

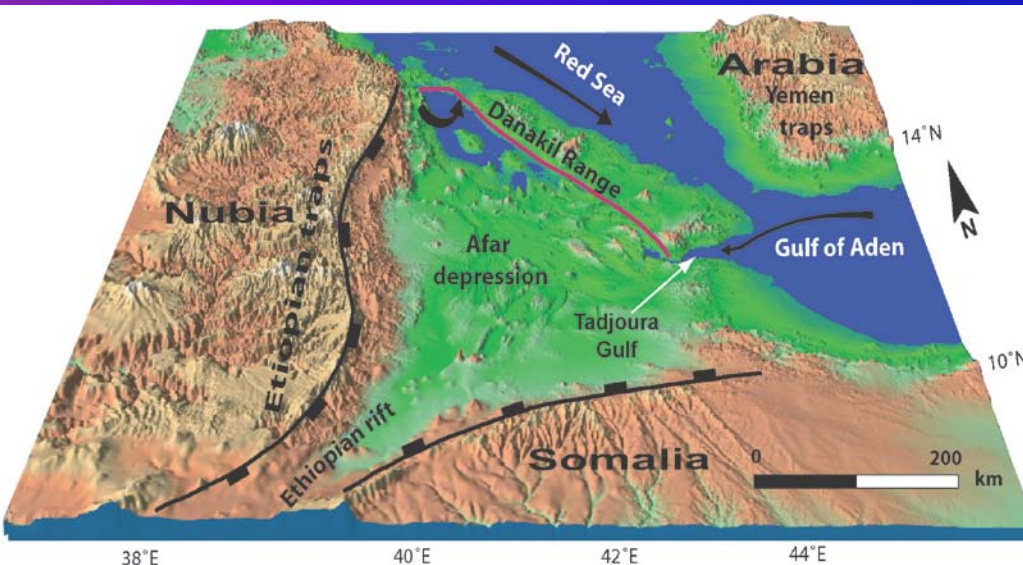
**Kinematics of rift propagation throughout the Tadjoura-Ghoubbet
connection zone, western of Aden, Republic of Djibouti.**

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**MINISTERE DE L'ENSEIGNEMENT SUPERIEUR ET DE LA RECHERCHE
CENTRE D'ETUDE ET DE LA RECHERCHE DE DJIBOUTI (CERD)**

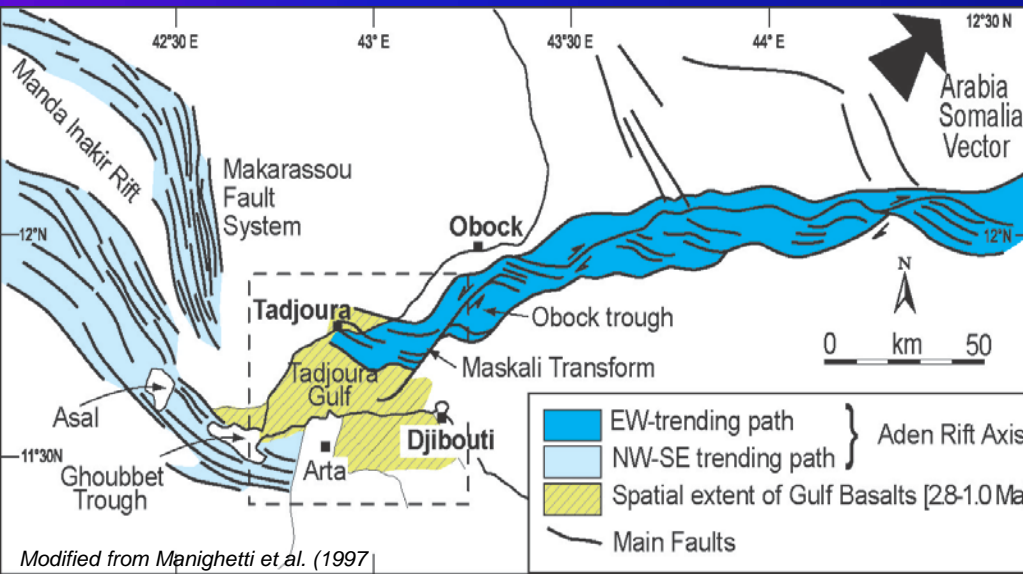
**Magmatic Rifting and Active Volcanism conference
Addis-Ababa, Ethiopia 11th – 13th, january 2012**

Tadjoura Rift in the Afar geodynamical setting



□ Tadjoura Gulf (TG) lies at the western tip of the EW-trending Gulf of Aden which forms one of the three diverging branches of the Afar Triangle.

