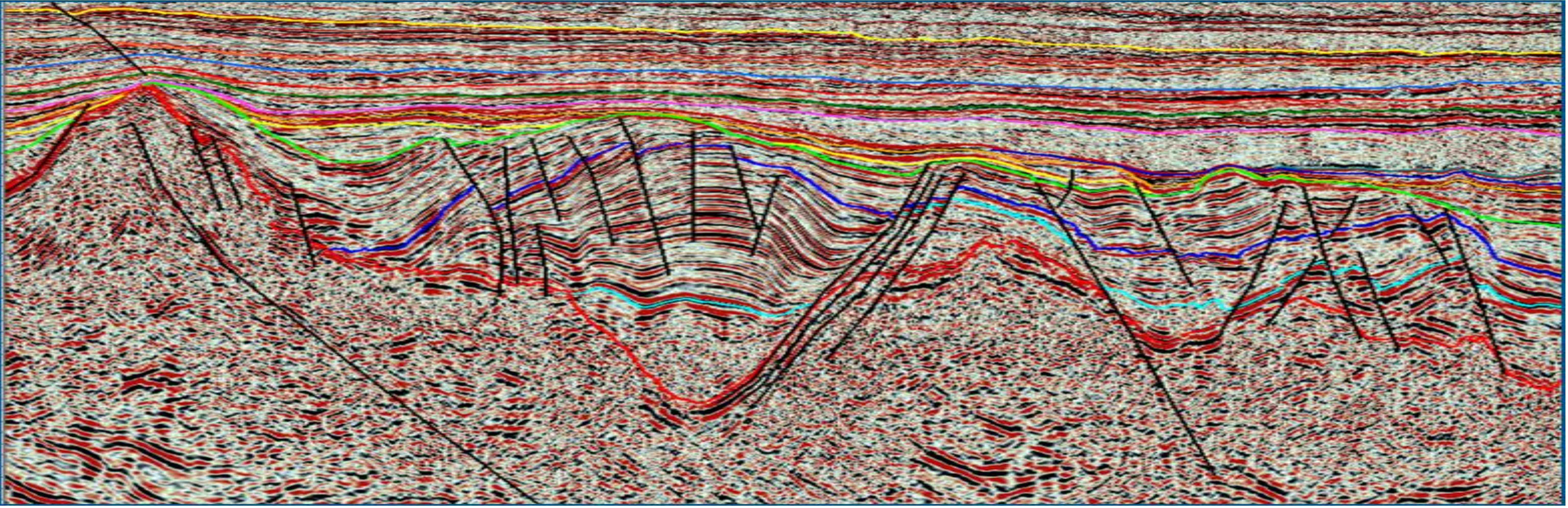

Evaluation of Structural Style, Timing and Possible Petroleum System, Andaman Sea, Thailand (29 – 2D Seismic Lines

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Introduction and Objectives of the Study

Study Overview:

Location: Andaman Sea, Thailand.
Dataset: Interpretation of **29 2D seismic lines**.

Main Objectives:

1. Horizon and Fault Mapping:
- Identification and mapping of key **horizons**
- Mapping of **major faults**: Fault 1 and Fault 2 (Figure 1).

2. Structural Analysis:
- Evaluate the **structural style** of the region.
- Analyze the **timing** of structural events.

3. Stress Regime Identification: Determine the inferred **stress regime**.
4. Trap Evaluation: Assess **possible hydrocarbon trap styles**.

