Nature of crustal necking and rift domain architecture along the Newfoundland Margin, Eastern Canada

Improved Seismic Perspectives and Interpretational Uncertainties

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This presentation participates in OSPP — Outstanding Student & PhD candidate Presentation contest

1. The Newfoundland rifted margin

- Rifted margins record the entire spectrum of lithospheric deformation.
- Current debate: Controls on necking and asymmetry.
- Newfoundland is a classic magma-poor margin with complex features (failed rifts, ribbons, etc.).

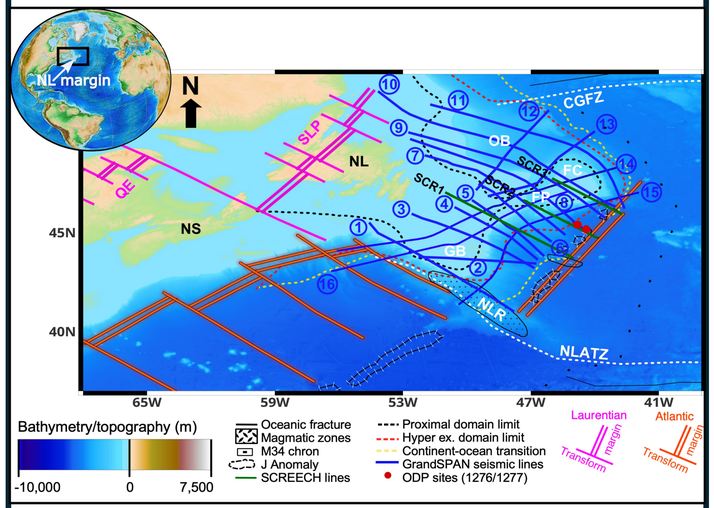


Figure 1. Bathymetric/topographic map of the NL margin overlain by the GrandSPAN (blue lines) and SCREECH (green lines) seismic data, inset is global topography/bathymetry map.

2. Depth-migrated seismic data

- GrandSPAN is an exceptional seismic reflection dataset.
  - ✓ Pre-stack depth-migrated.
  - ✓ Margin-scale with unprecedented depth.
- We focus on crustal configurations and deformation structures.