□ The EW-trending axis veers abruptly counterclockwise into the N120°E-oriented Ghoubbet rift which is part of a submeridian, and partly emerged, rifted zone encompassing to the N the Asal and Manda Inakir *en echelon* subrifts.

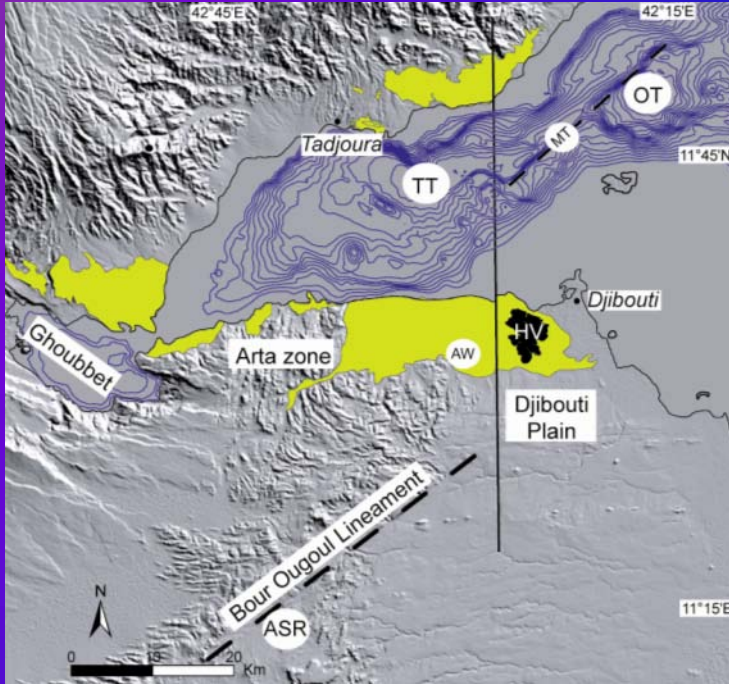


Scientific goals of the present work are :

□ to define the overall structure of the TR

□ to precise the kinematics of recent rifting in the linkage zone

Methodology and datasets



bathymetric data

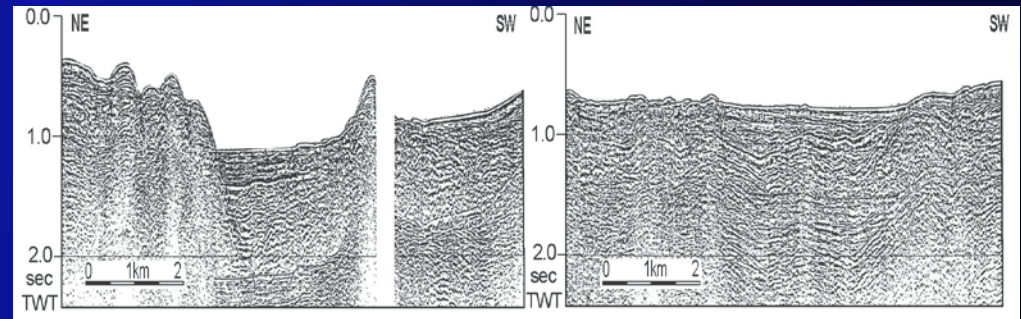
seismic reflection profiles

remote sensing data :