Figure 1: Vertical section showing the horizons and major faults

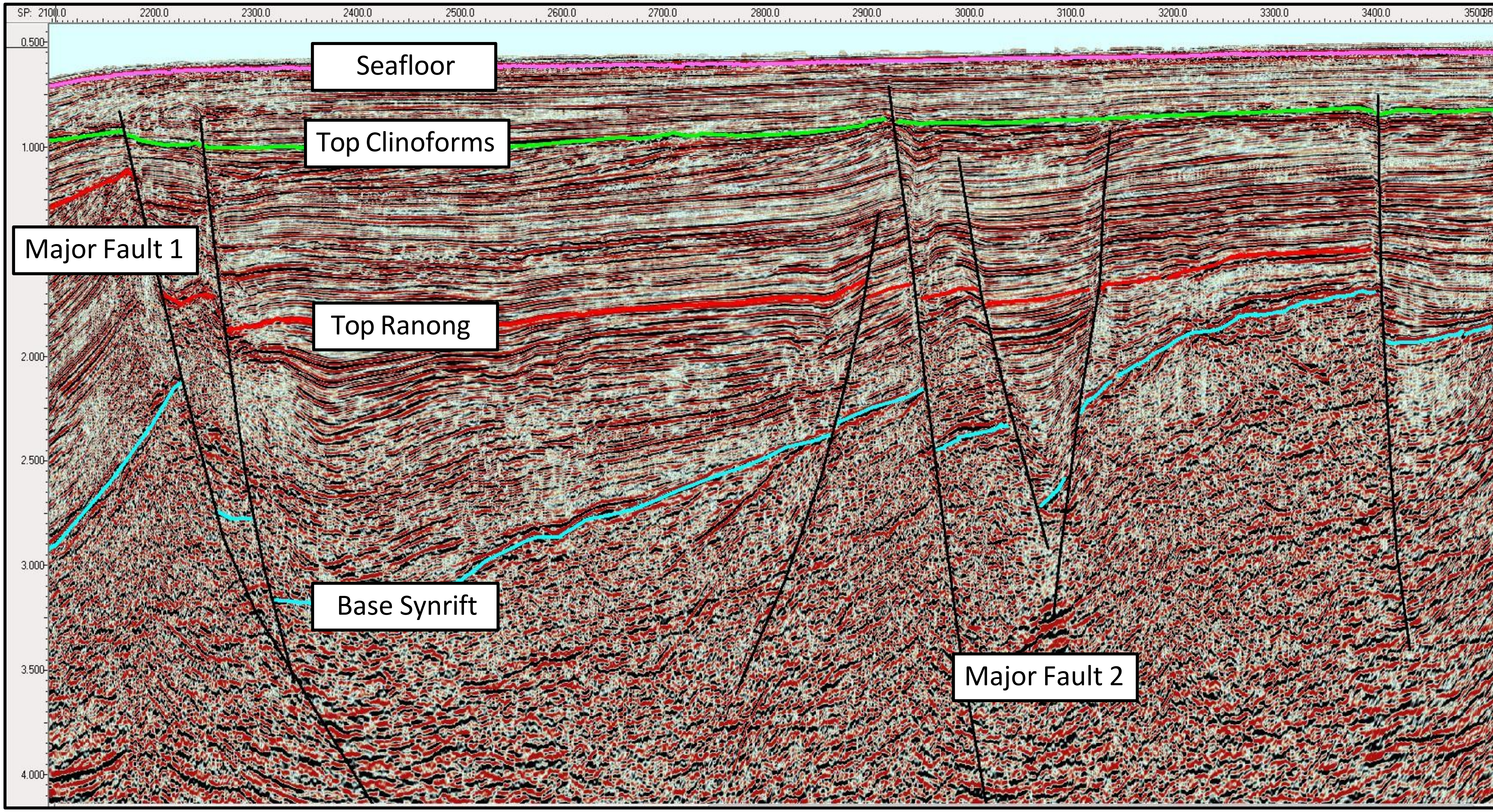


Figure 2: Time structure map of base syn-rift showing fault polygon with faults annotation

