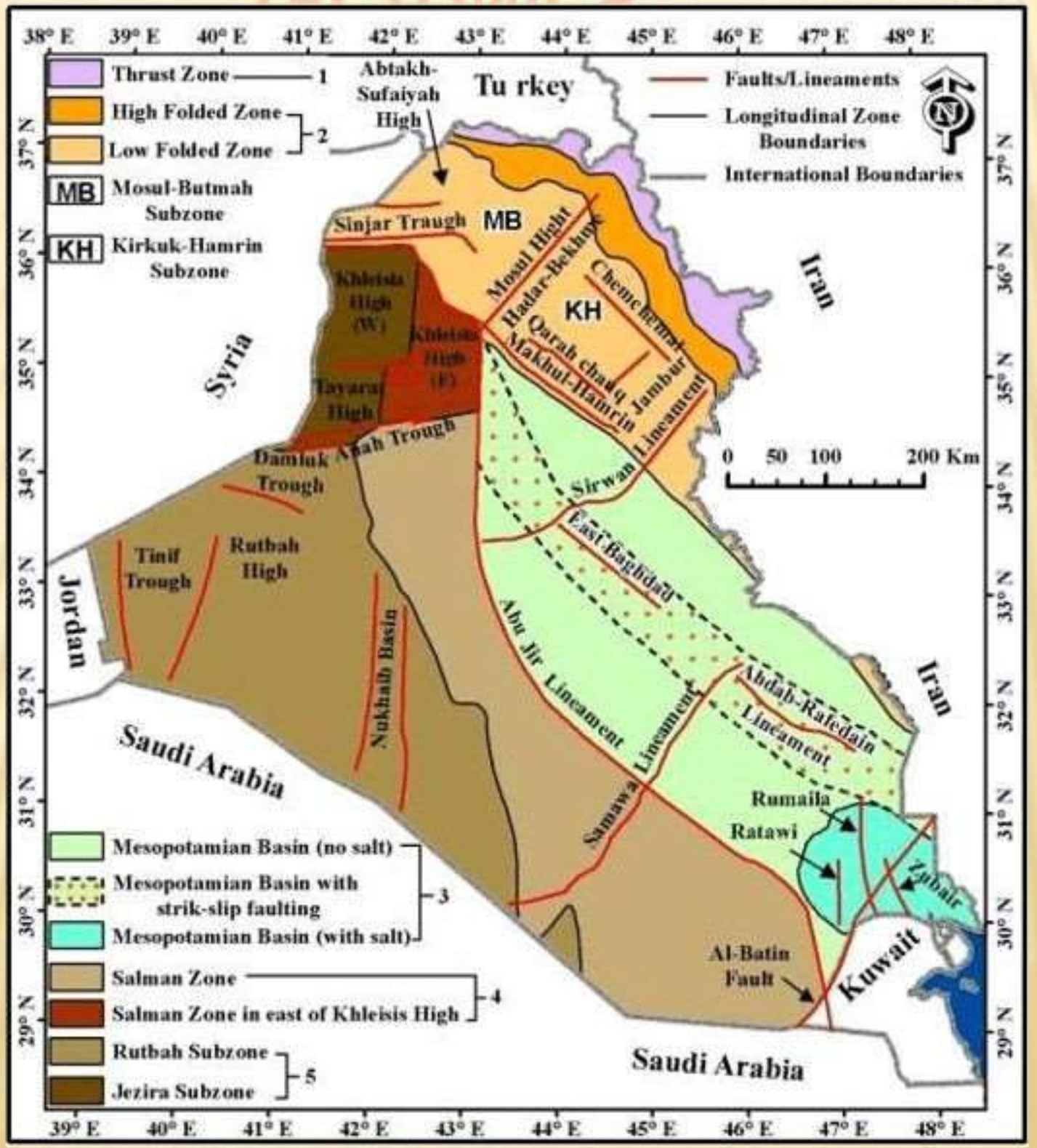