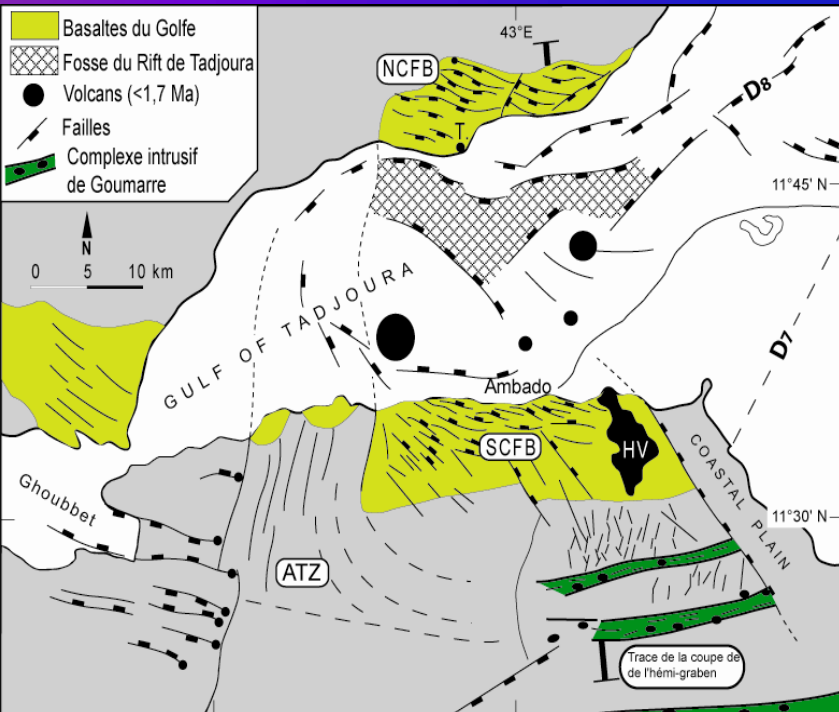
➤ Aster images (lateral resolution 15 m)

➤ Aster 3-D topographic data (vertical resolution 7m)

onshore geology

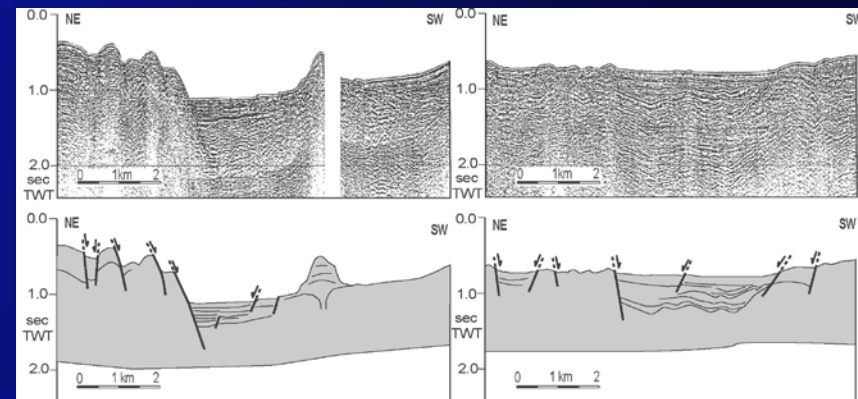
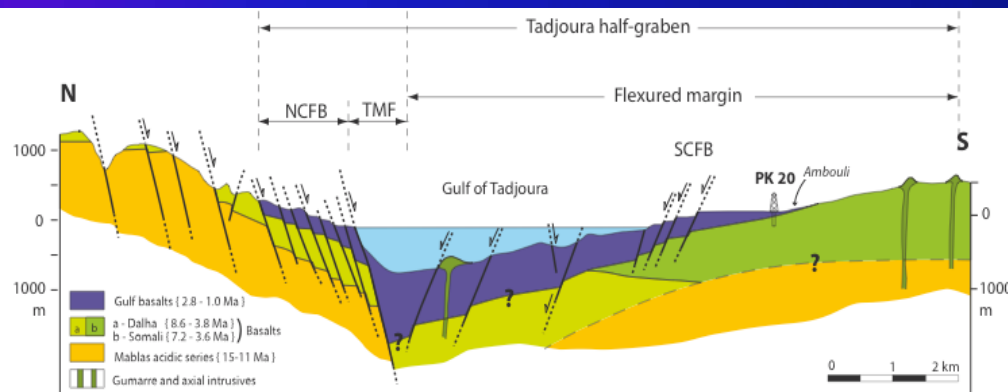