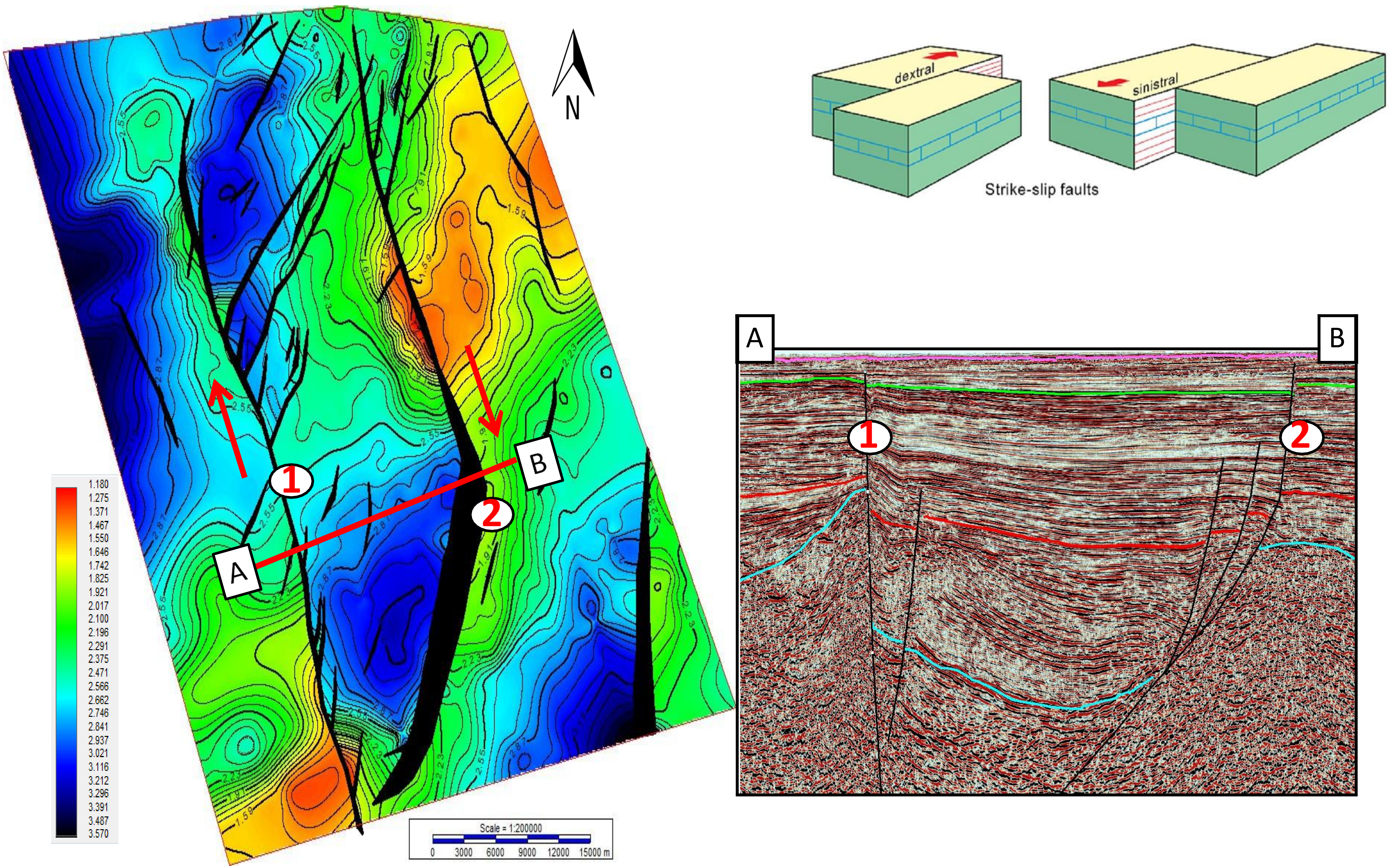


Figure 3: Series of vertical section from north to south

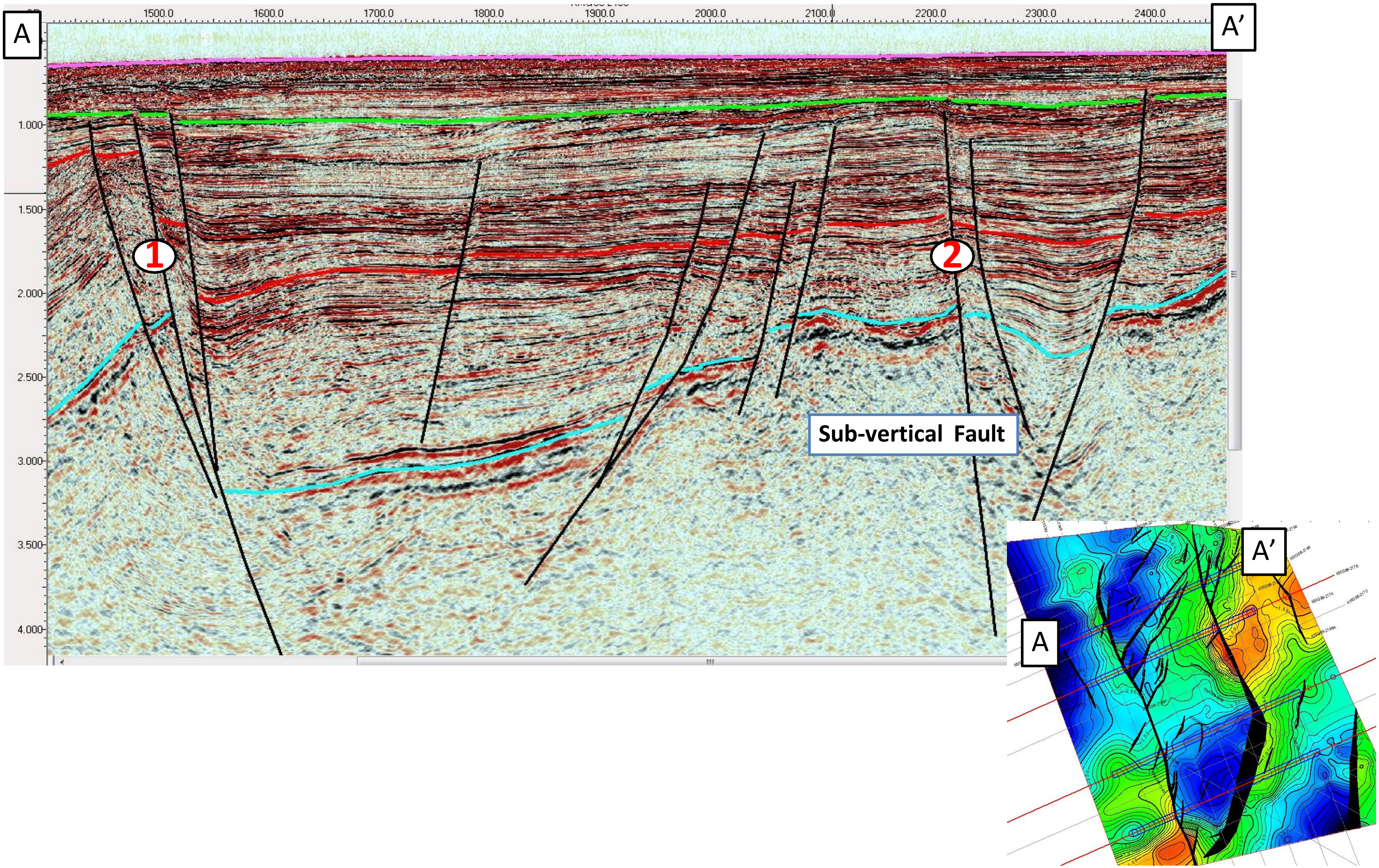


Figure 4: Series of vertical section from north to south (Cont.)