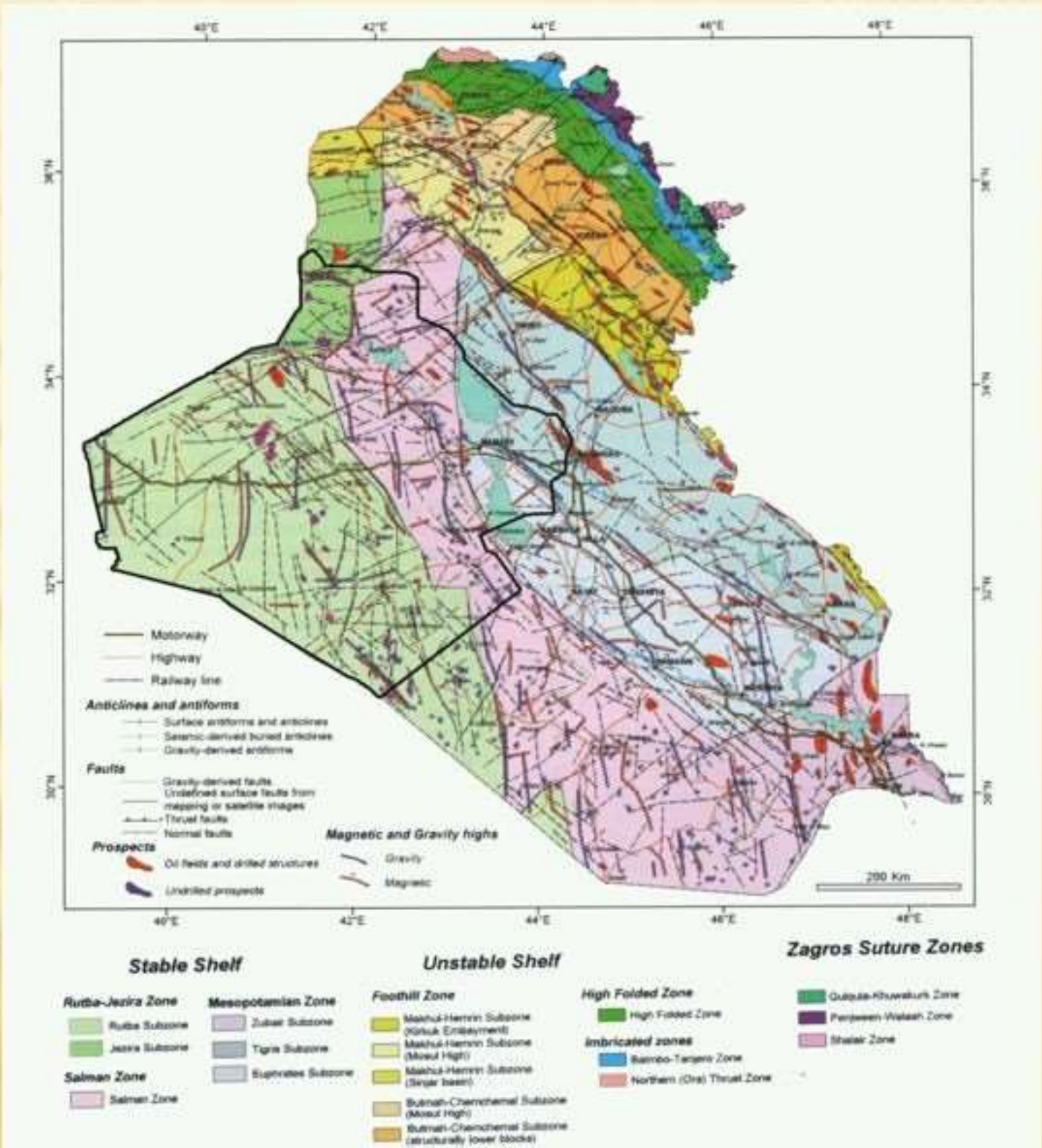
المحاضرة الخامسة