Overall structure of the Tadjoura Rift

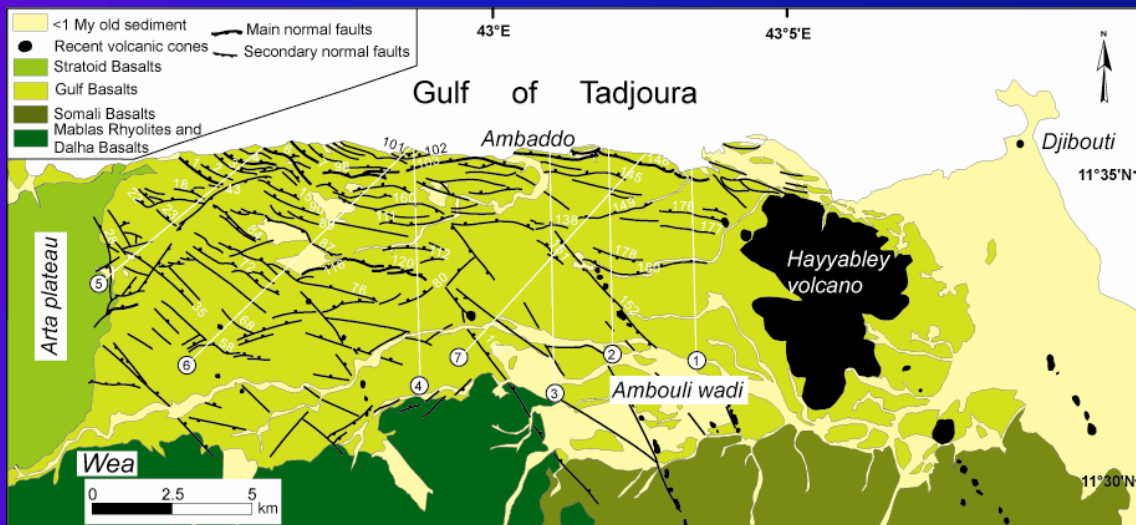
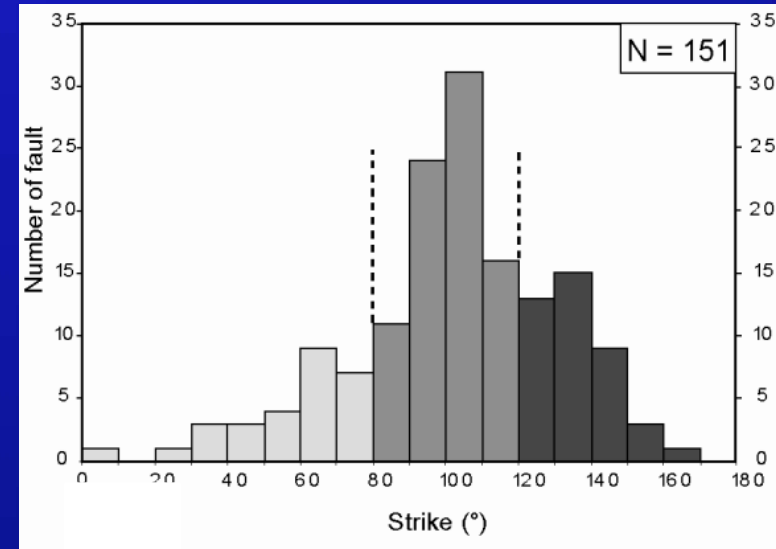
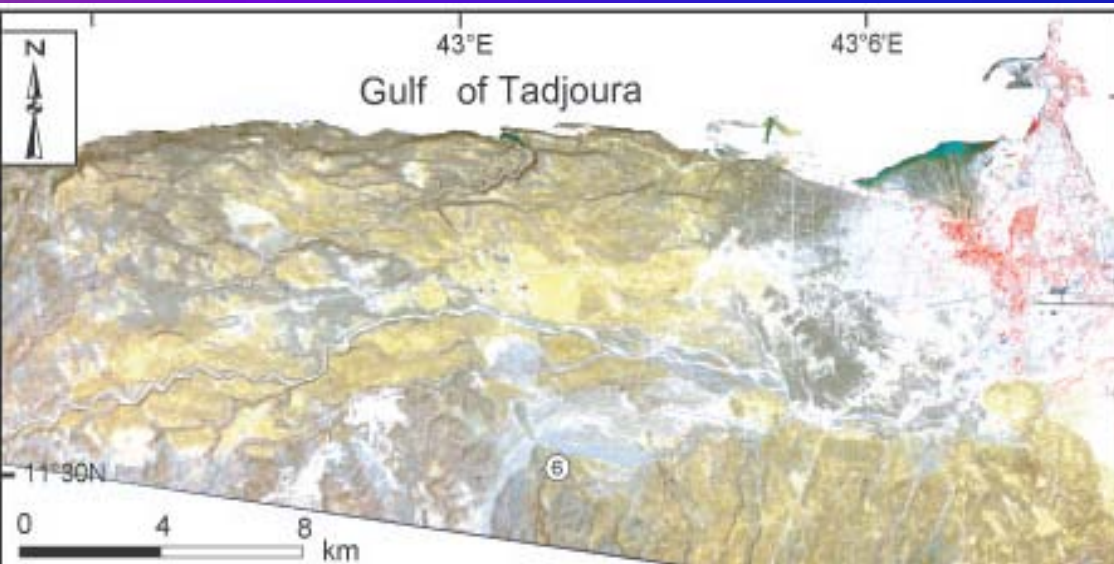