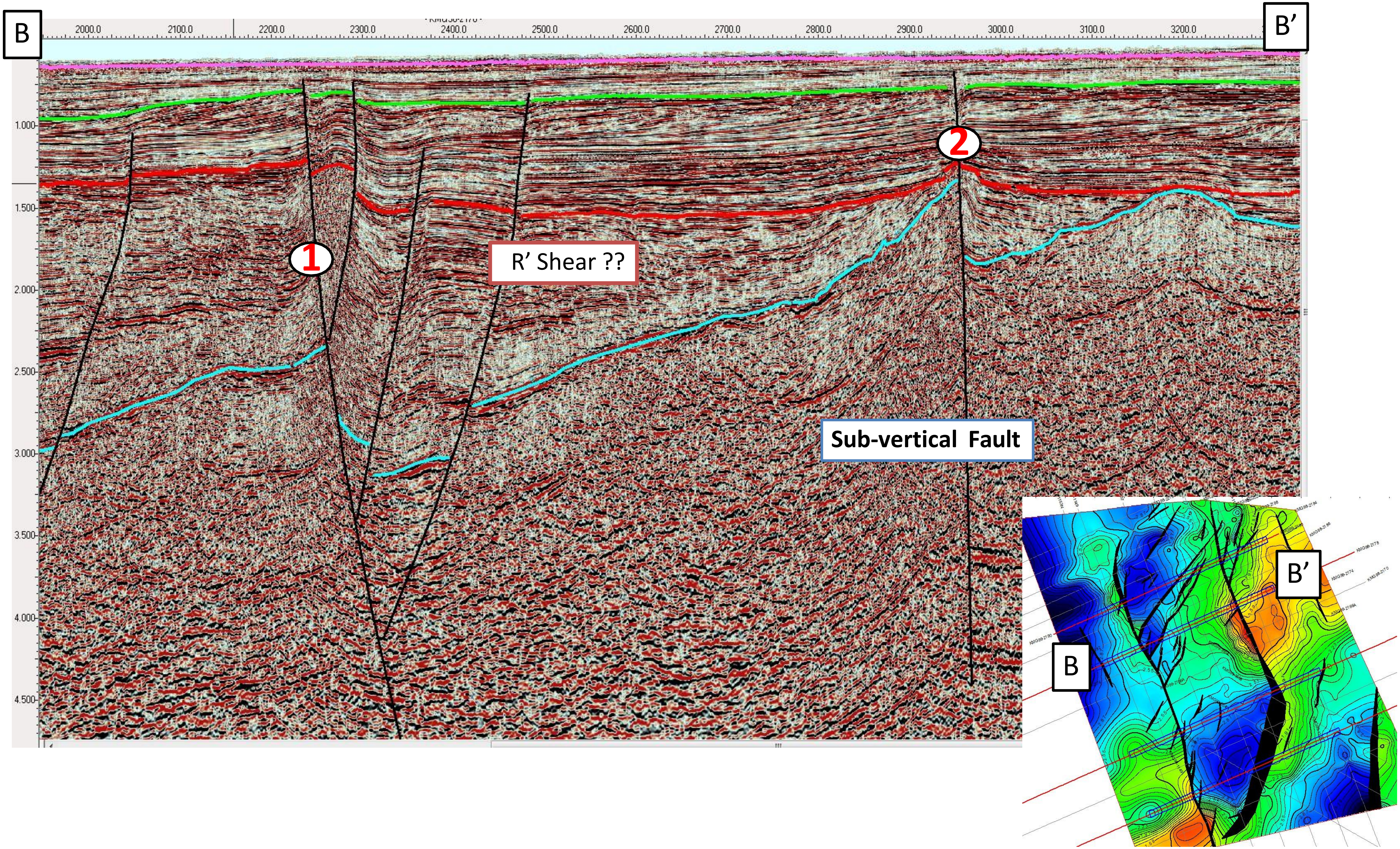


Figure 5: Series of vertical section from north to south (Cont.)