تكتونية الصحراء الغربية

TECTONICS



يقع العراق بين الجزء العربي للصفيحة العربية - النوبيه من جهة والجيوسنكلاين الالبي من جهة أخرى (شكل -٢).



FAULT SYSTEMS

The distribution of faults (back ground brown lines) is show n in Fig. 4-7.
Major fault zones correspond to the NW-SE Najd Fault System (red) and the NE-S W Transversal System (blue).
Five major transversal blocks are identified bounded by major transverse faults.

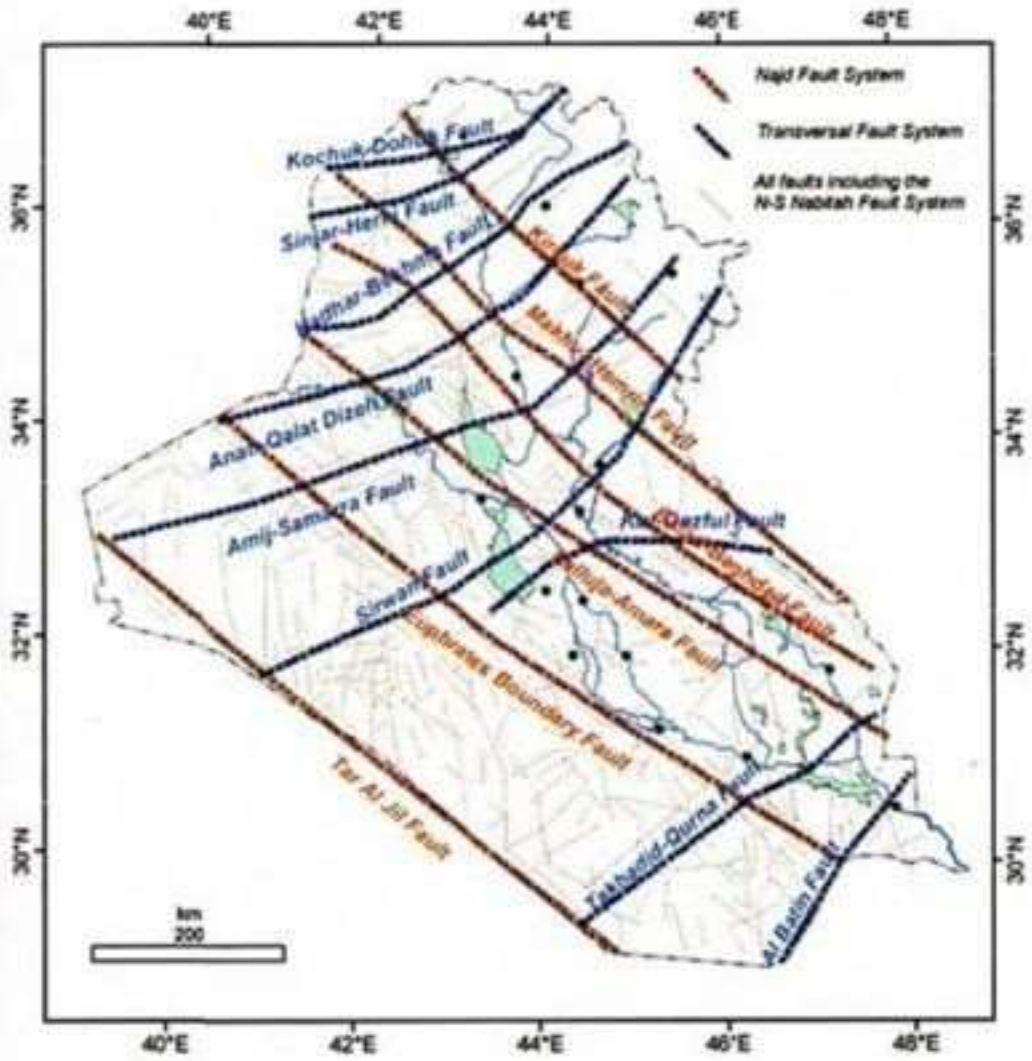
The three major fault systems are;-

1- The N-S Nabitah (Idsas) System,
2- The N W-SE Najd System and
3- The NE-SW or E- W Transversal System.

These fault systems formed during Late Precambrian Nabitah orogeny.
They were re-activated repeatedly during the Phanerozoic.
The transversal blocks are show n in Fig. 4-8.

