Segmentation and structural style evolution during continental breakup:

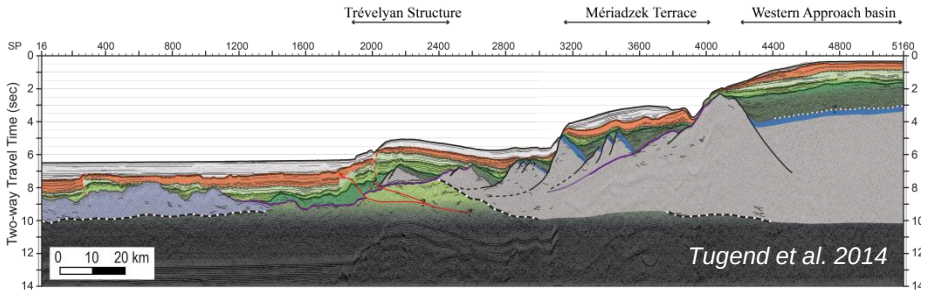
observations from the Northern Bay of Biscay passive margin (offshore France)

J. Tugend, E. Masini, S. Leroy & L. Jolivet

EGU General Assembly 2020

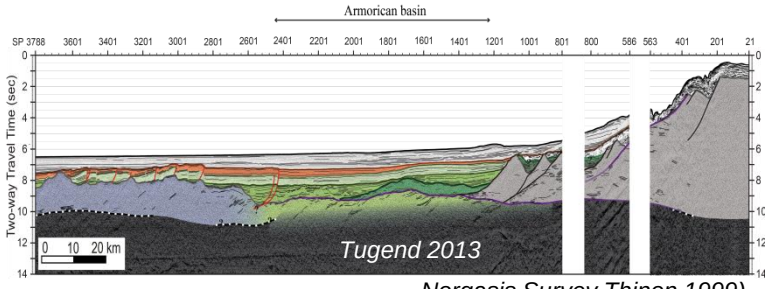
Northern Bay of Biscay segmentation

Western Approach margin



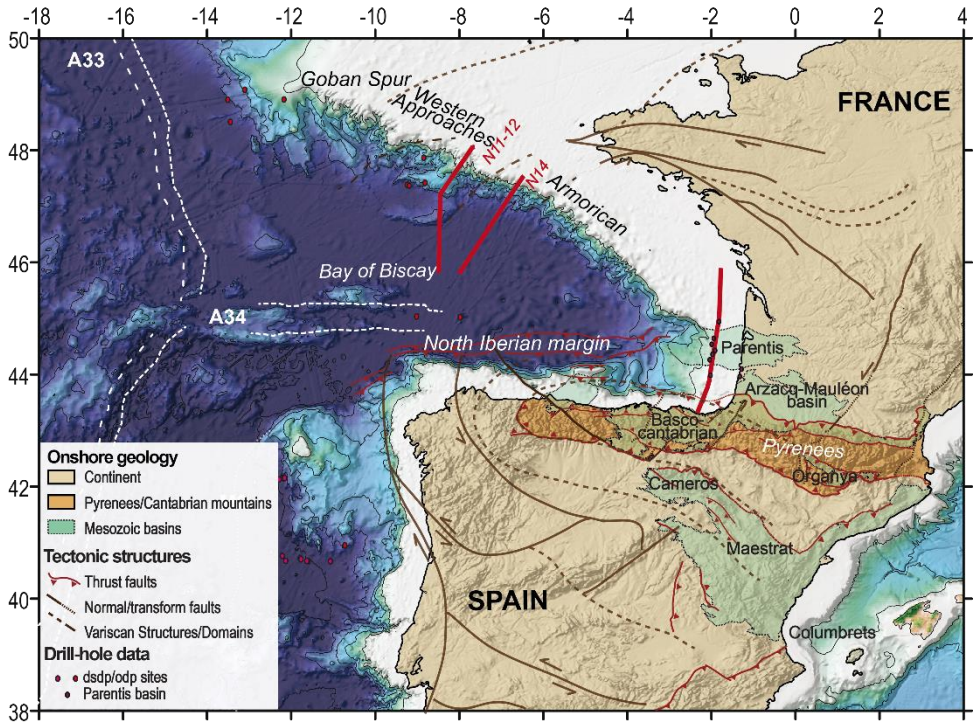
Norgasis Survey Thinon 1999)

Armorican margin



Norgasis Survey Thinon 1999)

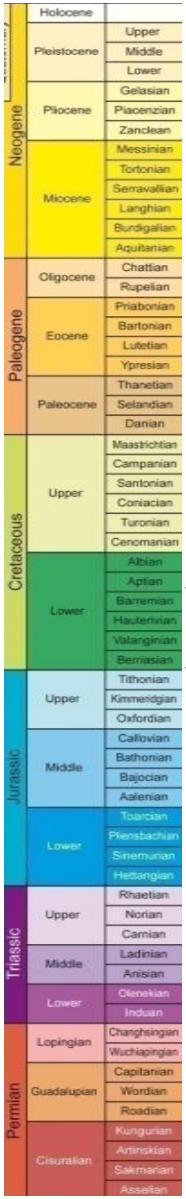
Bay of Biscay



Significant morpho-structural changes are described along the Northern Bay of Biscay rifted margins *(Thinon et al., 2003)*

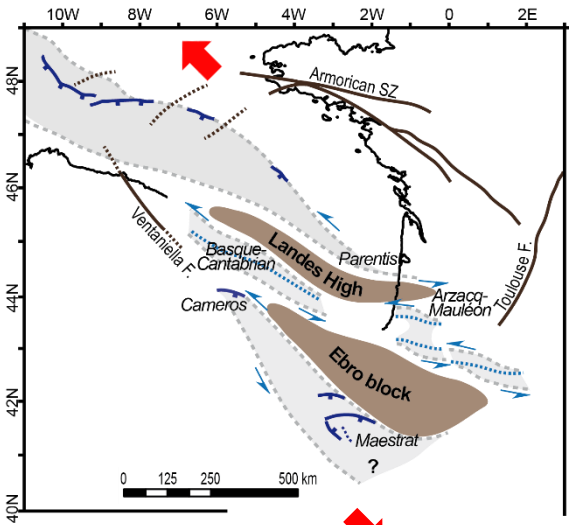
- Where and how does it occur?
- Origin of this change ?

Morpho-structural variations at rifted margins



Oblique rifting

(Latest Jurassic – Aptian)

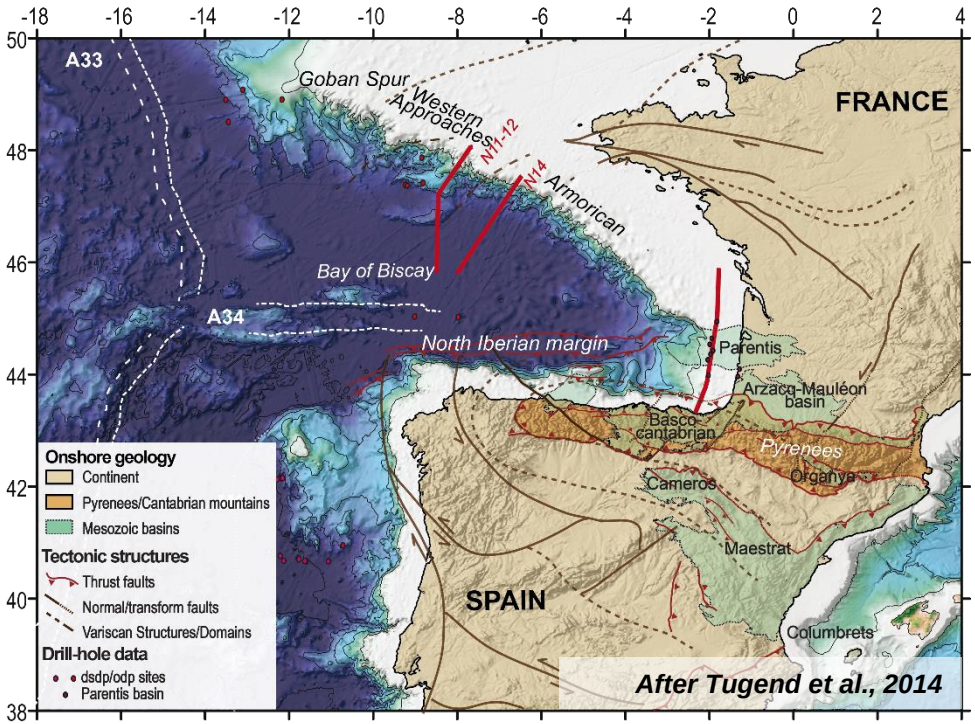


Jurassique Sup.

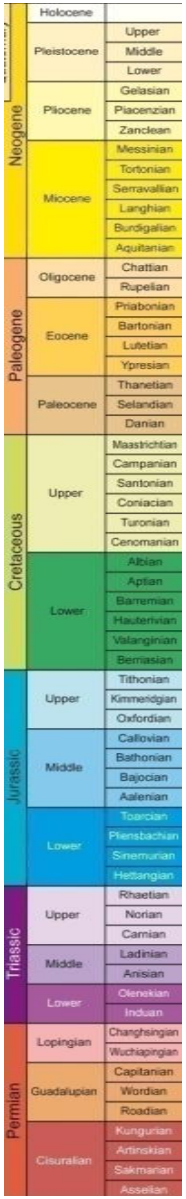
(~145Ma)

Tugend et al., 2015b

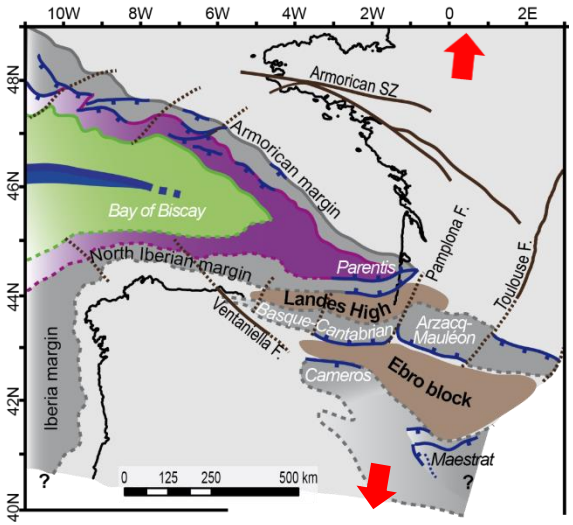
Bay of Biscay



What is the impact of oblique rifting on the structural style?