TR appears as :

- a 40 km-wide SSW-facing half-graben, filled by 1-3 Ma Gulf Basalts
- bounded to the north by a master fault and with a highly faulted footwall block (Northern Coastal Fault Belt)
- To the south, it extends as a >20 km-long shallower flexural margin (Djibouti Plain), locally disrupted by :
 - 1) antithetic extensional faults (Southern Coastal Fault Belt)
 - 2) the Goumarre transverse fault-dyke corridors, close to the inflexion point of the Somali Basalts monocline
- Recent faulting onshore is spatially restricted to the young Gulf Basalts



Spatial distribution of the South Coastal Fault Belt

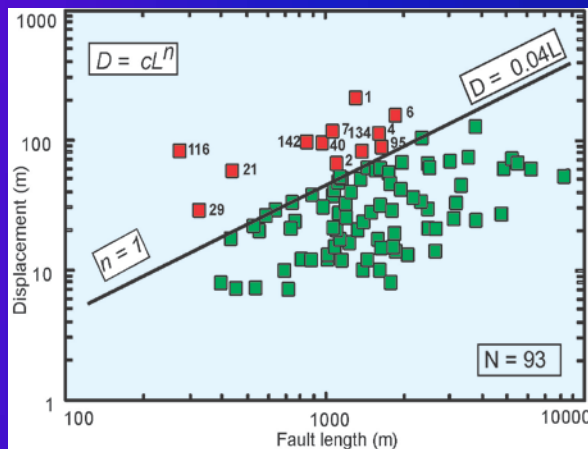
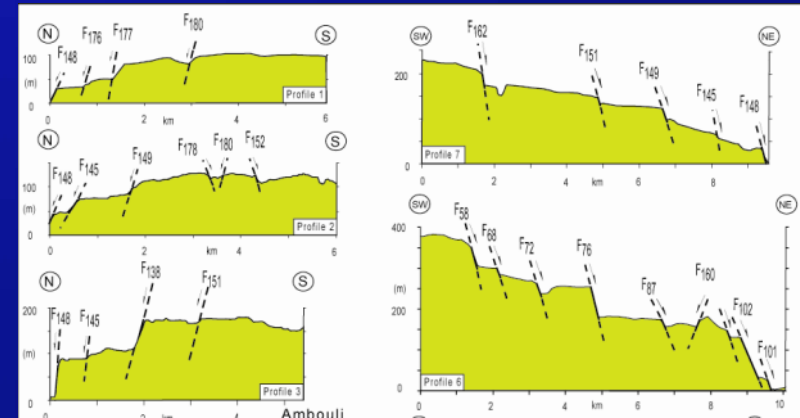
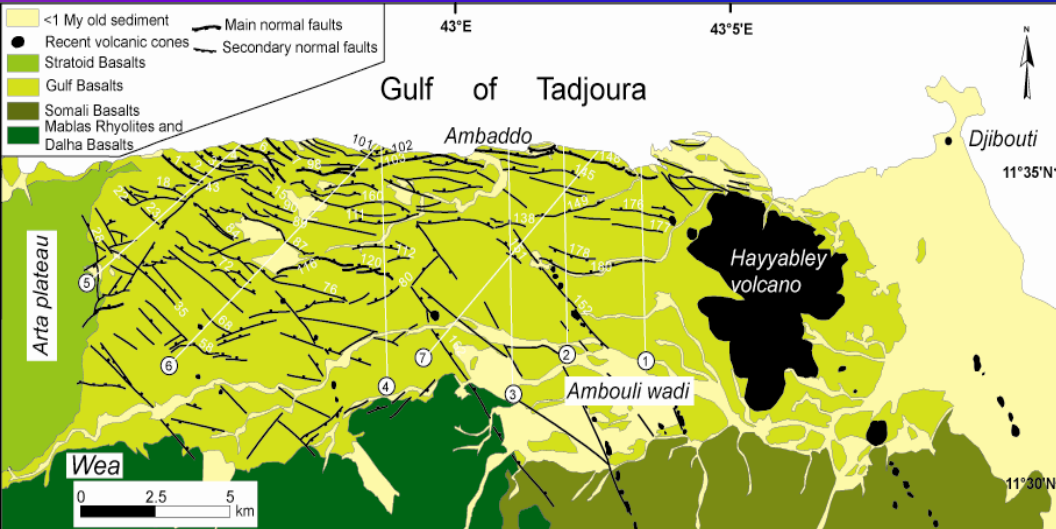