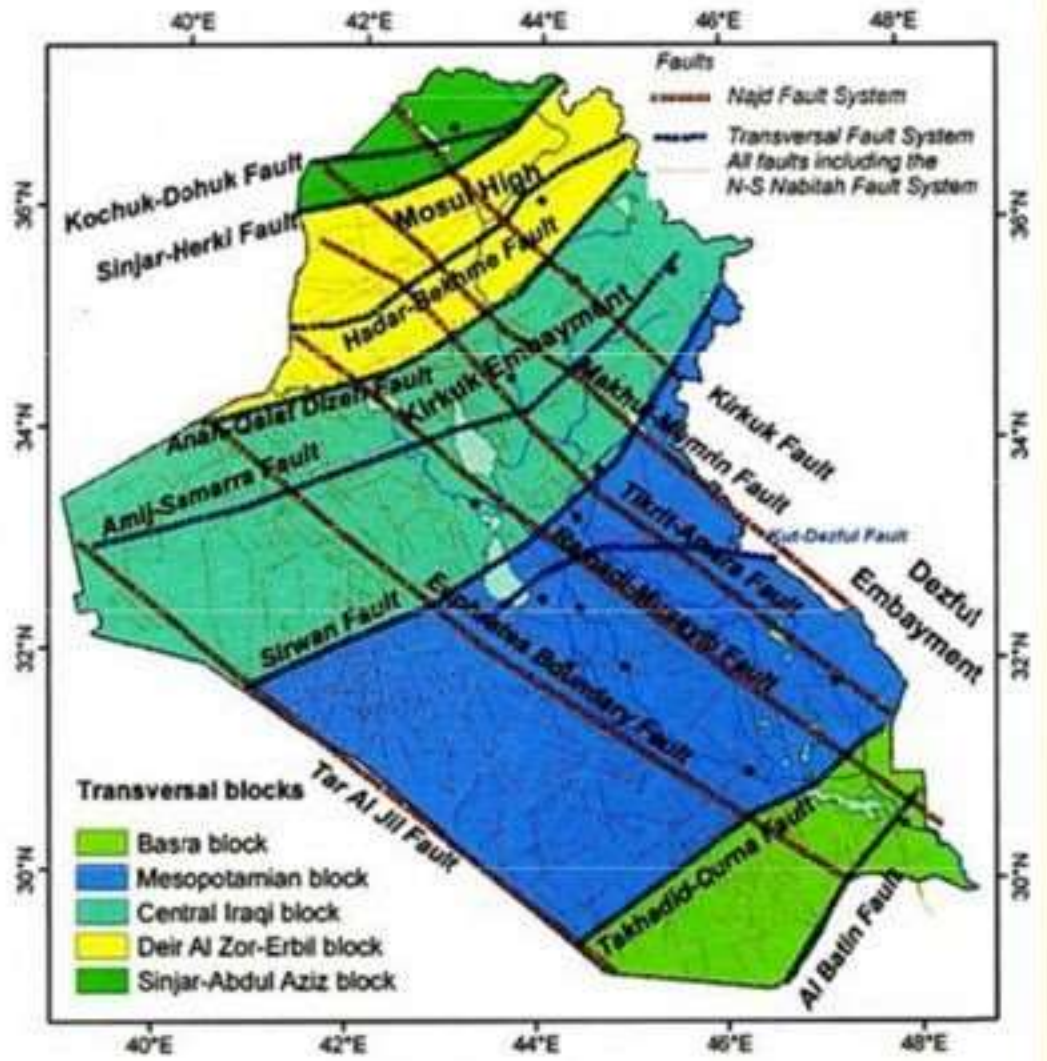
Faults & Fault Zones

Fig. 4-7: ...kt for description...



Transversal Blocks

Fig. 4-8: ...



Nabitah (idsas) Fault System

The N-S trending Nabitah Fault System is prominent in S and W Iraq.

it affects the thickness of the Infracambrian and Palaeozoic sections and, to lesser extent, the Triassic section.

-The fault system resulted from *E- W compression*, which formed major N- S trending thrust anticlines and associated molasse - filled fore deep (collapse) basins during the Nabitah Collision (680-620 Ma).