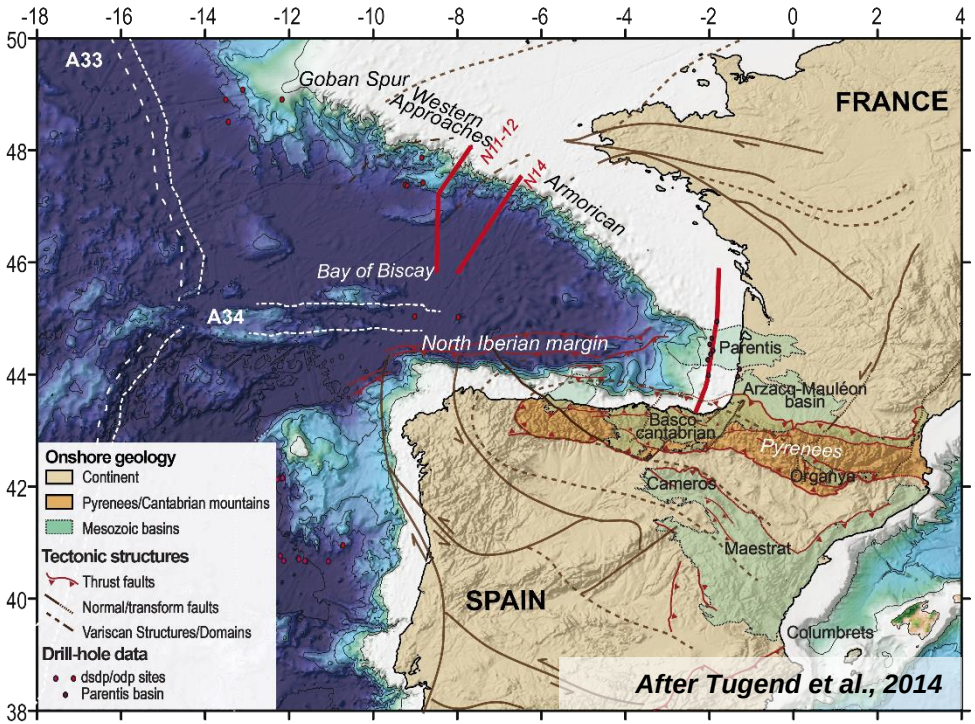
Onset of oceanic accretion



Aptien-Albien
(~110Ma)

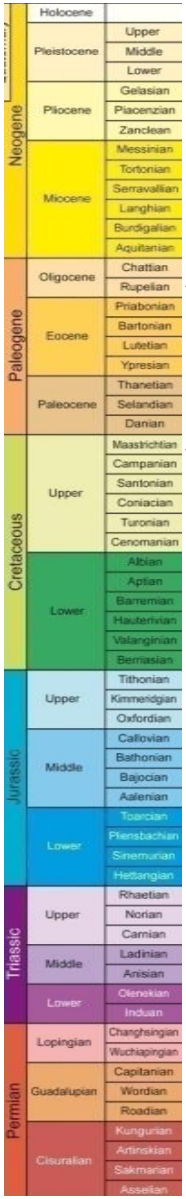
Tugend et al., 2015b

Bay of Biscay

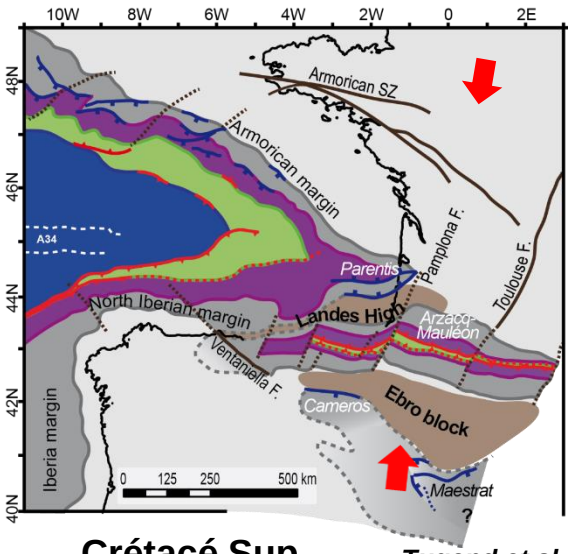


What is the structural style related to continental breakup?

TECTONIC CONTEXT



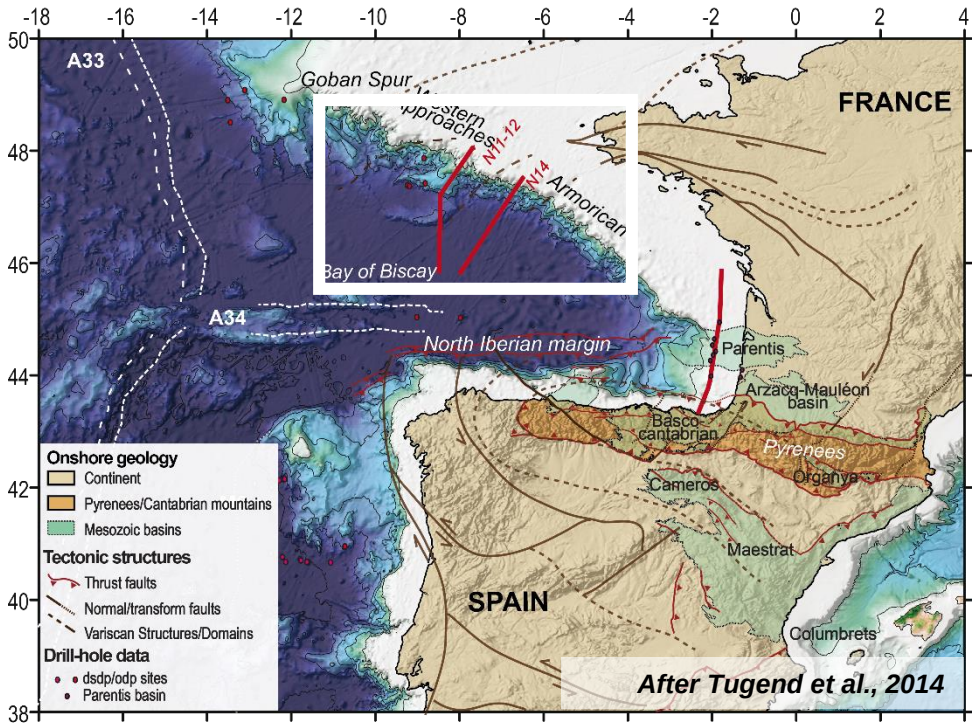
Pyrenean compression



Crétacé Sup.
(~80Ma)

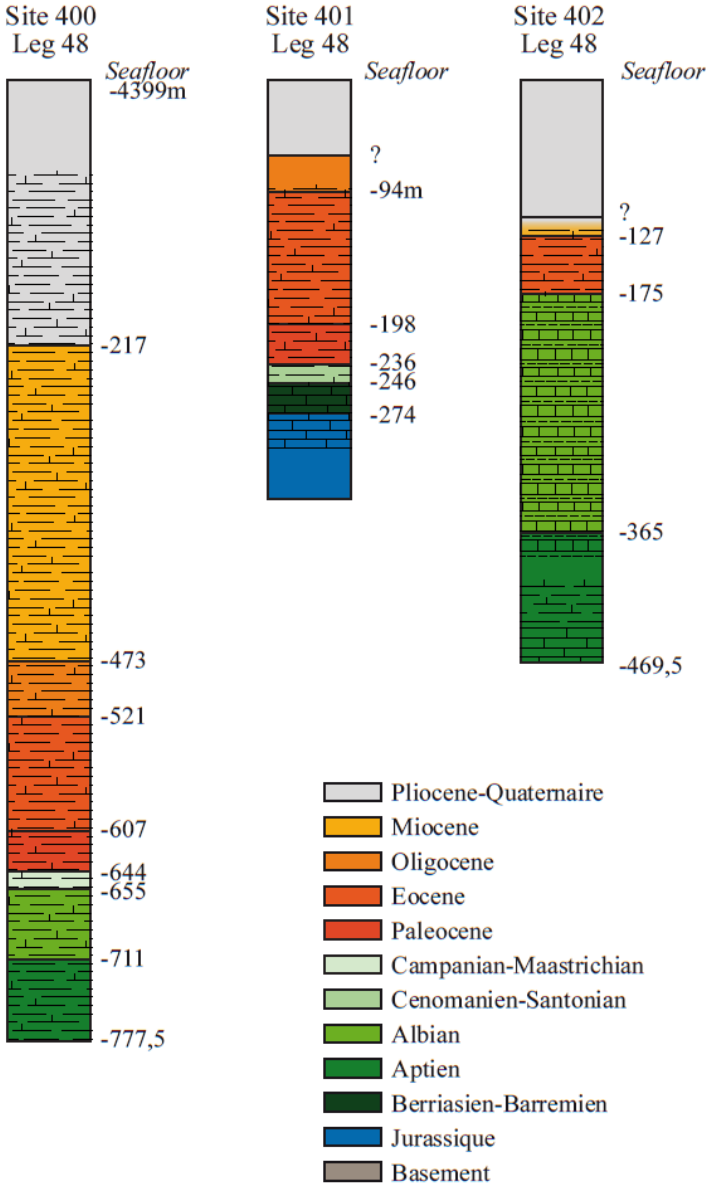
Tugend et al., 2015b

Bay of Biscay



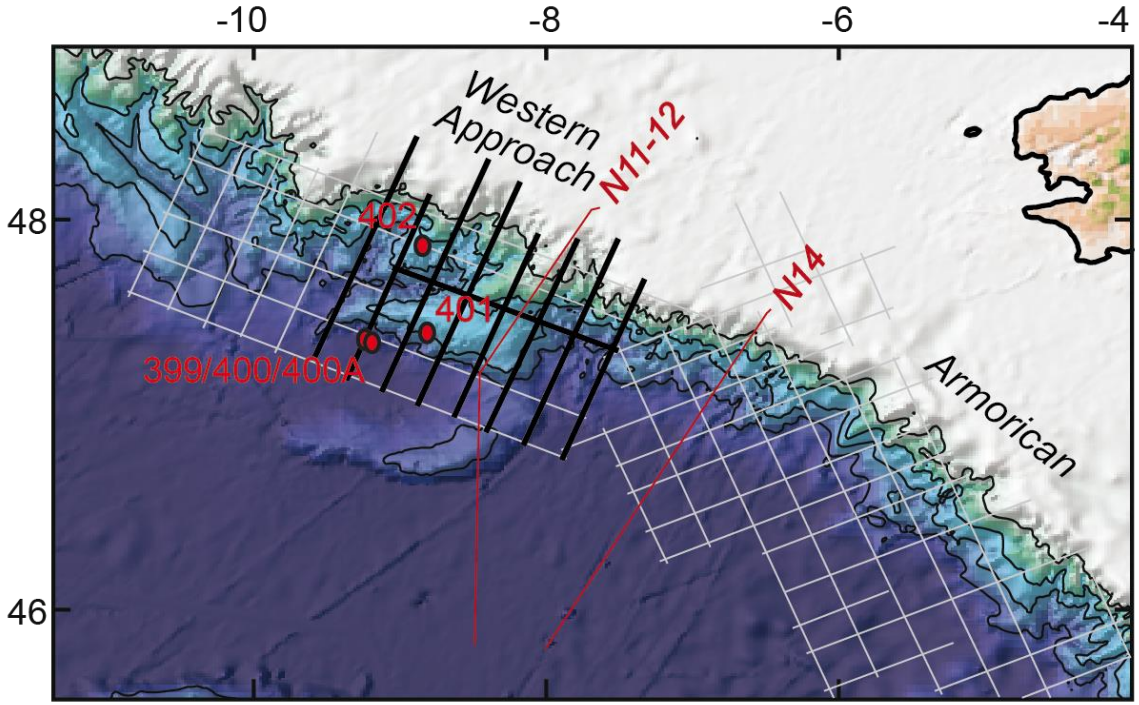
After Tugend et al., 2014

DSDP drilling results



Shipboard Scientific Party (1979a,b,c)

