CRETACEOUS
L. Campanian
PERM
Late
CARBONIF.
Tournaisian-Viscan
DEVON
Late
Marl
Pelagic limestone
Sandstone
Continental red beds
Sandstone-Conglomerate
Limestone

Çandağ



Cide


Age
Lithology
Explanation
CRETACEOUS
Late Campanian
Jurassic
Late
Marl
Crinoidal limestone
Limestone

Late Campanian-Maestrichtian

Late Paleocene-Eocene

POST EOCENE


UKRAINE
MOLDOVIA
ROMANIA
ODESSA
RUSSIA
Kerç
Simferopol
Sivastopol
Constanta
Novorossiysk
Maykop
BULGARIA
BLACK SEA
GREECE
GEORGIA
Eflani
Safranbolu
Boyaba
Ereğli
Kastamonu
Adapazarı
Bolu
ANKARA
Gümüşhane
Bayburt
TURKEY
Erzincan

CONCLUSIONS

- No marine deposition during Triassic Time in the Westen Black Sea Region except Kocaeli Peninsula.
- Early Jurassic marine sedimentation is not present in the same area
- Middle Jurassic Sea advanced from the east and north and covered Palaeozoic unit in Zonguldak area.
- An important deformation caused an uplift and sea level fall paralleling the present coastal zone as indicated by alluvial fan.
- Late Jurassic was the time of platform development and sea was advanced from east , north and south of the Palaeozoic highland.
- At the beginning of Early Cretaceous Marginal faulting created horst-graben system and this has been interpreted the onset of opening of the Black Sea.At about Coniacian Time, volcanic Island Arc started to develop and marginal faulted margin limited southern extension of the volcaniclastics.
- Late Campanian was the time of maximum subsidence. Some local uplifts occurred.
- Eocene was limited smaller basinal areas in the south while Black Sea area was a deep basinal area.
- Sea was withdrawn from most of the areas and marine deposition was limited to Black Sea trough.


THANK YOU