-The system in Iraq has been mostly identified from gravity data and is most commonly observed in SW, S and W Iraq and less commonly in NW Iraq.

Not all the N-S trending features shown are faults; some may be due to lateral changes in basement composition.

The Nabitah System is older than the Najd system and originated around 680 Ma.

'-Extension probably occurred along this trend to form the N-S Infracambrian *rift basins*.

It was reactivated during the "*Hercynian" events* in Late Carboniferous time as indicated by the isopach of the Palaeozoic.

-Erosion occurred over the Salman Zone which forms the central longitudinal unit in Iraq.

-Further reactivation of the Nabitah system occurred in the Late Cretaceous as *indicated by depositional thinning and the presence of unconformities over some of the N-S trending structures of Kuwait and E Saudi Arabia.*

- Neotectonic movements may have occurred along some structures of this system, including the Abu Jir and Tharthar faults in central and N Iraq and the Nukhaib Graben in SW Iraq.

Najd Fault System

★The Najd Fault System is very significant in Iraq *as it forms boundaries not only of the Precambrian terranes but also of the tectonic zones, especially in central, E and NE Iraq*.

★The Najd System originated as a *sinistral strike-slip faulting* system around 670 Ma and was associated with deep ductile deformation that resulted in the rise of gneiss domes (Nehlig et al., 2002). It later developed as an *extensional system* from 640 Ma to 530 Ma.

The following fault zones are related to the Najd Fault System:-

1-The Tar Al Jil Fault Zone runs along the Iraqi-Saudi border and is well defined on satellite images and from gravity data. It is associated with an *escarpment of Palaeocene strata, facing a depression to the SW filled in with Mio-Pliocene clastics and fresh water limestones.*

-The fault has thus been *active* in Late Tertiary time.

-It continues into W Iraq, NE Jordan and SE Syria.

2-The Euphrates Boundary Fault Zone is one of the most prominent Najd fault zones. It runs along the Euphrates River in S Iraq and continues towards the Rutba area in W Iraq.

In the S the fault zone comprises a *series of step faults sometimes associated with grabens,* and forms the boundary between the Quaternary Mesopotamian Plain and the rocky desert of SW Iraq.

-*It is associated with a large number of sulphur springs*.

-In W Iraq the fault zone was reactivated during Late Jurassic and Cretaceous time forming small fault bounded depressions filled in with fluvial sandstones.

3-The Ramadi-Musaiyib Fault Zone

is a prominent feature on the gravity gradient map.

-*It controls the course of the Tigris River between Baghdad and Kut*.

-It is associated with long NW-SE buried anticlines in S Iraq and controls the location of the buried W Baghdad structure. It continues NW toward Anah in W Iraq to the point where the Euphrates River changes direction from E to SE.

-The fault zone was probably active during the Mio-Pliocene time.

4-The Tikrit-Amara Fault Zone

extends from the Jezira region in NW Iraq through Tikrit and Balad into Baghdad and Nahrawan.

-It continues along the SE trending stretch of the Tigris River between Kut and Amara.

-Major buried anticlines are located along this fault zone (Rafidain, Nahrawan, E. Baghdad, Balad and Tikrit). Seismic and gravity data indicate that the zone is associated with a Late Cretaceous graben system (Aljawadi, 1990).

5-The Makhul-Hemrin Fault Zone

-has a magnificent surface expression represented by one of the longest anticlinal chains in the Middle East that includes ***Makhu***l in the NW, ***Hemrin North*** and ***Hemrin South*** in the Middle and ***Pesht-i-Kuh*** along the Iraq-Iran border in the SE.

-The same trend continues into SW Iran along some of the anticlines forming the NE coastline of the Arabian Gulf.

-This fault zone may be the boundary between the Eastern Arabian and Zagros Precambrian terranes and also forms the Boundary between the Stable and Unstable Shelf.

-Late Cretaceous ***extension*** may have occurred along this fault zone.

*-It was **strongly reactivated** during the Pliocene and forms the SW boundary of the area affected by Late Tertiary folding.*

It is still active at the present day.

6-The Kirkuk Fault Zone

is expressed on the surface by the 300 km long anticlinal range of Kirkuk and forms the boundary between two subzones of the Foothill Zone.