Series of reflection seismic sections

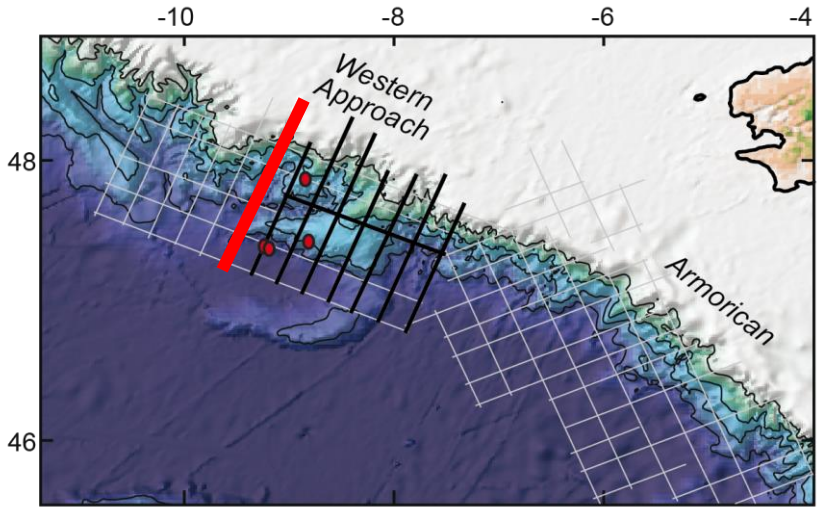


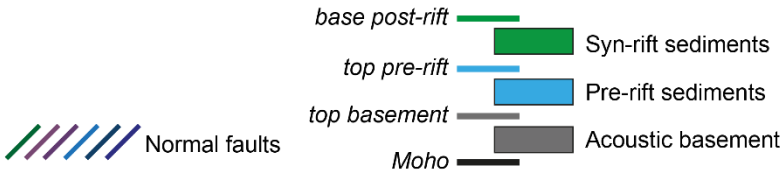
Previous works by Guennoc 1978; Barbier 1986; Deregnaucourt 1981; Thinon 1999

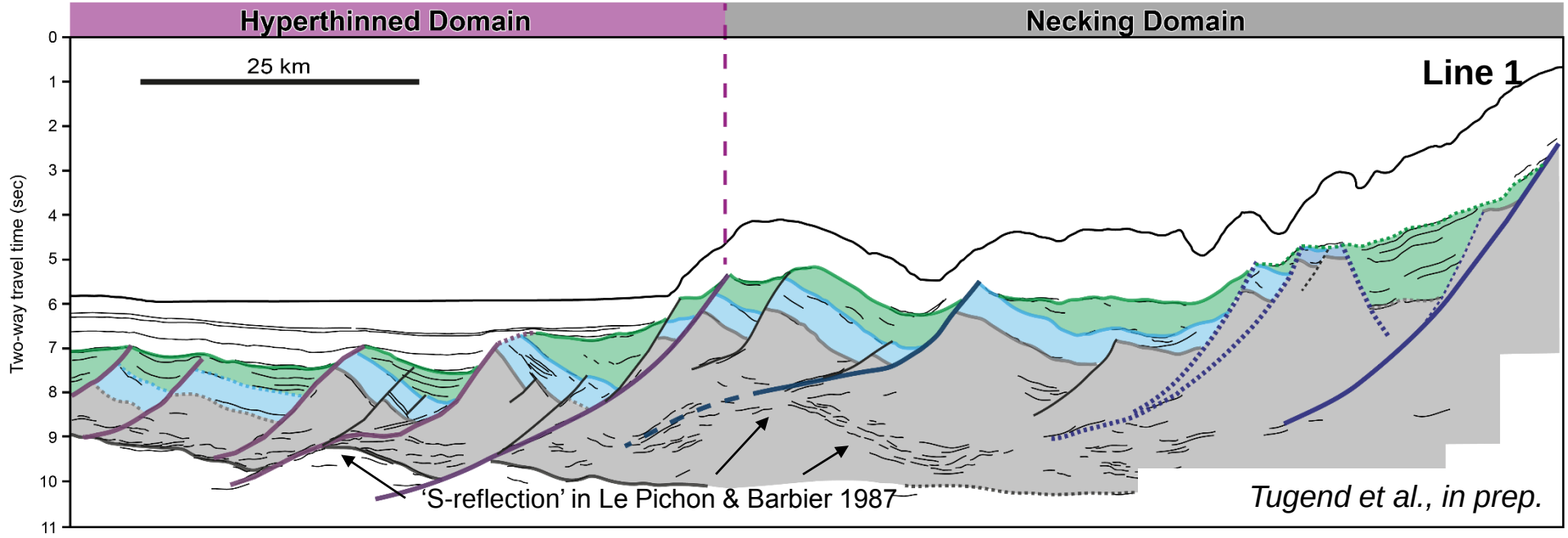
Western Approach segment

- Necking domain: faults root on an intra-basement decoupling interface (*top lower crust?*).
- Hyperthinned domain: fault root at the Moho or deeper.