□ Three distinct sets of faults at : N100–110°E, N130–140°E, and to a lesser extent N60–70°E

□ The dominant N100°E veers clockwise westwards into a ~5 km-wide swarm of probably coeval N140°E faults

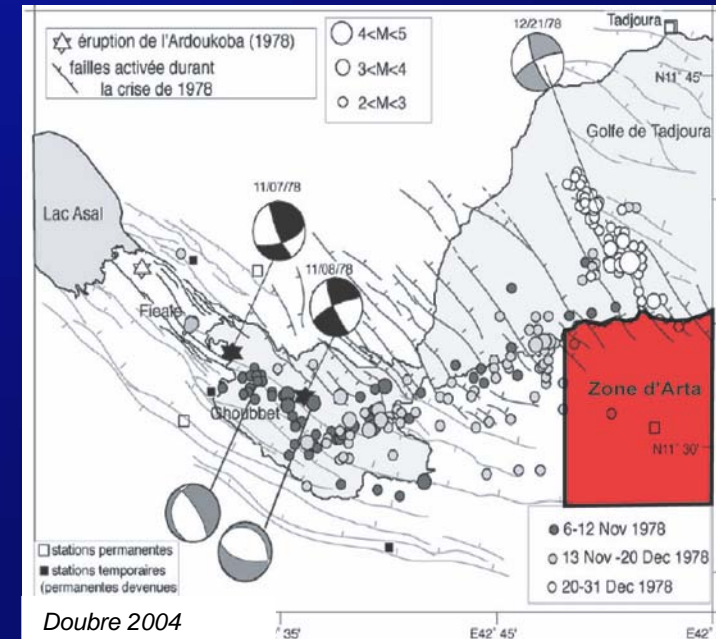
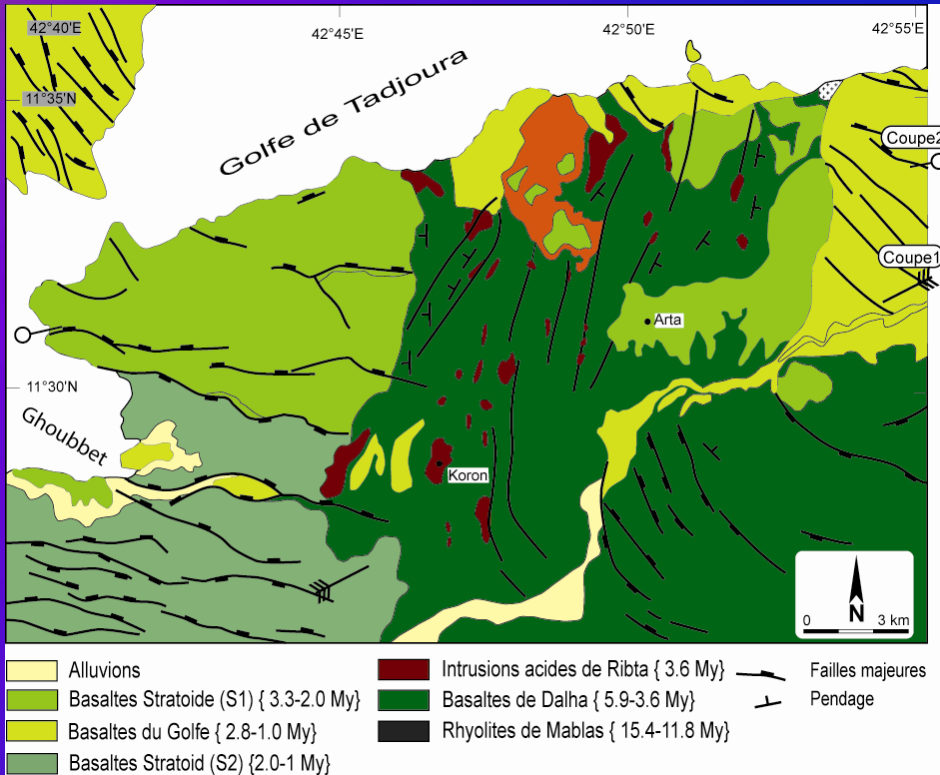
□ Most Gulf-parallel faults are sigmoid or curved in map-view