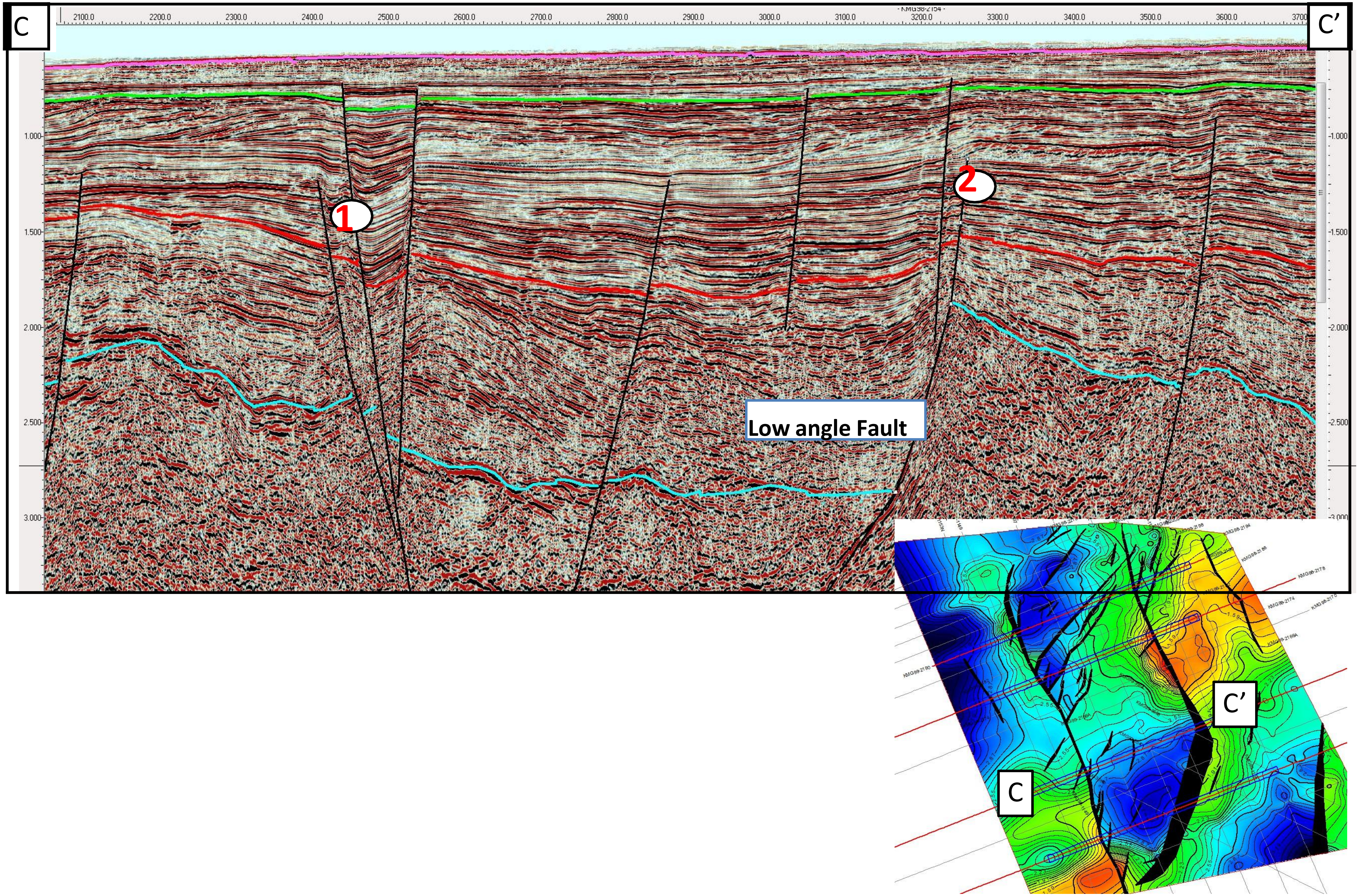


Figure 6: Series of vertical section from north to south (Cont.)