► **Evolution of the nature and depth of the fault rooting level**

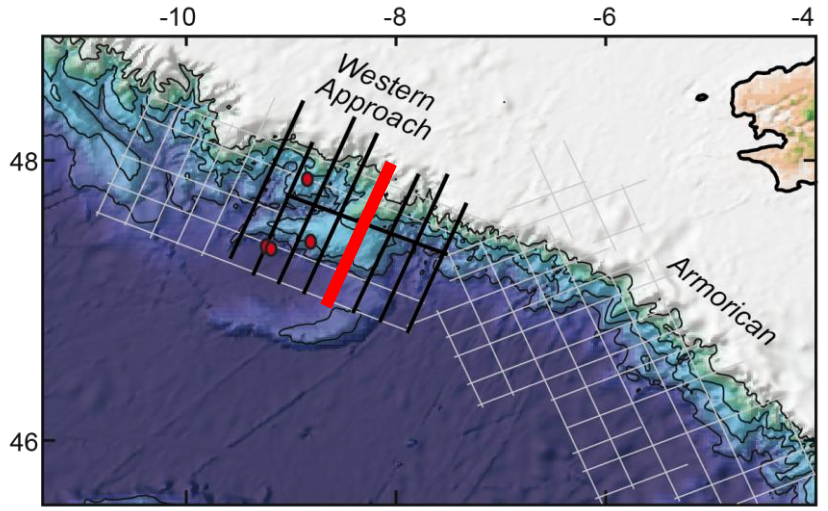


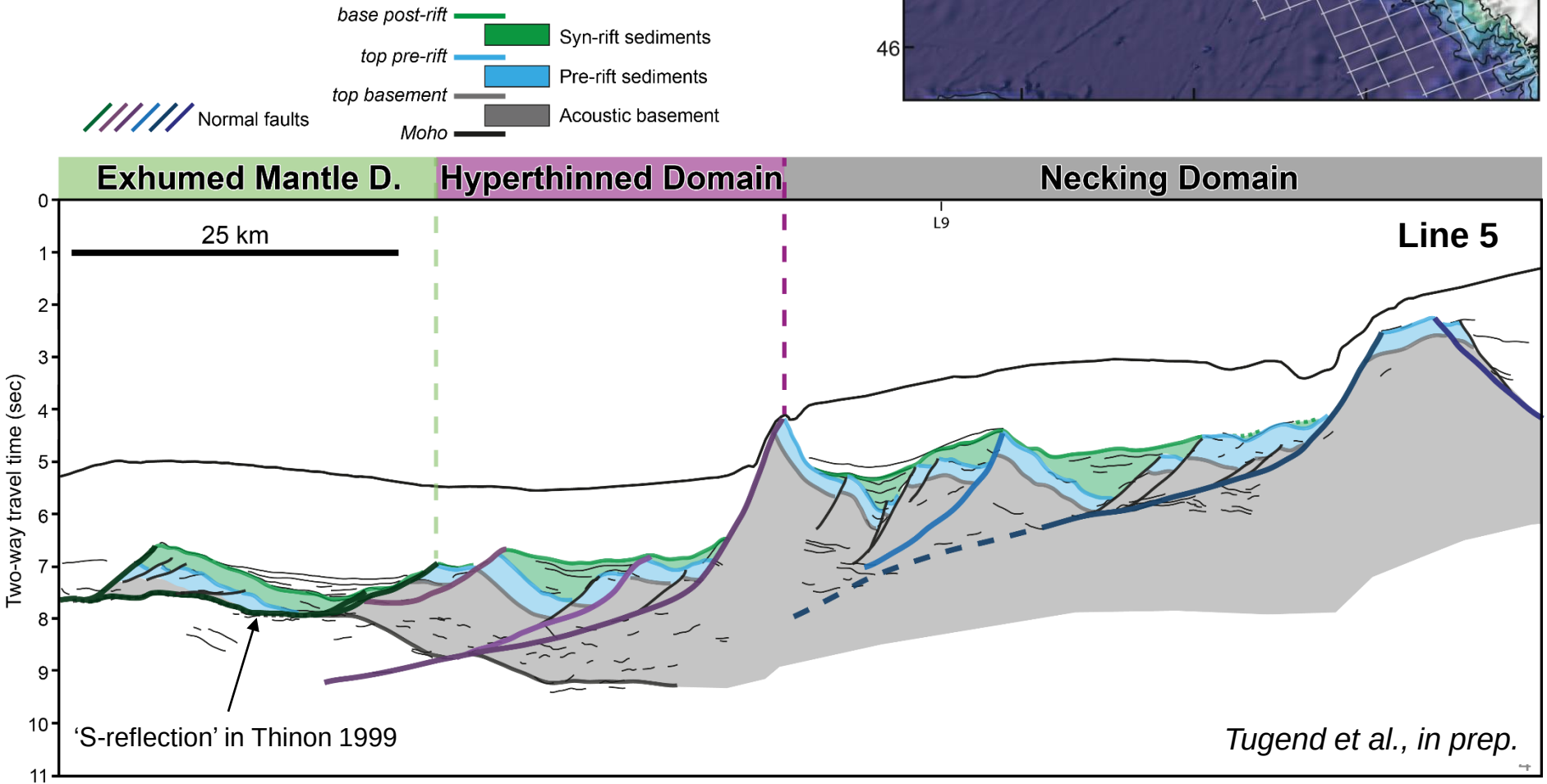




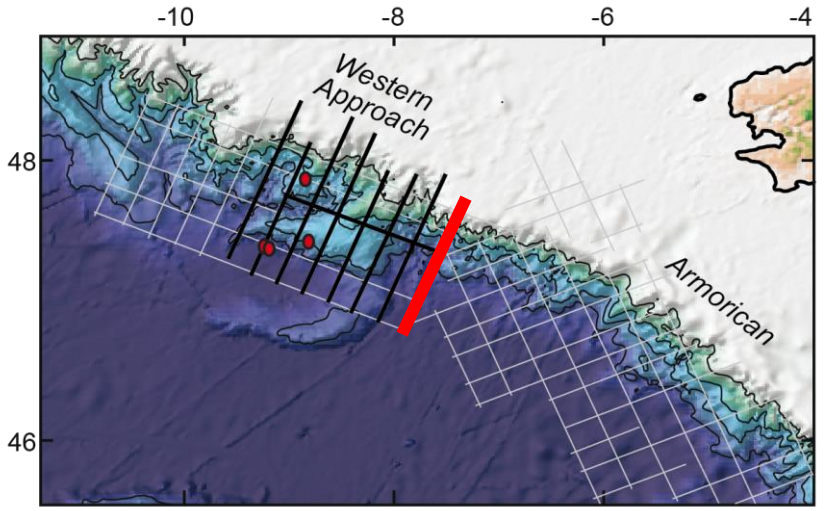
Western Approach segment

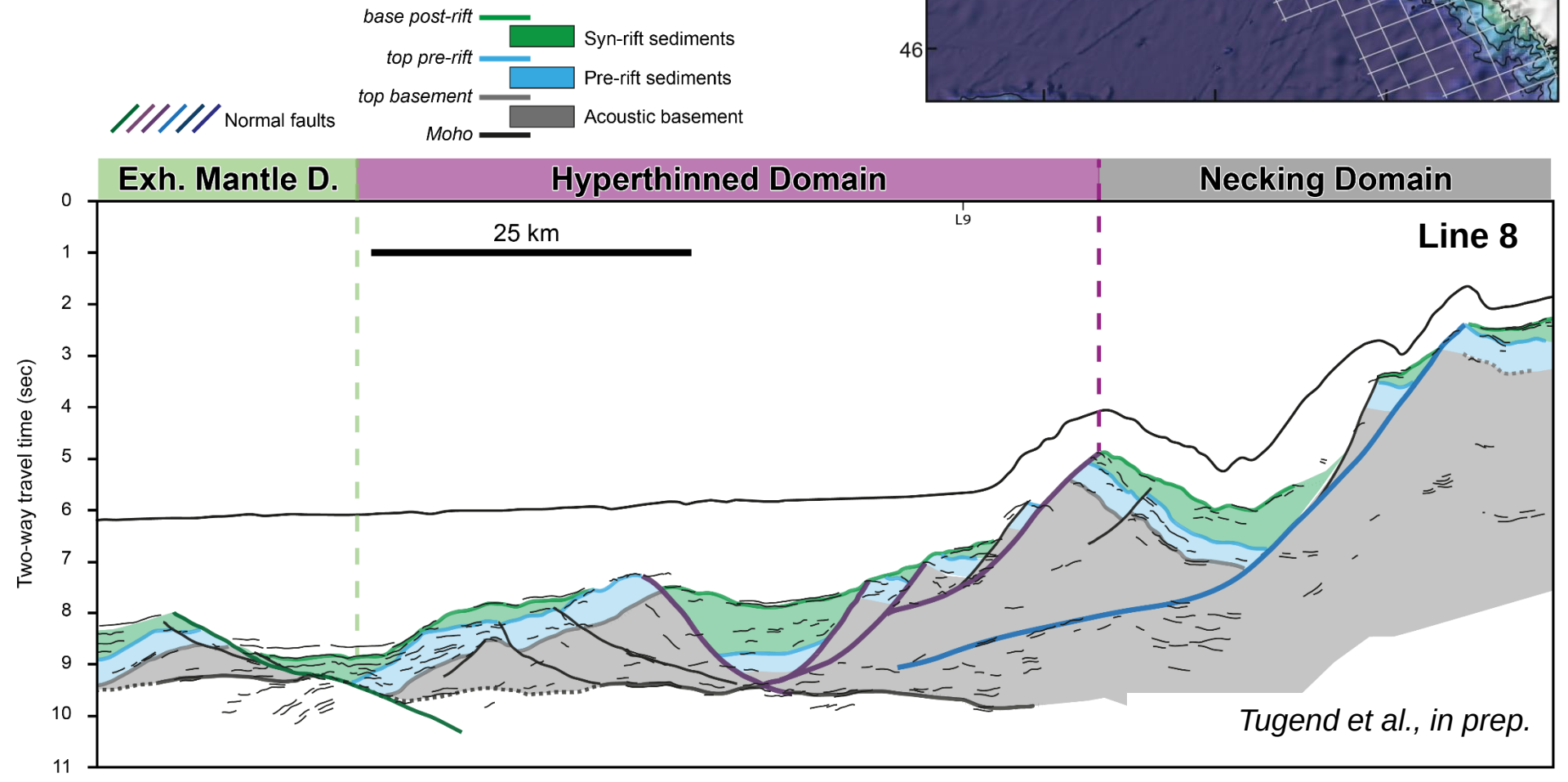
- Mantle seems to be exhumed locally forming the ocean-continent-transition (*Thinon et al., 2003, Tugend et al., 2014*)





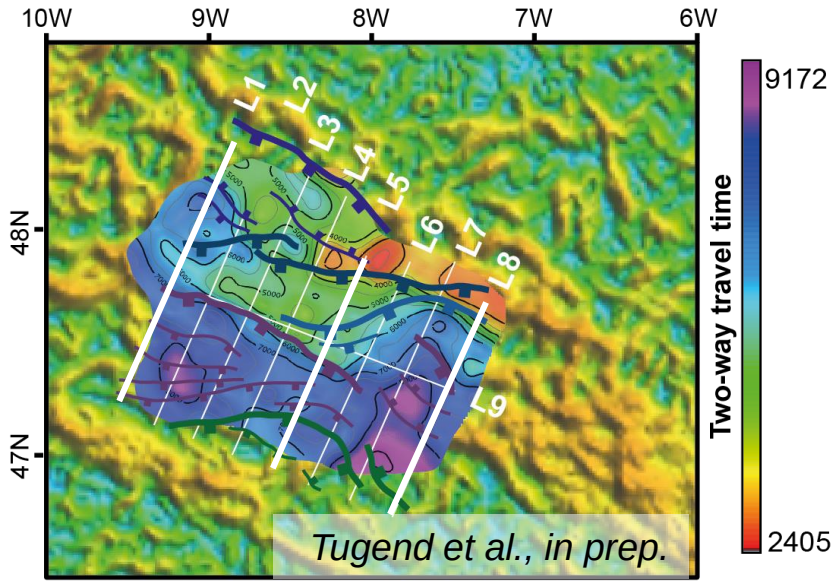
- A change in structural style occurs in the distal margin. Normal faults dip mainly continentward.



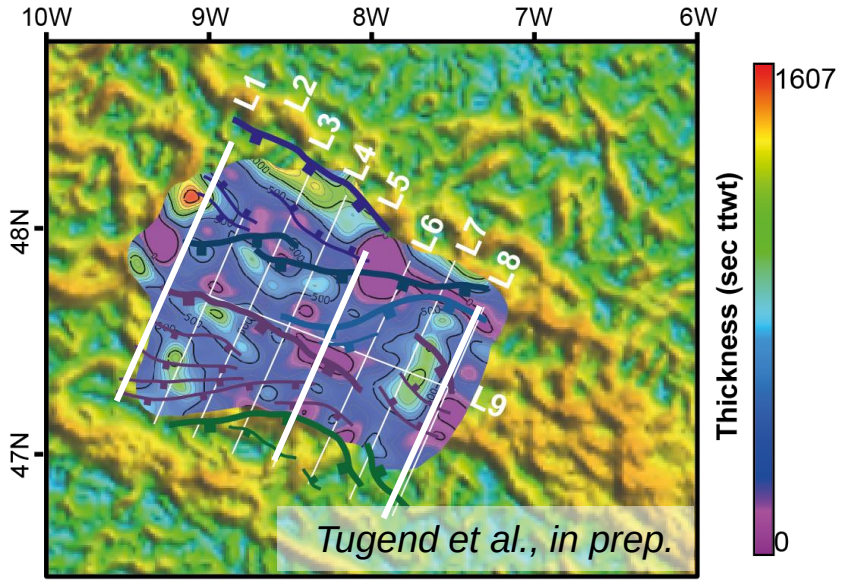


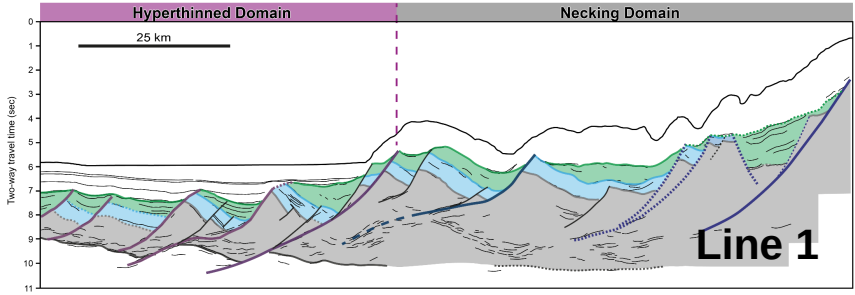
Structural style variations

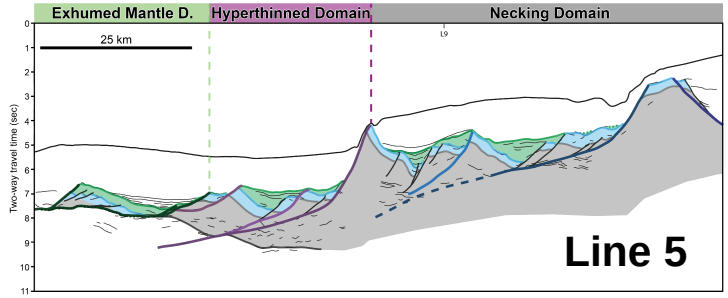
Isobath top pre-rift

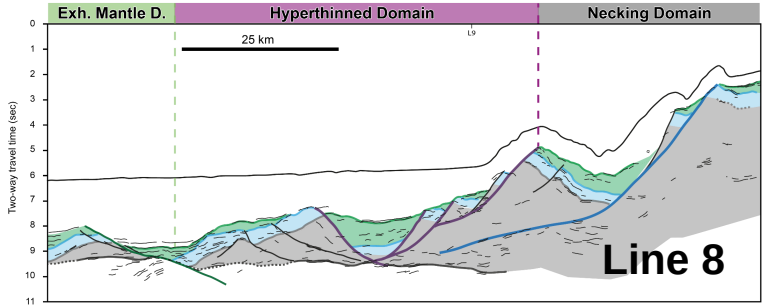


Isochore syn-rift sediments



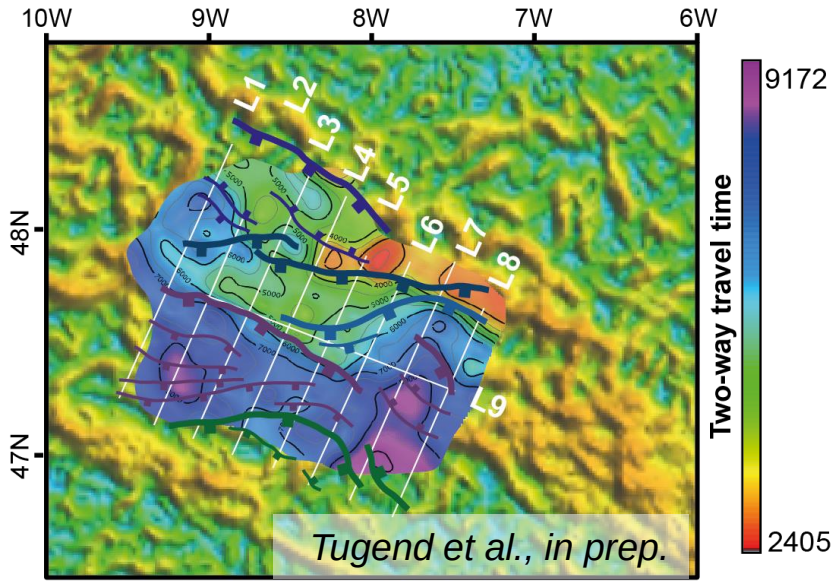




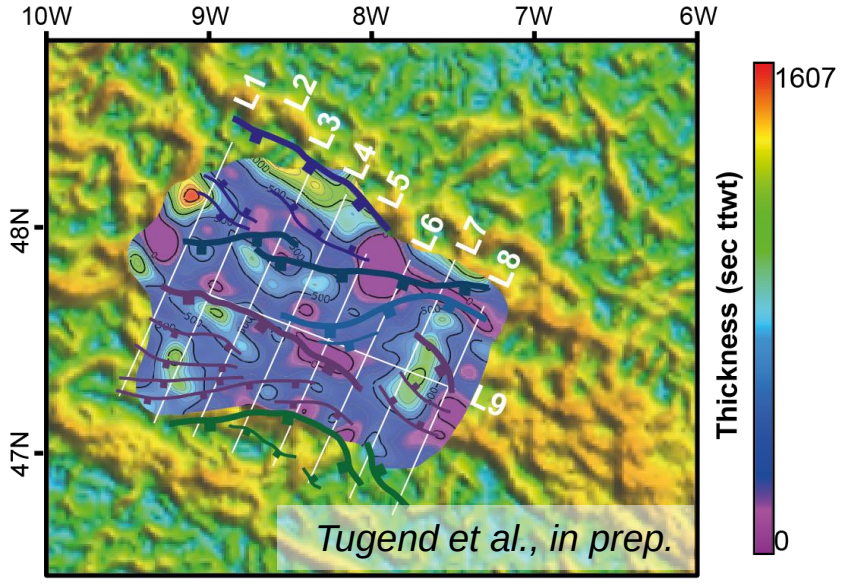


- **Loose segment transition**
- Progressive change in structural style in the distal margin (*hyperthinned domain*) and OCT (*Exhumed mantle domain*).