-It was active during the Plio-Pleistocene.

Transversal Fault System and transversal blocks

The Transversal system includes two main trends,:-

1- the easterly trend which is more dominant in W and NW Iraq and

2- the northeasterly trend that dominates the E and N parts of Iraq.

-*These two trends merge into each other to form arcuate faults*.

-The Transversal systems may have formed in Late Precambrian times.

-Poorly defined E- W and NE-SW trends occur in the Arabian Shield.

The NE-SW trend might be a conjugate trend to the Najd Fault System.

-The easterly trend may have formed during Late Precambrian extension associated with igneous intrusions.

-The Transversal System was reactivated from Late Jurassic times onwards resulting in the formation of transversal blocks.

-Some faults of this system underwent sinistral strike slip movement in Quaternary time; at least 2 km of horizontal displacement has occurred along the *Anah-Qalat Dizeh Fault at Al Fatha* in the last few million years.

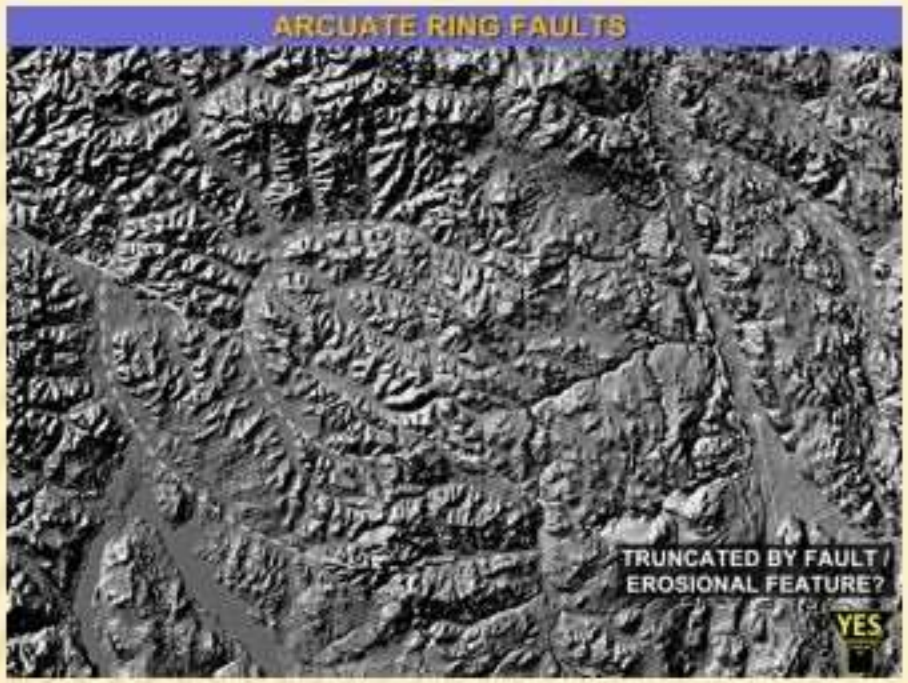
-Many Foothill Zone anticlines are segmented into separate domes and their fold axes are bent at the intersections with transversal faults.