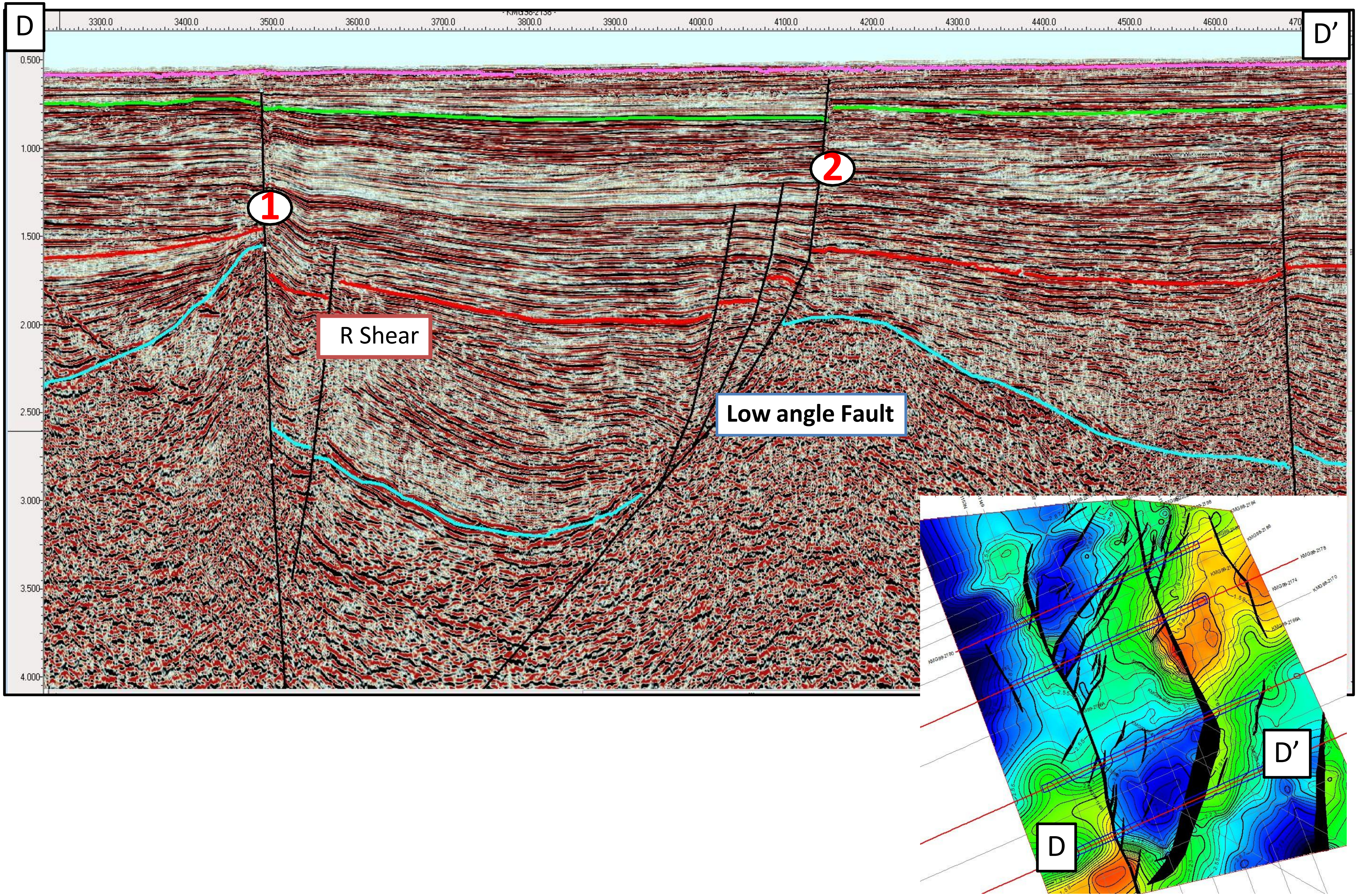
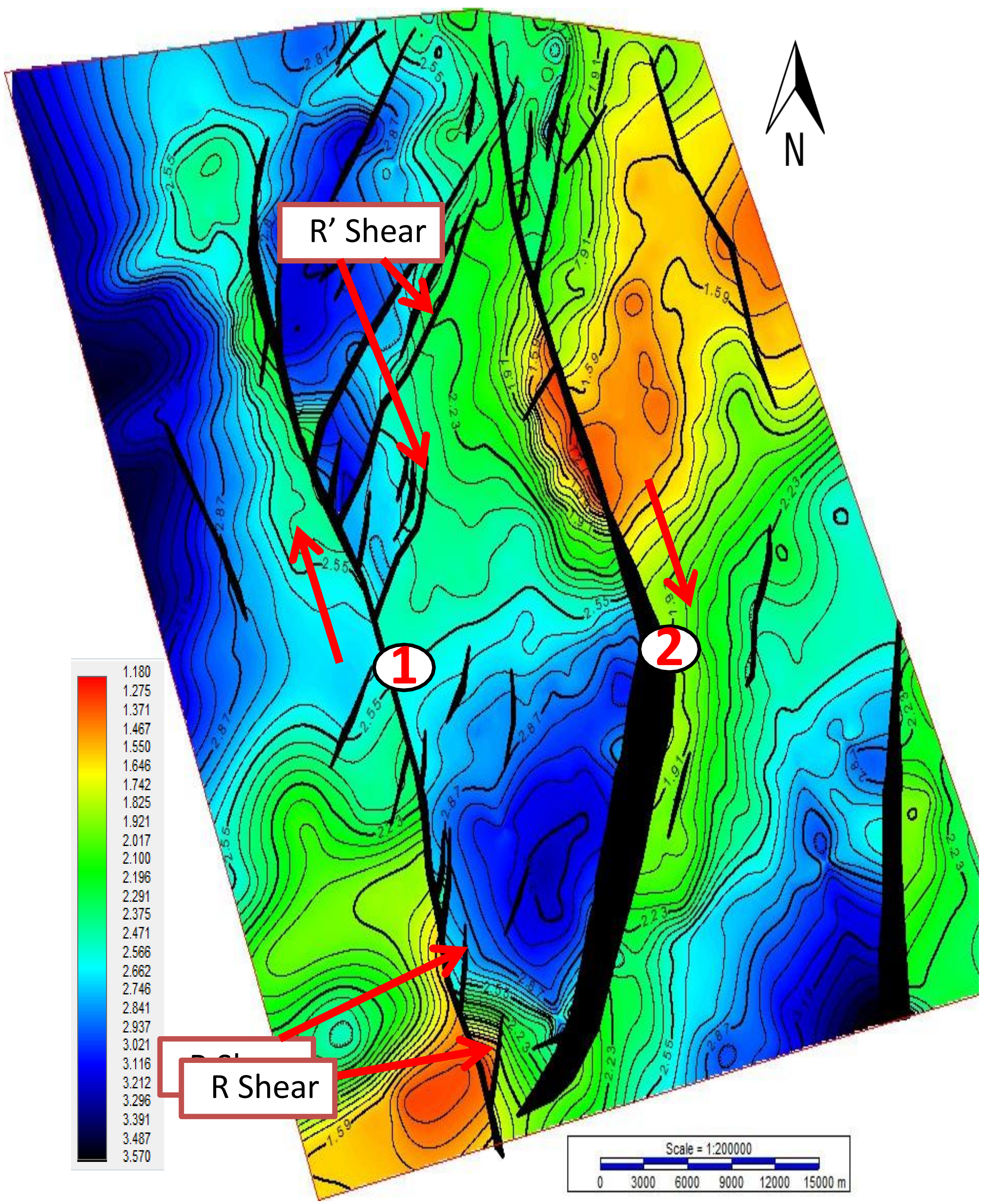