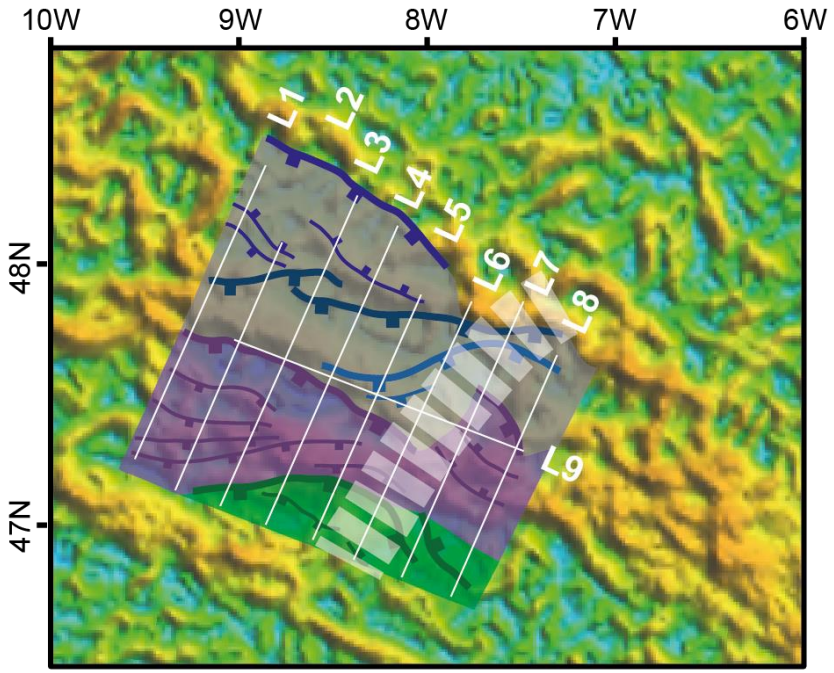
Isobath top pre-rift



Isochore syn-rift sediments



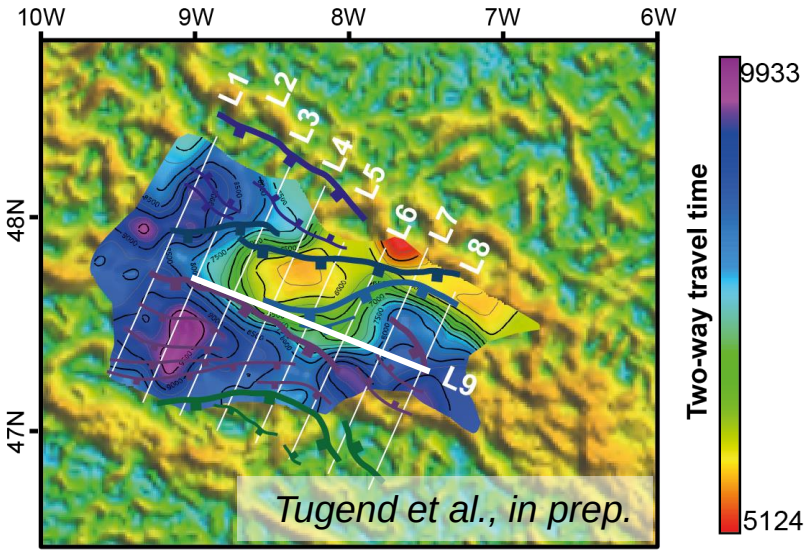
Rift domain map



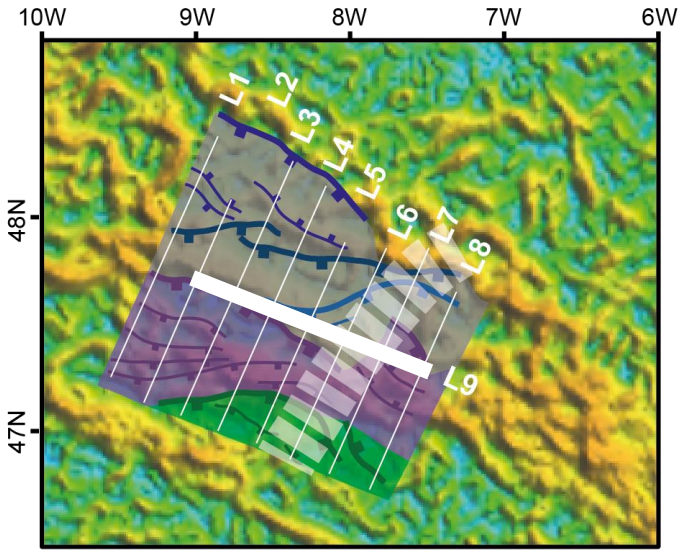
- Progressive change in structural style likely to be related a different accommodation of extensional deformation across the transfer zone.

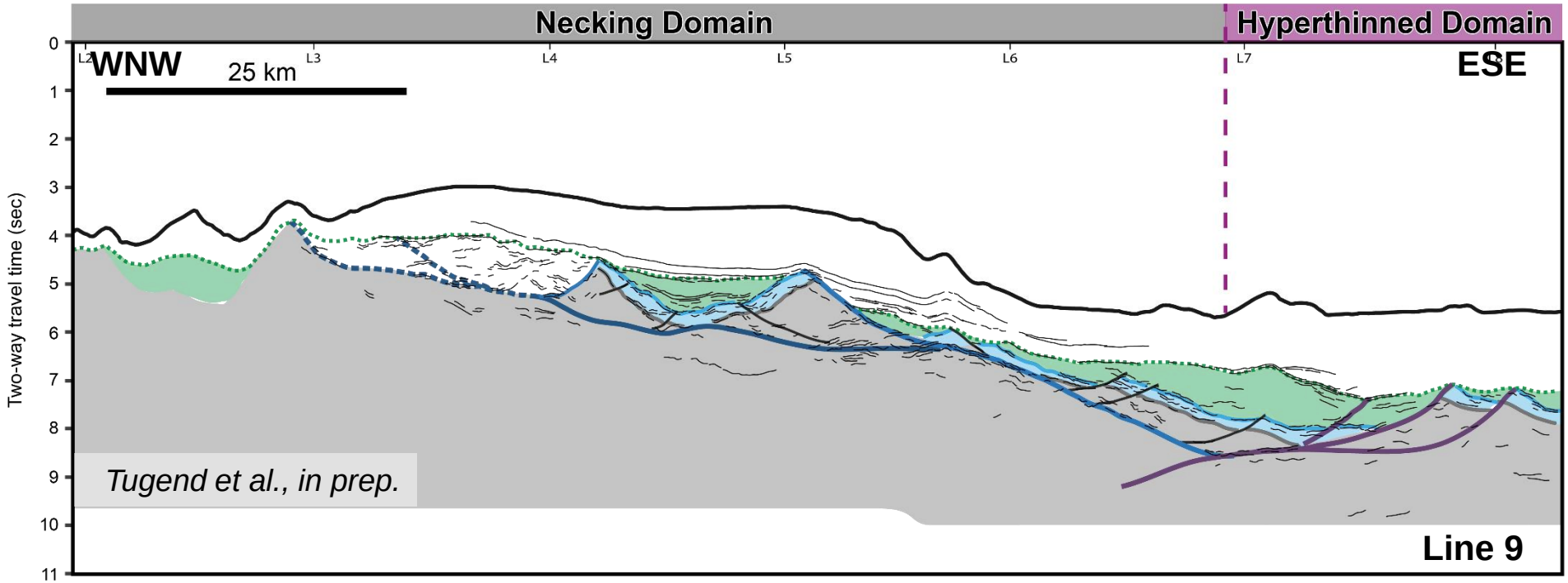
How is accommodated this segment transition?