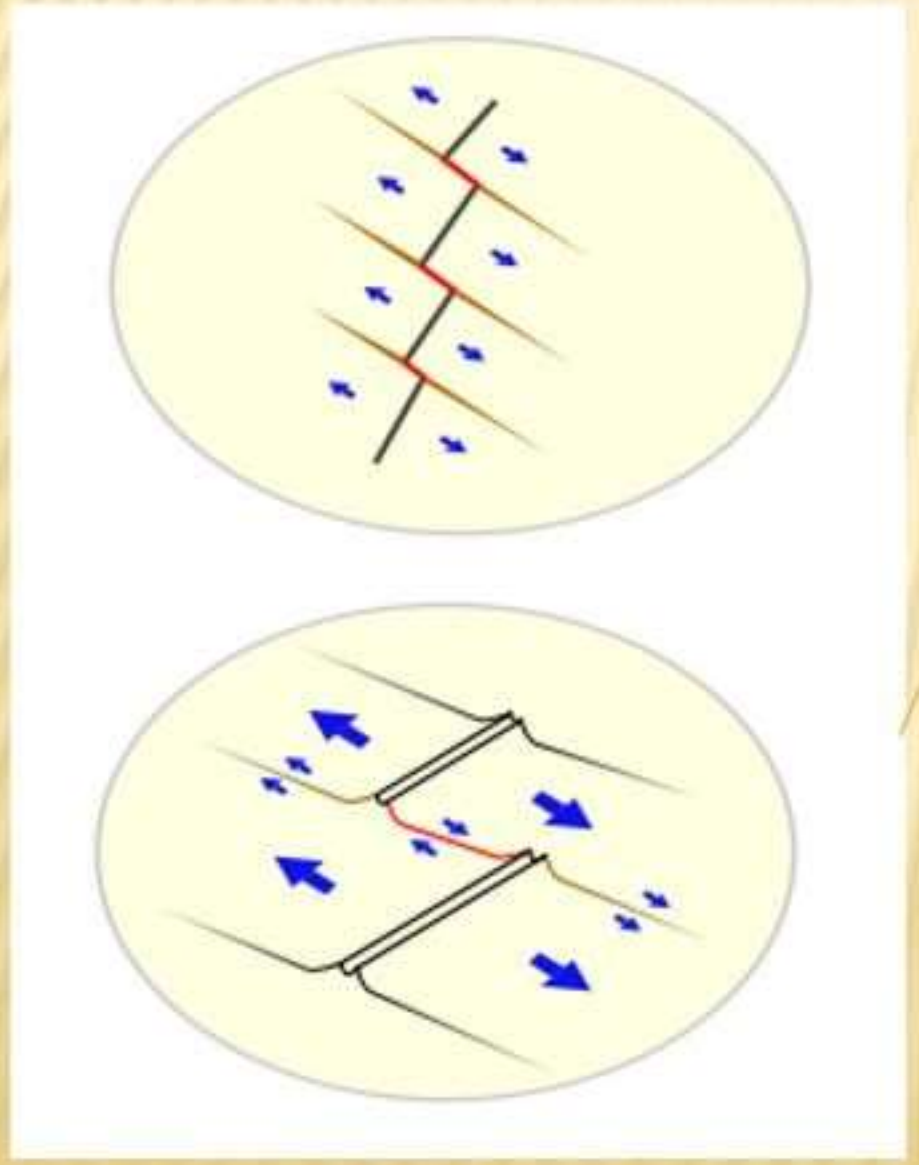
-The Transversal Fault System may represent old planes of weakness which ***controlled the position of transform faults active during Neo- Tethyan Ocean spreading, and during the opening of the Red Sea.***

-Their SW continuation into Africa is confirmed by satellite and gravity interpretations .

-This suggests that this fault system extends from the Arabian Plate into the African plate.

The transversal faults influenced the thickness of the Jurassic to Neogene sequences





A ***transform fault*** or transform boundary (also known as a conservative plate boundary, ***since these faults neither create nor destroy lithosphere), is*** a type of fault whose relative motion is predominantly horizontal, in either a sinistral (left lateral) or dextral (right lateral) direction. Furthermore, transform faults end abruptly and are connected on both ends to other faults, ridges, or subduction zones.[1] While most transform faults are hidden in the deep oceans where they offset divergent boundaries as series of short zigzags accommodating seafloor spreading, the best-known (and most destructive) are those on land at the margins of tectonic plates. Transform faults are the only type of strike-slip fault that can be classified as a plate boundary.