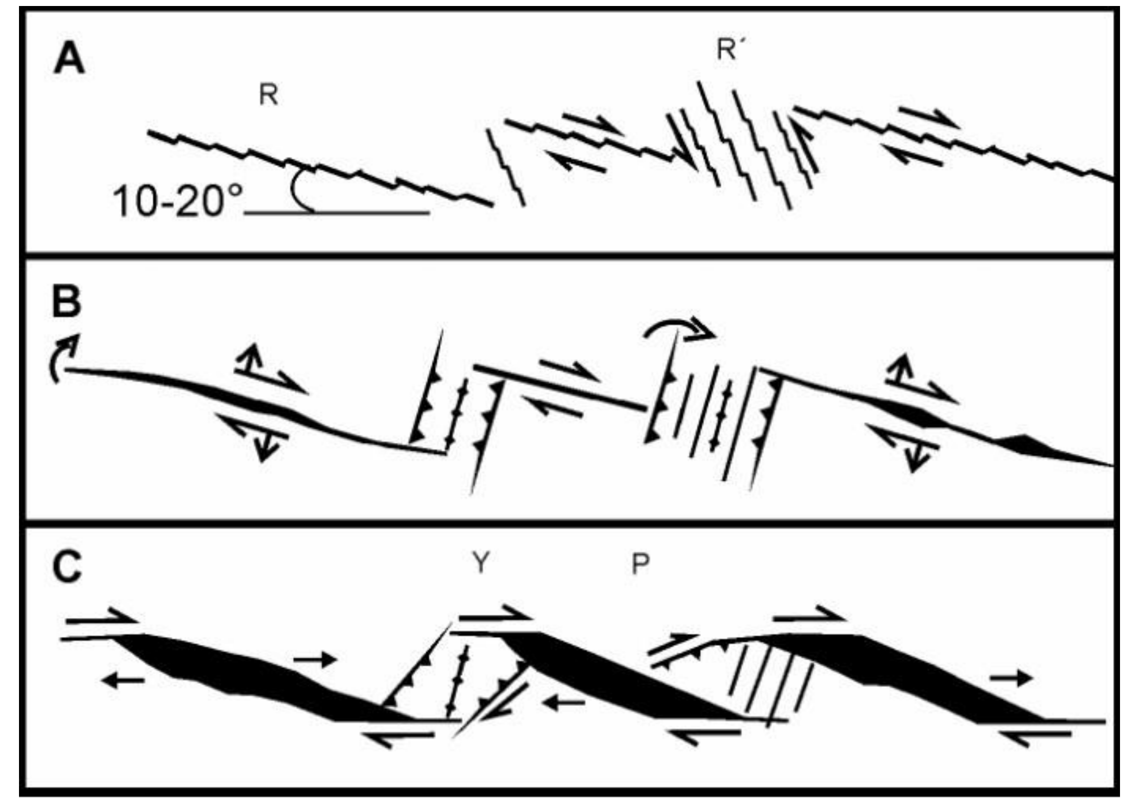
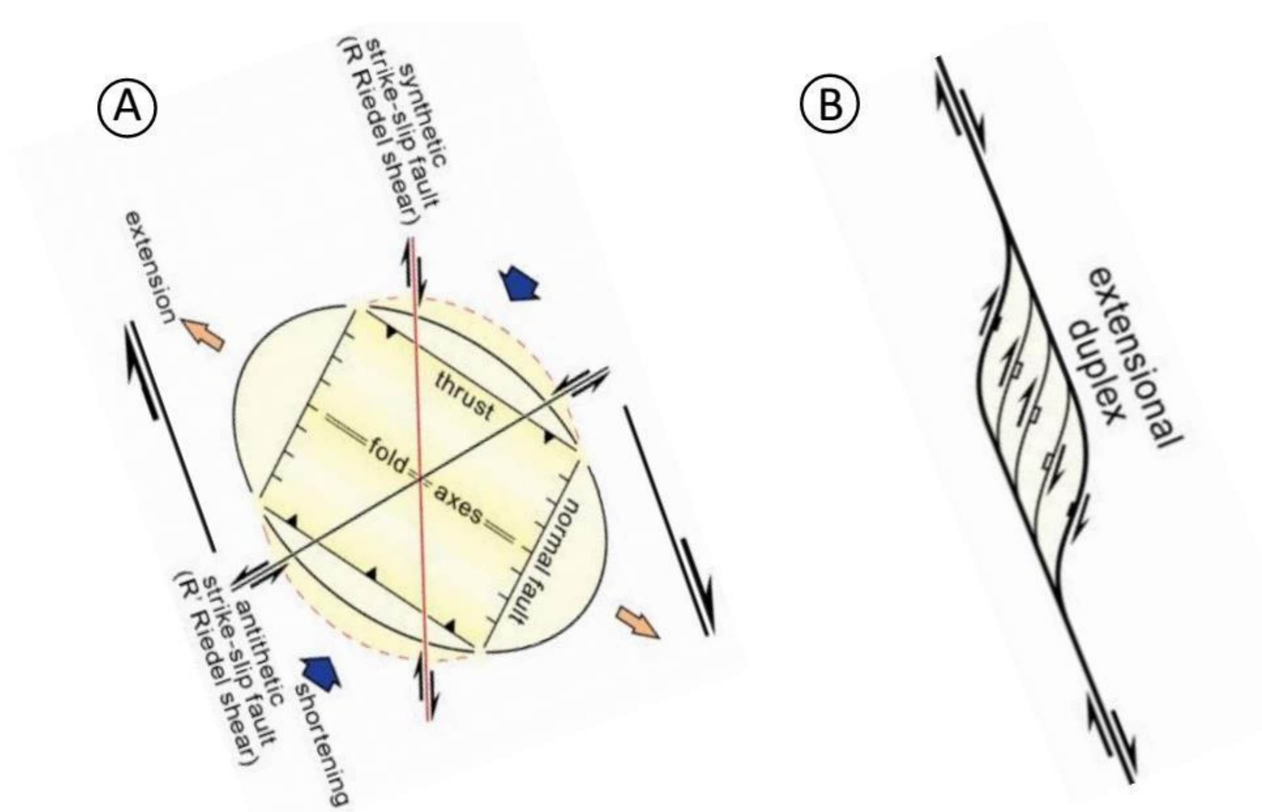