Isobath of the fault rooting level



Rift domain map

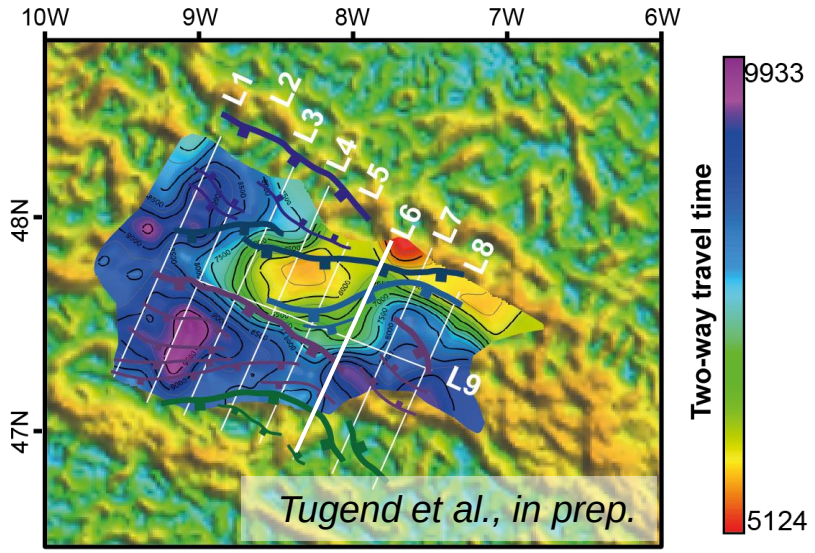




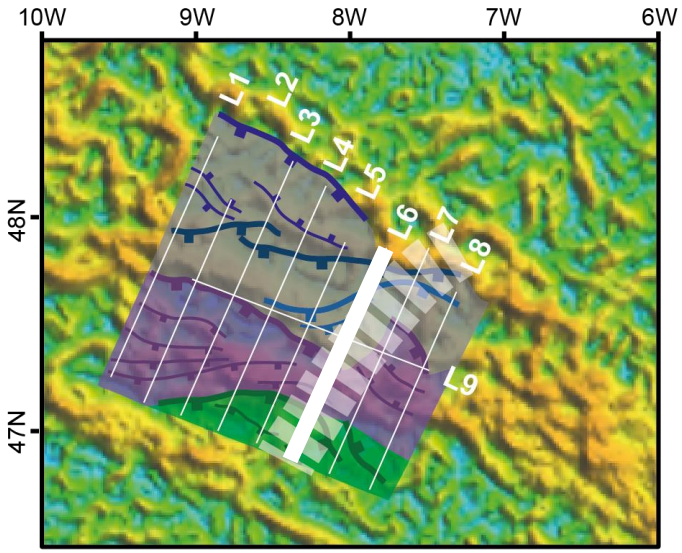
STRUCTURAL STYLE VARIATION

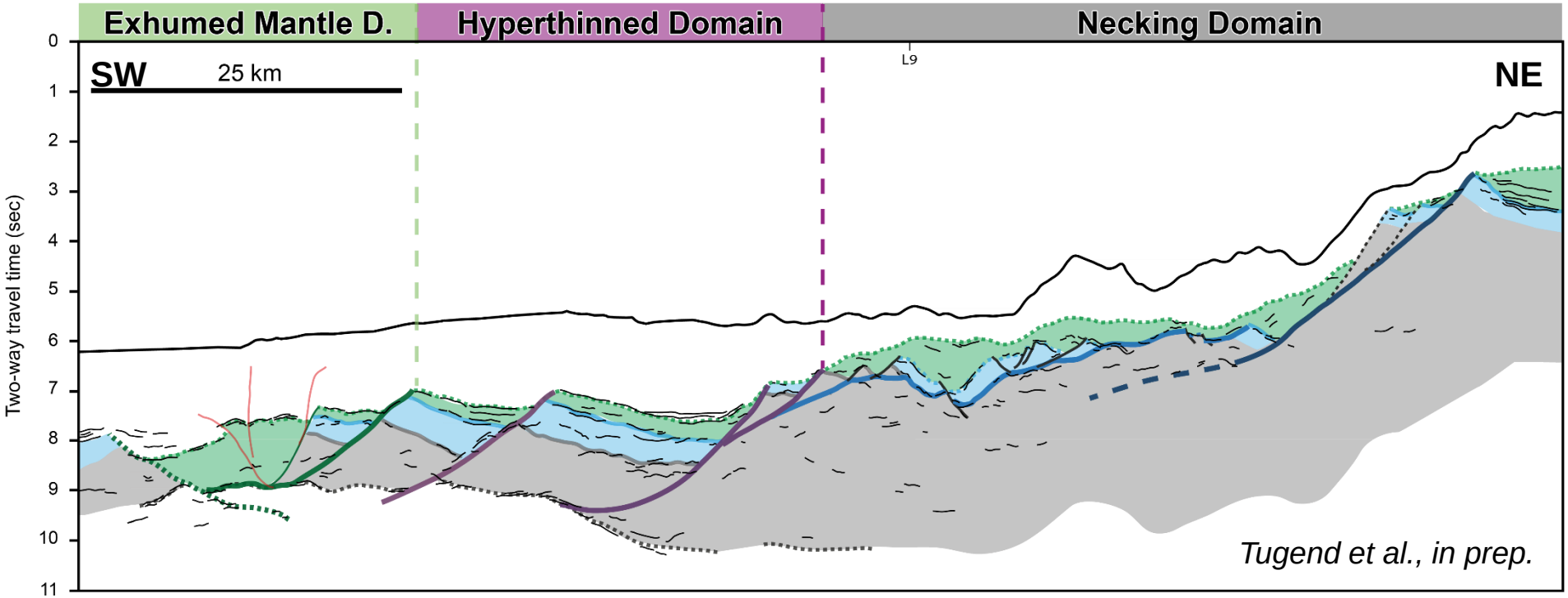
Segment transition

Isobath of the fault rooting level



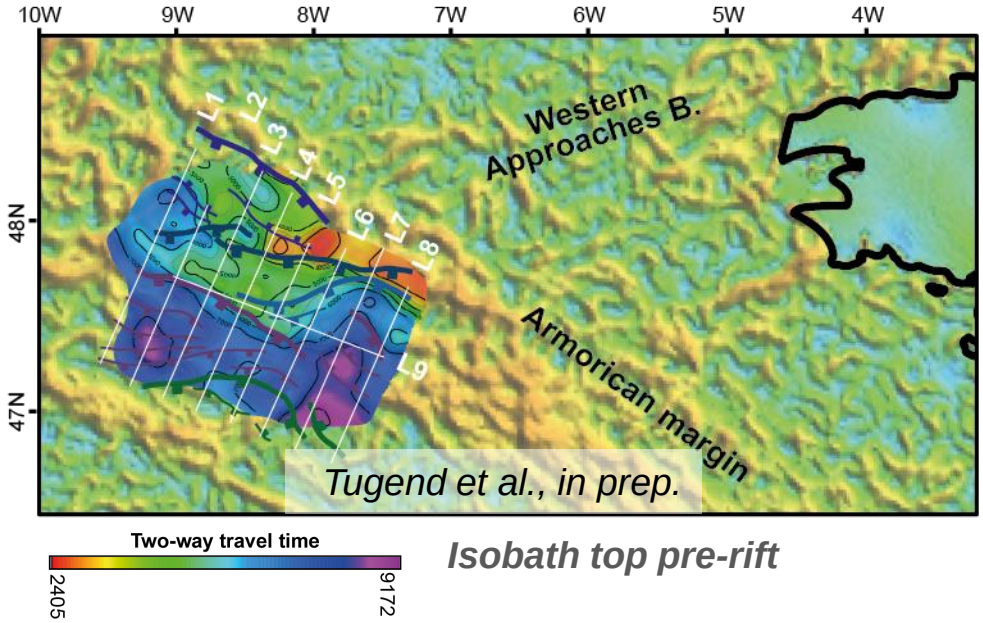
Rift domain map



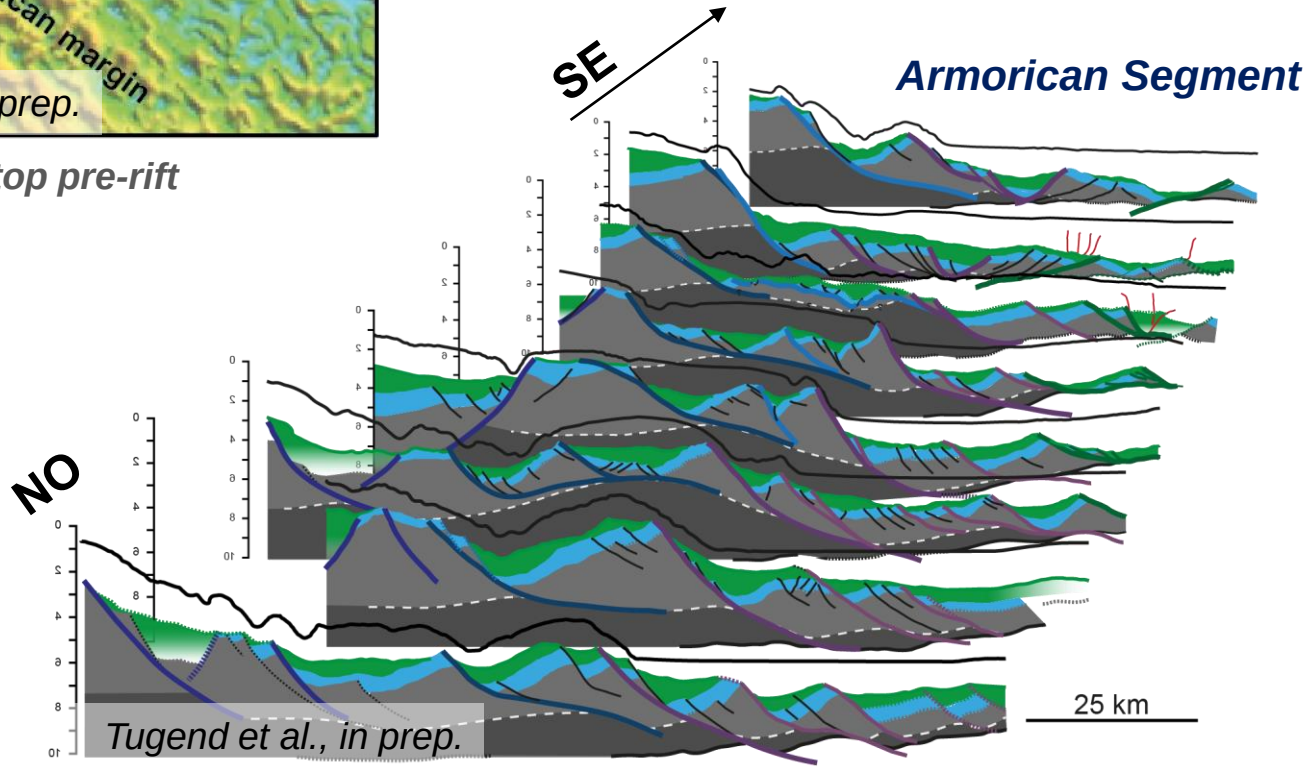


CONCLUSIONS

1. *Morpho-structural variations across a loose transfer zone.*

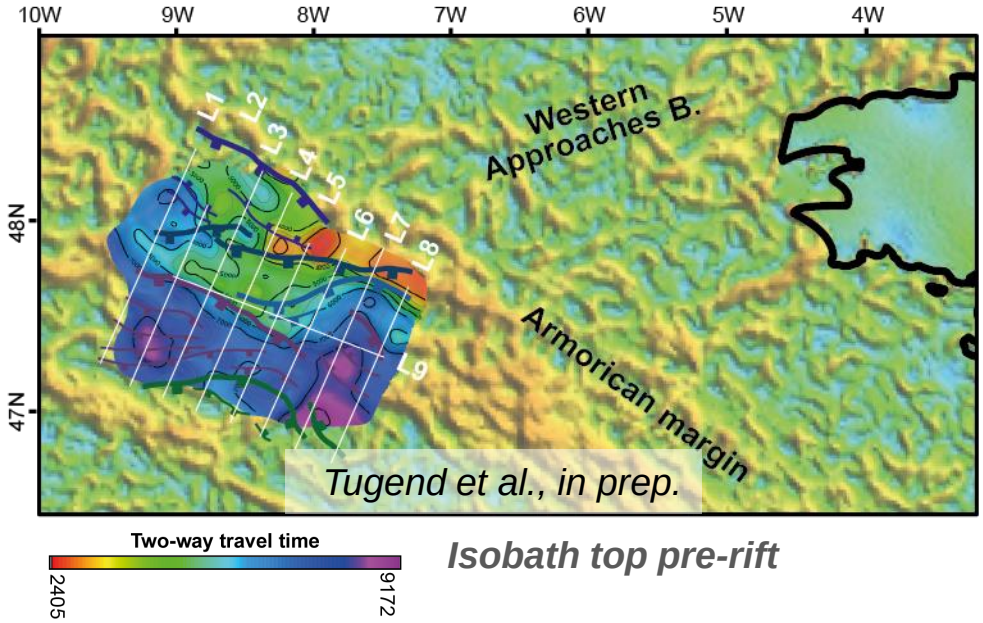


Isobath top pre-rift



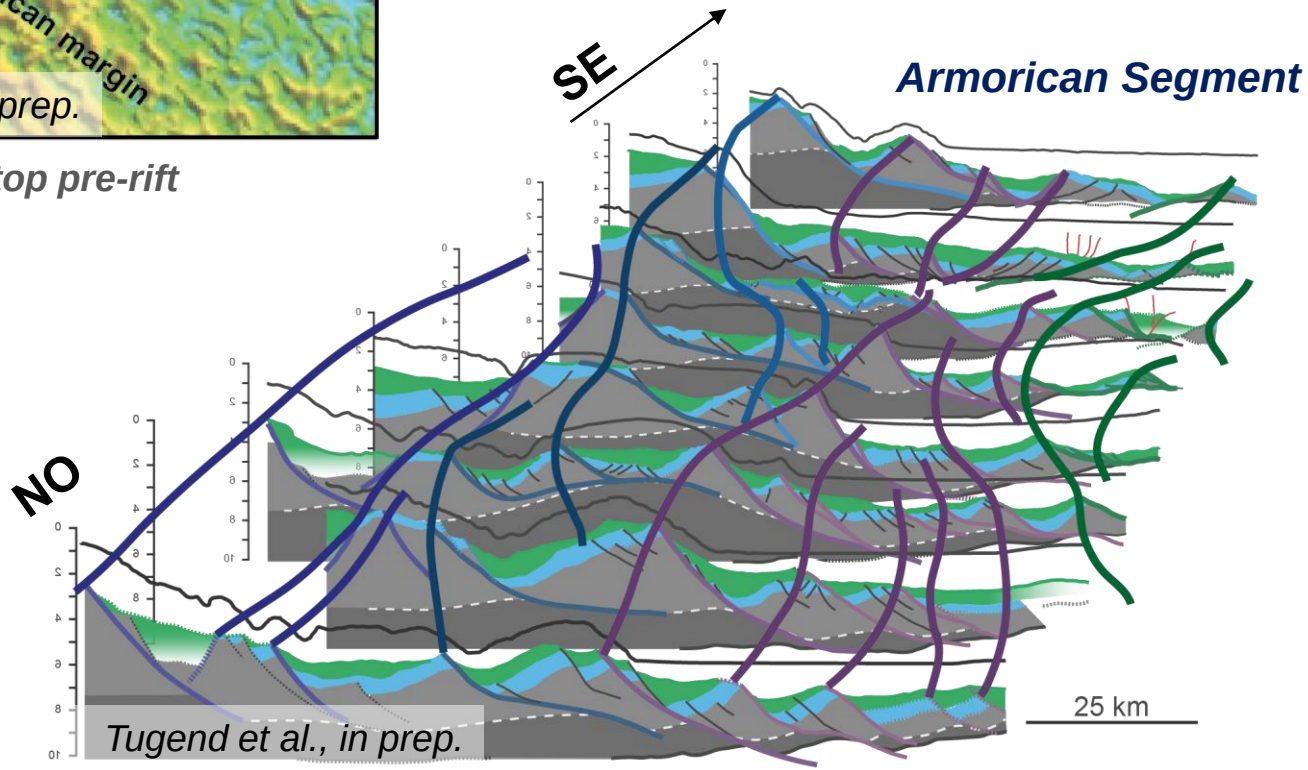
Continent ***Western Approach Segment*** **Ocean**

CONCLUSIONS



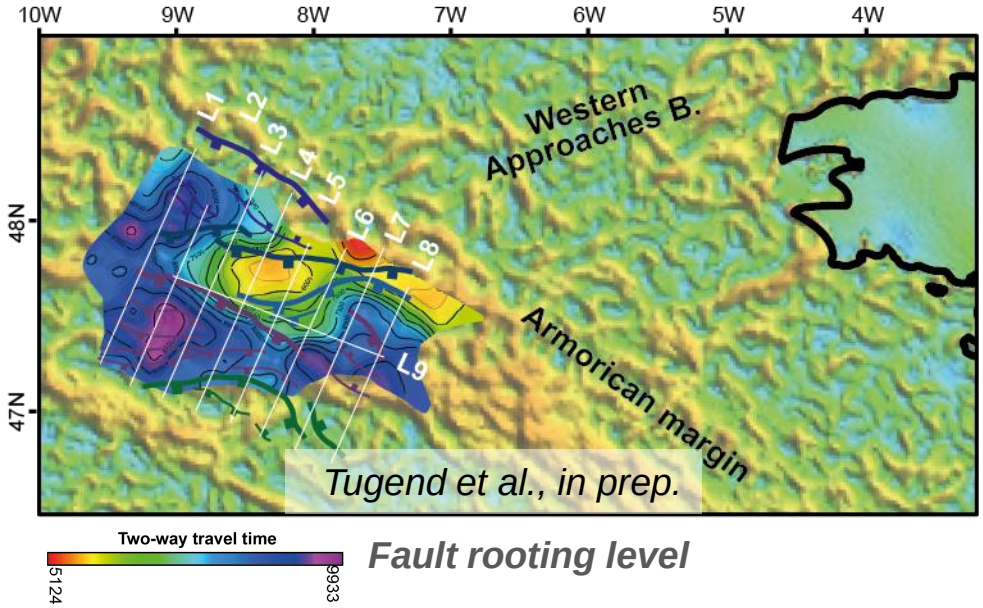