The system has been divided into major fault zones (Fig. 4-7).
These are described below starting in the south:

1-The Al Batin Fault Zone

2-The Takhadid-Qurna Fault Zone

3-The Kut-Dezful Fault Zone

4-The Sirwan Fault Zone

5-The Amij-Samarra Fault Zone

6-The Hadhar-Bakhme Fault Zone

7-The Sinjar-Herki Fault Zone

8-The Kutchuk-Dohuk Fault Zone

These faults formed five transversal blocks ,that are from south:-

1-Basrah Block

2- Mesopotamian Block

3- Central Iraqi Block

4- Deir Al Zor – Erbil Block

5- Sinjar – AbdulAziz Block

Fig. 4-7: Distribution of faults and fault zones (see text for description of individual systems)

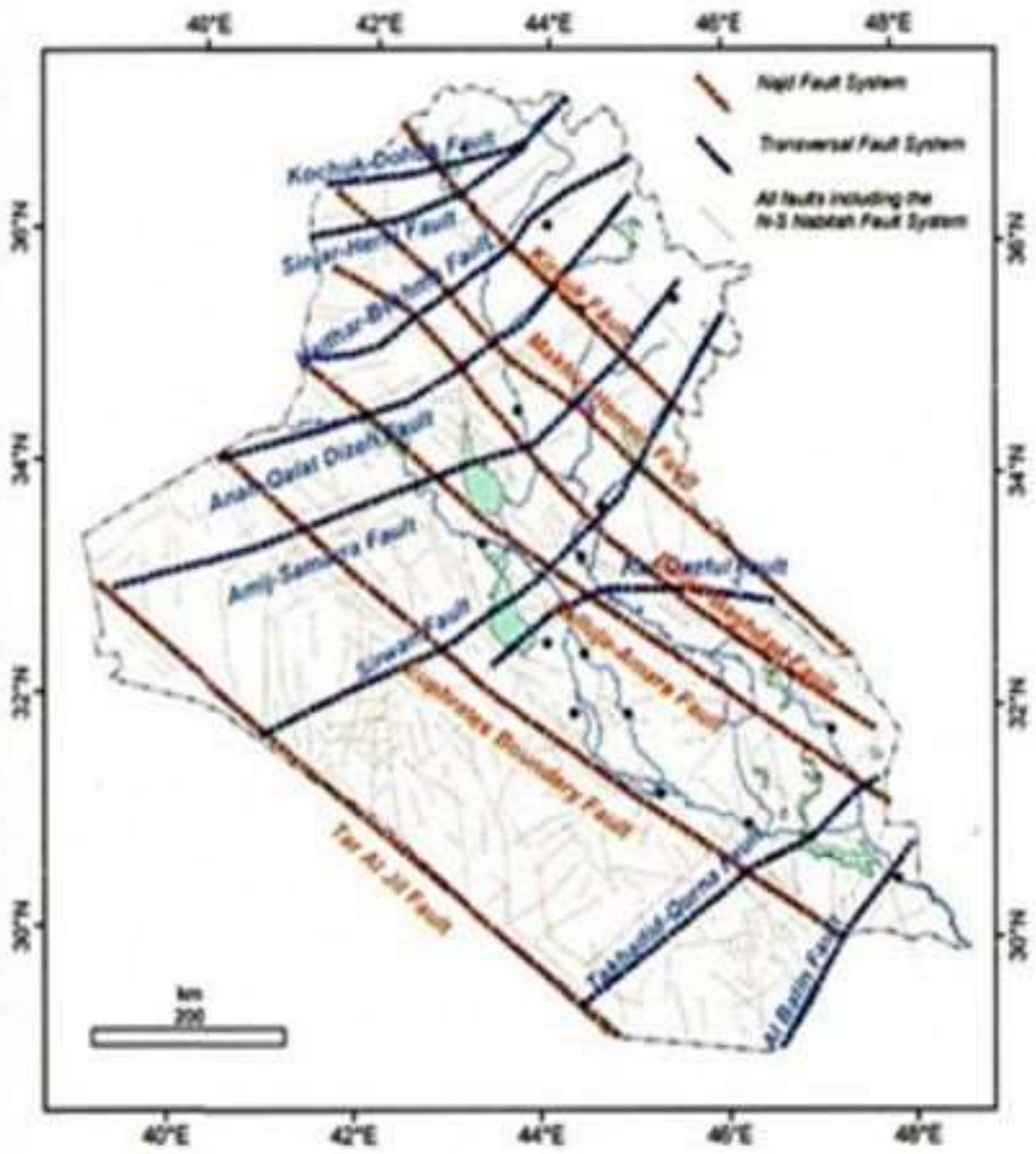


Fig. 4-8: Transversal blocks