3. Crustal necking, rift asymmetry, and serpentinization

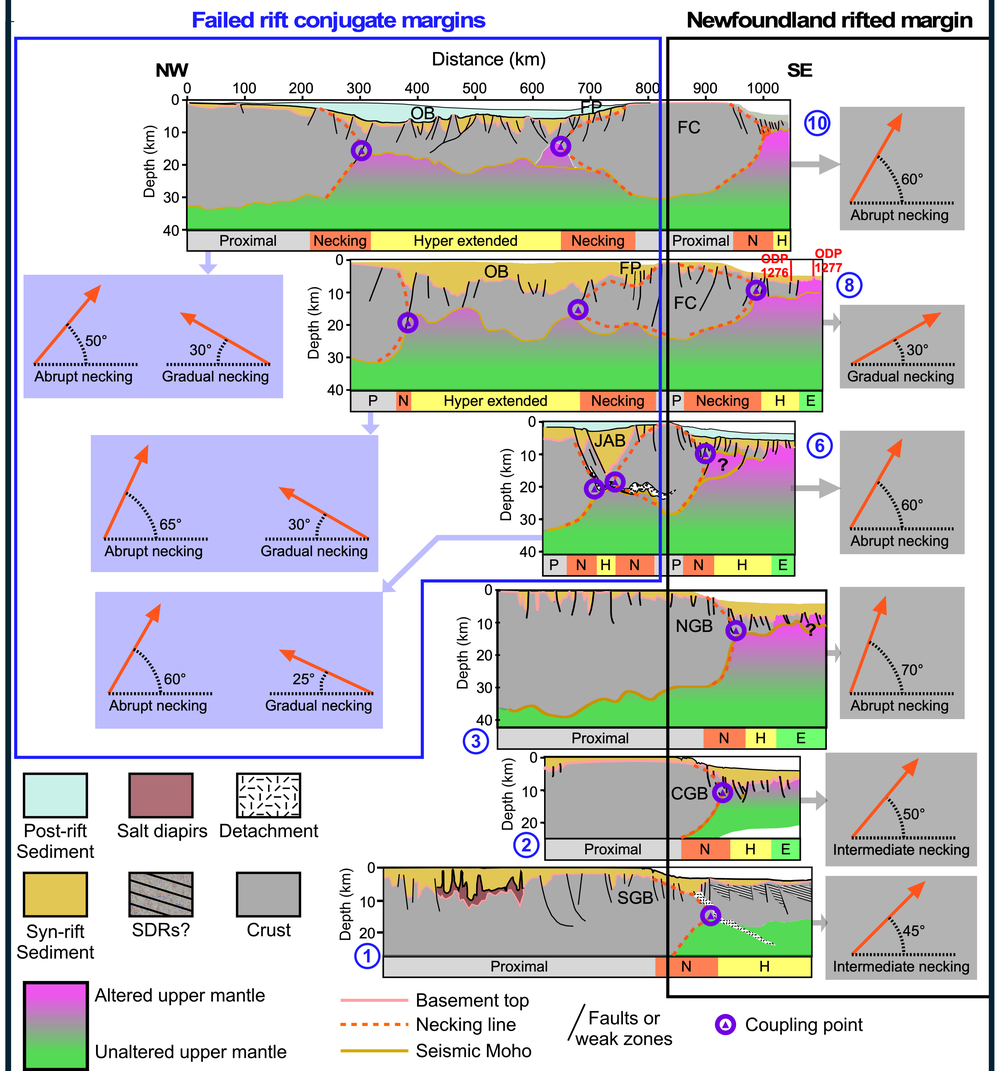
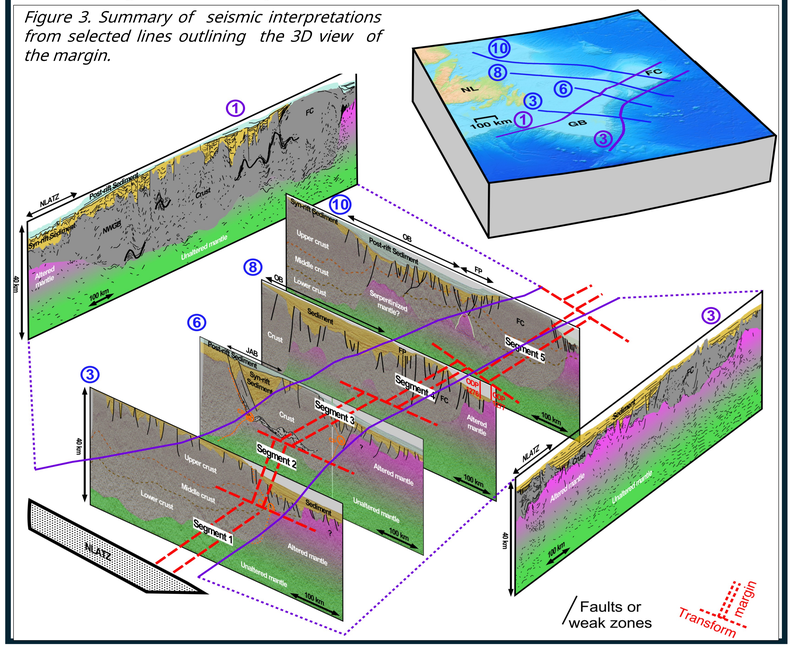


Figure 2. Crustal necking and rift domain variability along the failed rift zones (left panel) and the successful rifted NL margin (right panel). Abbreviations are: CGB = Central Grand Banks, FC = Flemish Cap, FP = Flemish Pass Basin, JAB = Jeanne d'Arc Basin, NGB = Northern Grand Banks, SGB = Southern Grand Banks, OB = Orphan Basin.

4. Implications

- Failed rift asymmetry developed prior to the necking phase.
- Lithospheric strength dictates necking style: warm (gradual necking) vs. cool (abrupt necking and deep >20 km faulting).
- Rifting is inherently 3D and variable, even within a margin.

Figure 3. Summary of seismic interpretations from selected lines outlining the 3D view of the margin.



5. Conclusions and outlook

- **Rift asymmetry**, controlled by lithospheric strength, **initiates before crustal necking**.
- **Serpentinization is not contingent on rift success or failure**.
- Detailed modeling is required to reconcile our observations and **inform models of other global margins**.

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