Isobath top pre-rift

1. *Morpho-structural variations across a loose transfer zone.*
2. *Horse-tail structures*



Continent ***Western Approach Segment*** **Ocean**

CONCLUSIONS

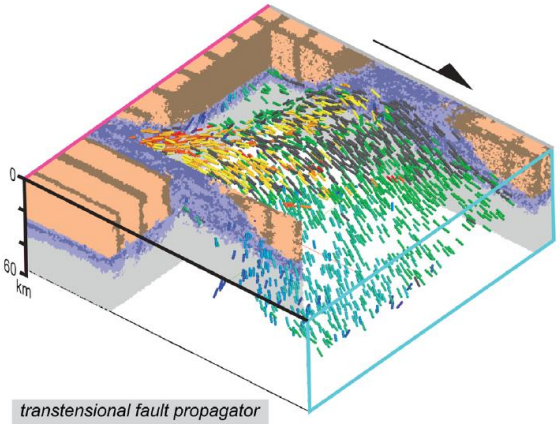


Tugend et al., in prep.

Fault rooting level

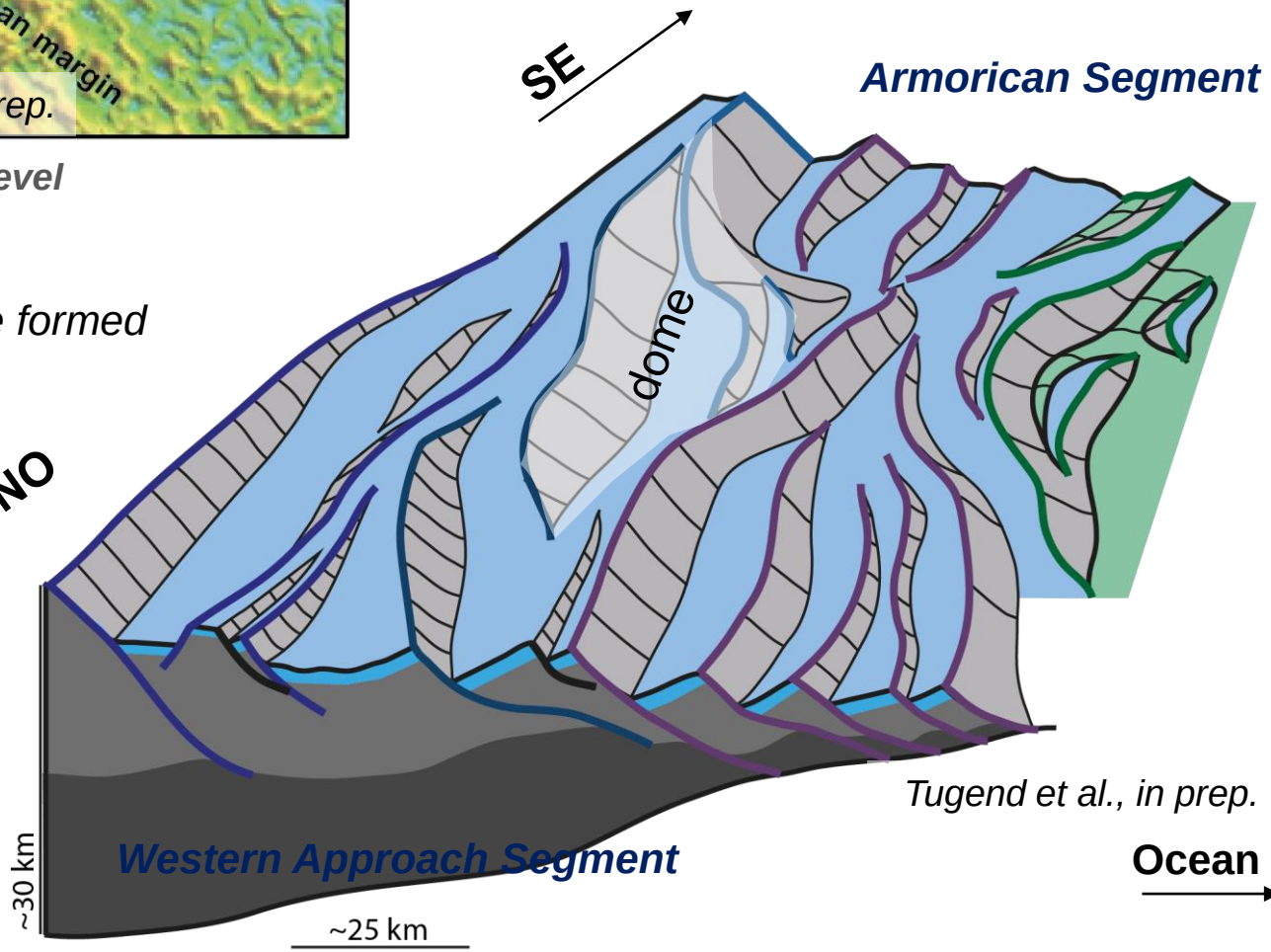
1. *Morpho-structural variations across a loose transfer zone.*
2. *Horse-tail structures rooting on a lower crustal dome*

► *Analogue to core-complexe formed in transtension?*



Le Pourhiet et al., 2012

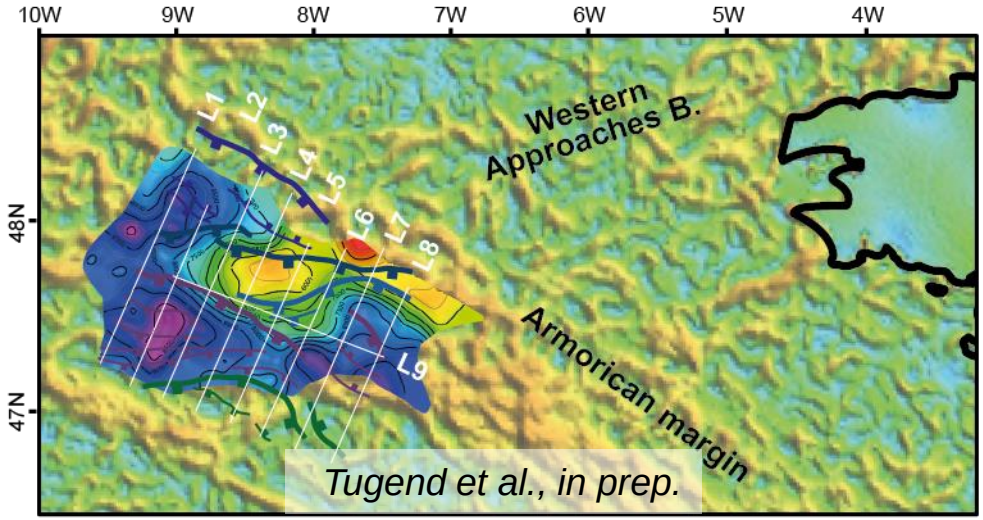
NO

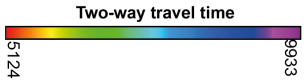


Tugend et al., in prep.