Morphostructural and statistical analyses of the SCFB



- ❑ Dominantly antithetic Gulf normal faults, dipping toward the Gulf.
- ❑ Increase of displacement to the W, toward the Arta zone.
- ❑ Over-displaced normal faults, evidenced on the D/L log/log diagram on the western edge of the SCFB, close to the Arta zone.

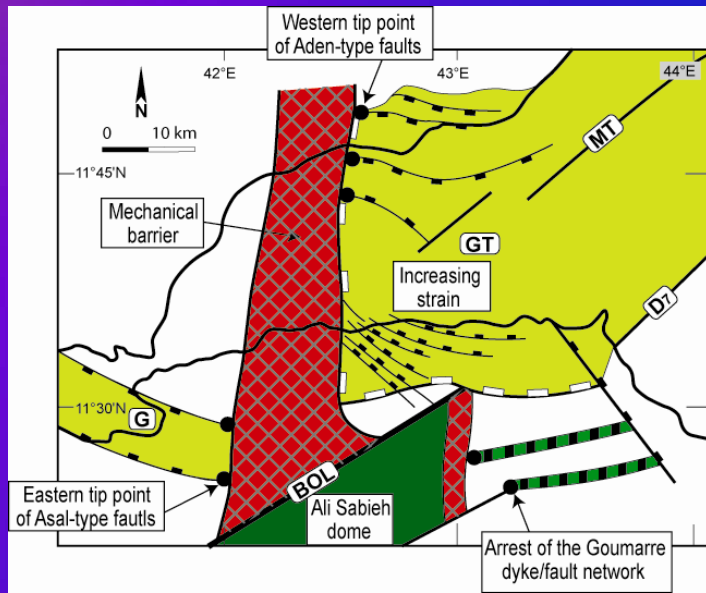
The Arta transverse zone



Dobre 2004

- ❑ Faults cutting the Gulf Basalts to the E as well as cutting the Stratoide Basalts to the W do not penetrate through older synrift volcanics
- ❑ the Arta transverse zone acts as a rigid micro-block with respect to the rift of the Tadjoura
- ❑ The spatial distribution of seisms seems to avoid the Arta transverse zone

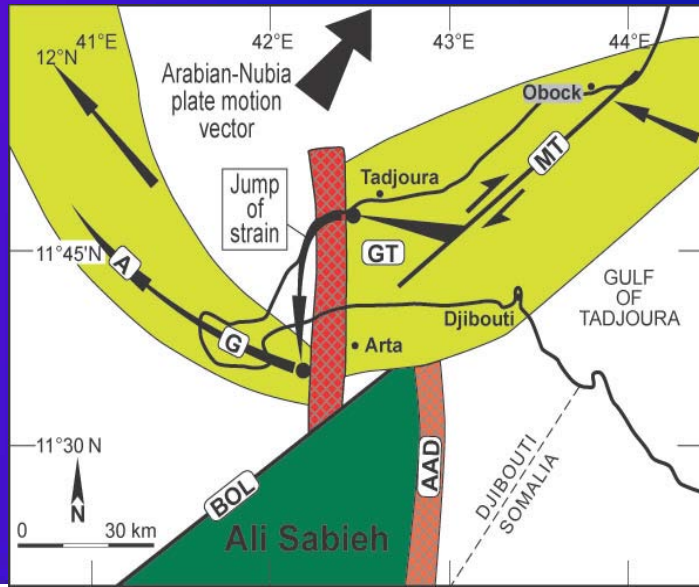
Proposed kinematical model



□ Frontal pinning of axial fault growth in the Tadjoura Rift against a rigid zone, orthogonal to rift propagation.

□ Lateral jump of rifting in the Ghoubbet trough.

□ Influence of inherited structures on recent rift kinematics in SE Afar.



Thanks for your attention

Gadda Geyya

Amasaginaloh



Statistical analysis of fault network (southern margin)