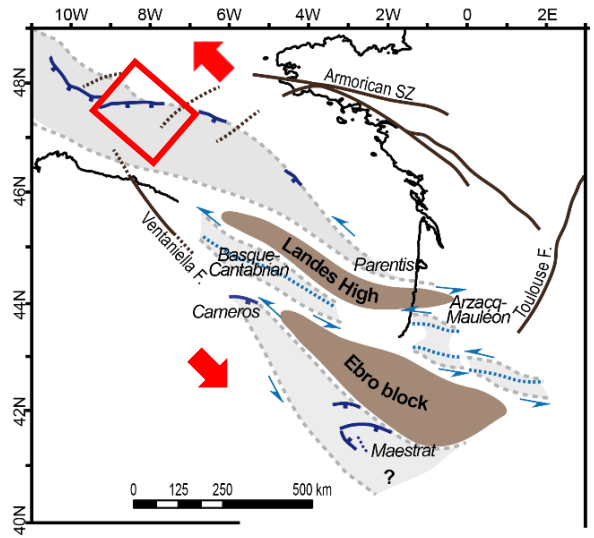
CONCLUSIONS

1. *Morpho-structural variations across a loose transfer zone.*
2. *Horse-tail structures rooting on a lower crustal dome (impact of oblique rifting?)*





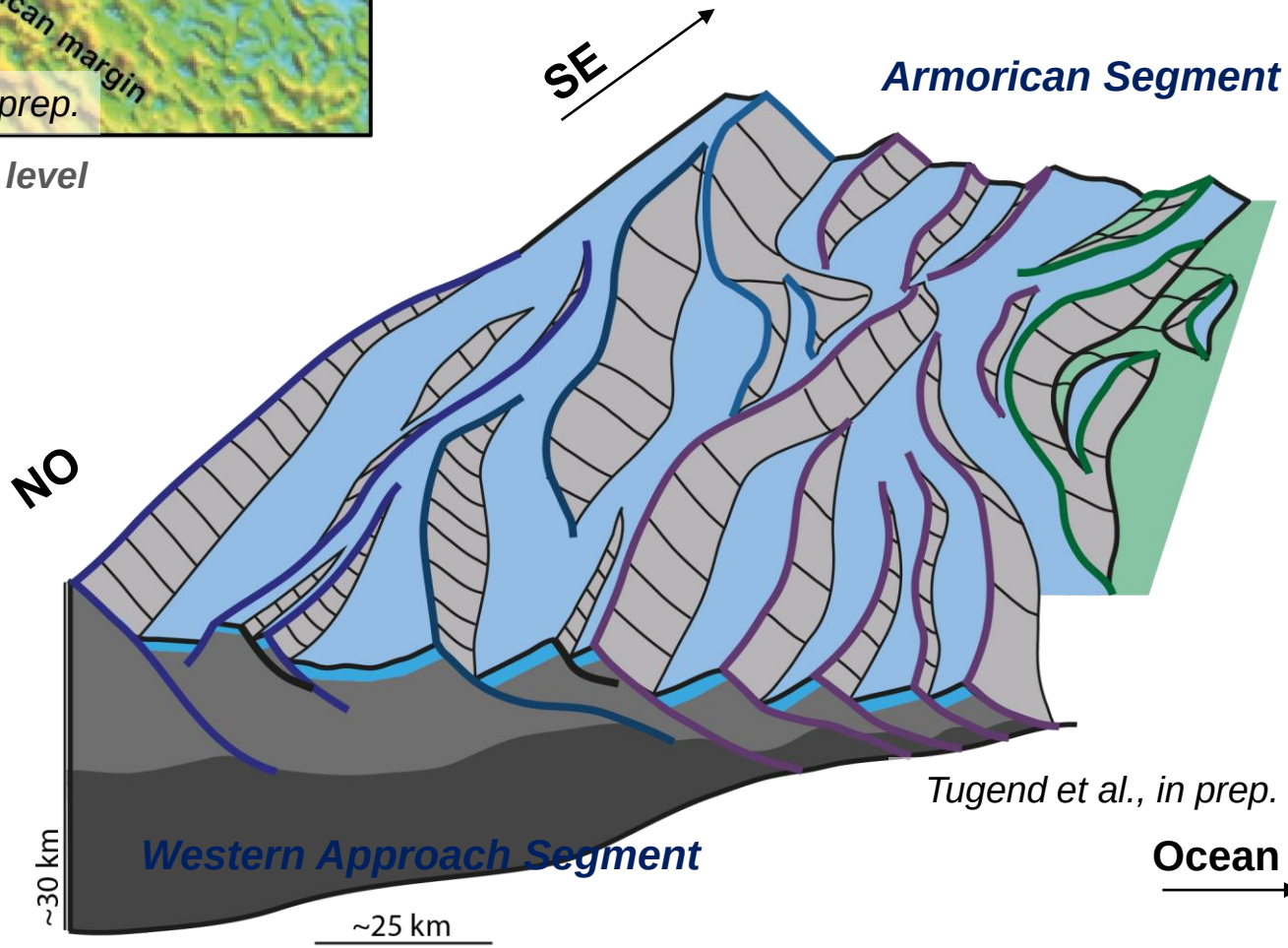
Fault rooting level



Tugend et al., 2015b

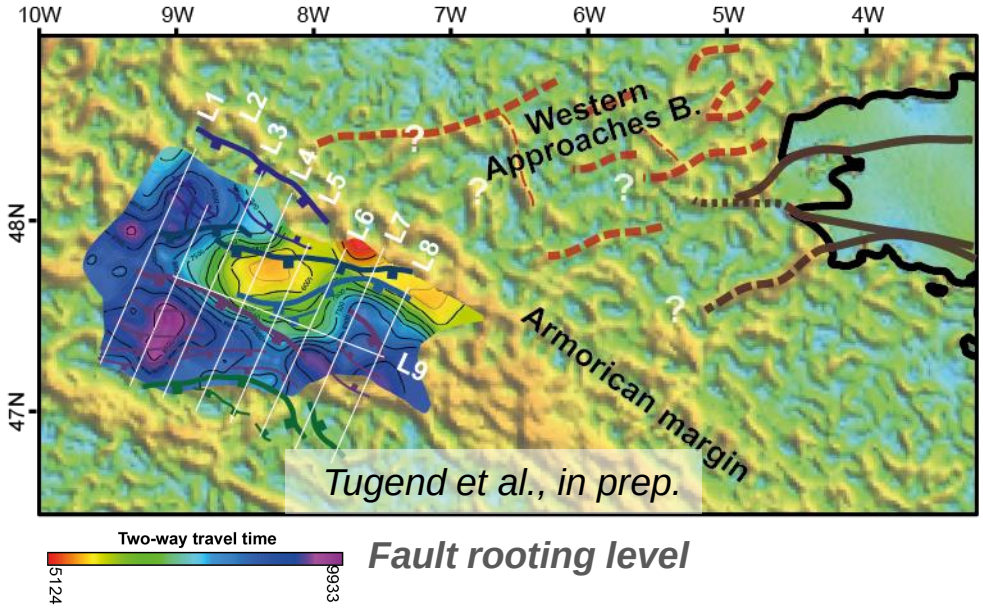
Oblique rifting

(Latest Jurassic – Aptian)



Tugend et al., in prep.

CONCLUSIONS

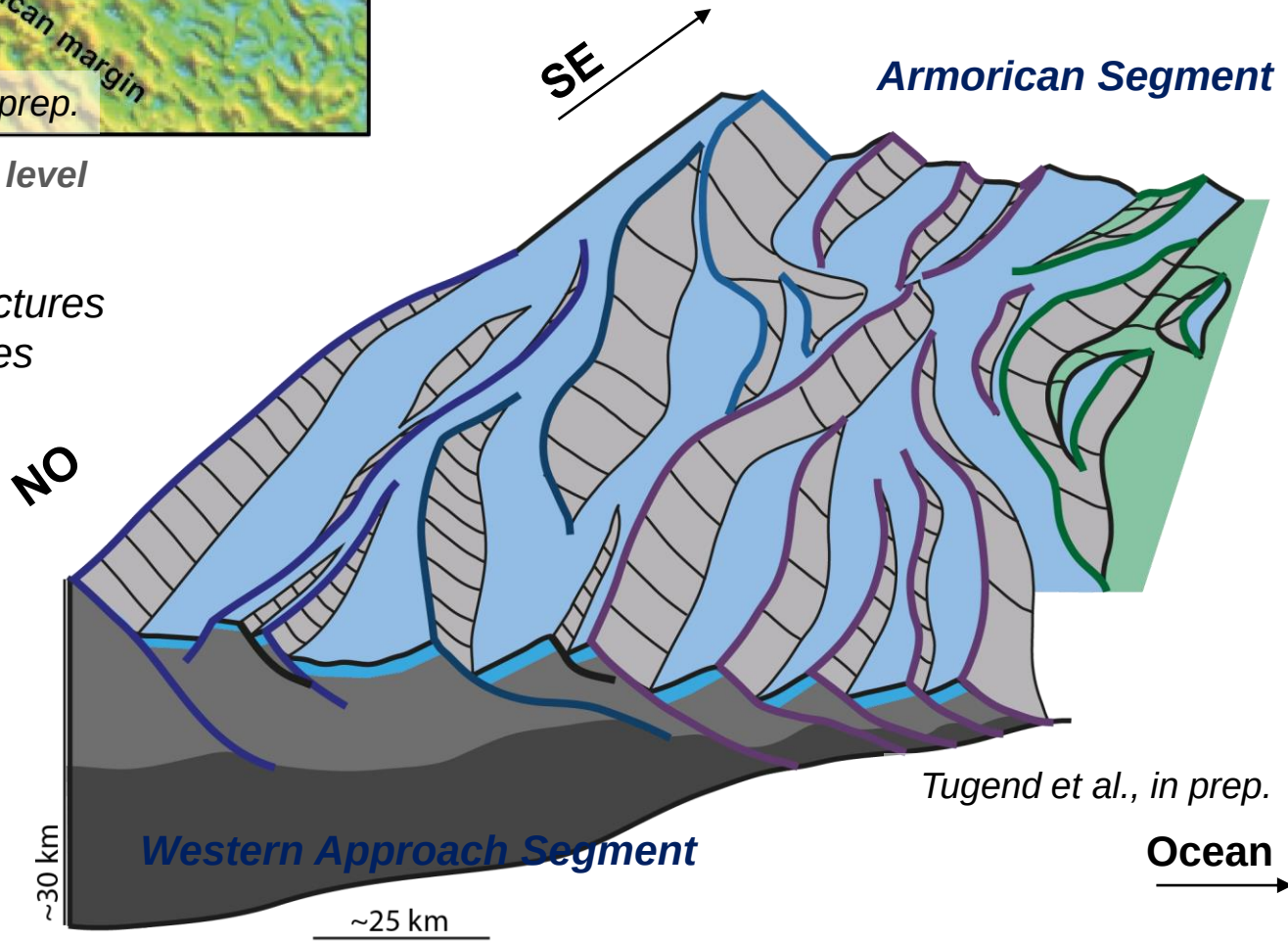


Tugend et al., in prep.

Fault rooting level

1. *Morpho-structural variations across a loose transfer zone.*
2. *Horse-tail structures rooting on a lower crustal dome (impact of oblique rifting?)*
3. *Role of structural inheritance?*

- *Permo-Carboniferous structures versus Western Approaches B.structures*



Tugend et al., in prep.

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