Figure 7: Stress-strain model of strike-slip fault





Model for defining R and R' Shear (Artamoui et al. 2005)



Stress Regime and Fault Dynamics

Stress Regime:
- The faults in the study area exhibit a **transtensional stress regime**.
- **Transtension** involves oblique principal stress relative to the strike-slip fault plane, resulting in both strike-slip and extensional components.

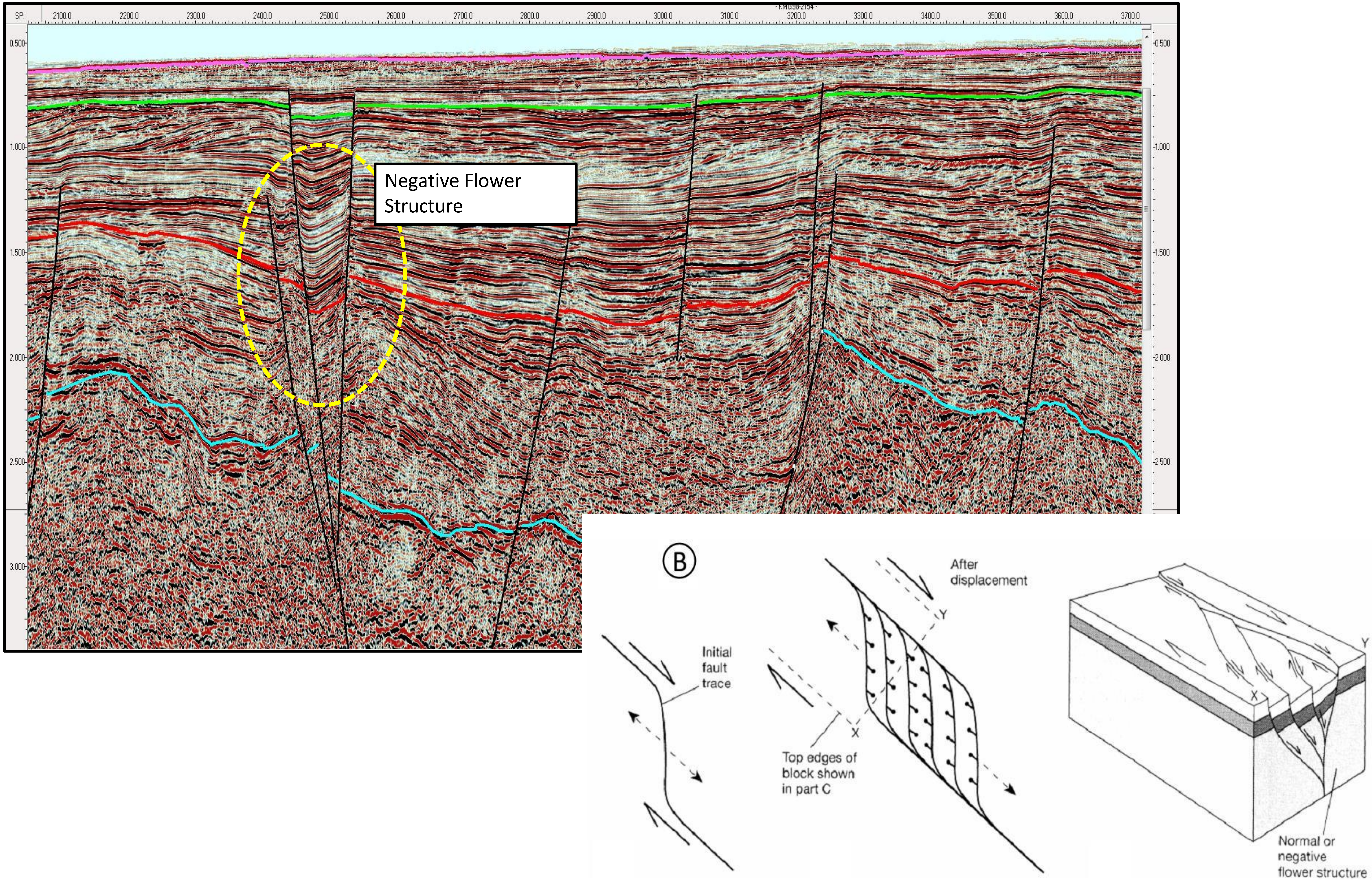
Fault Characteristics:

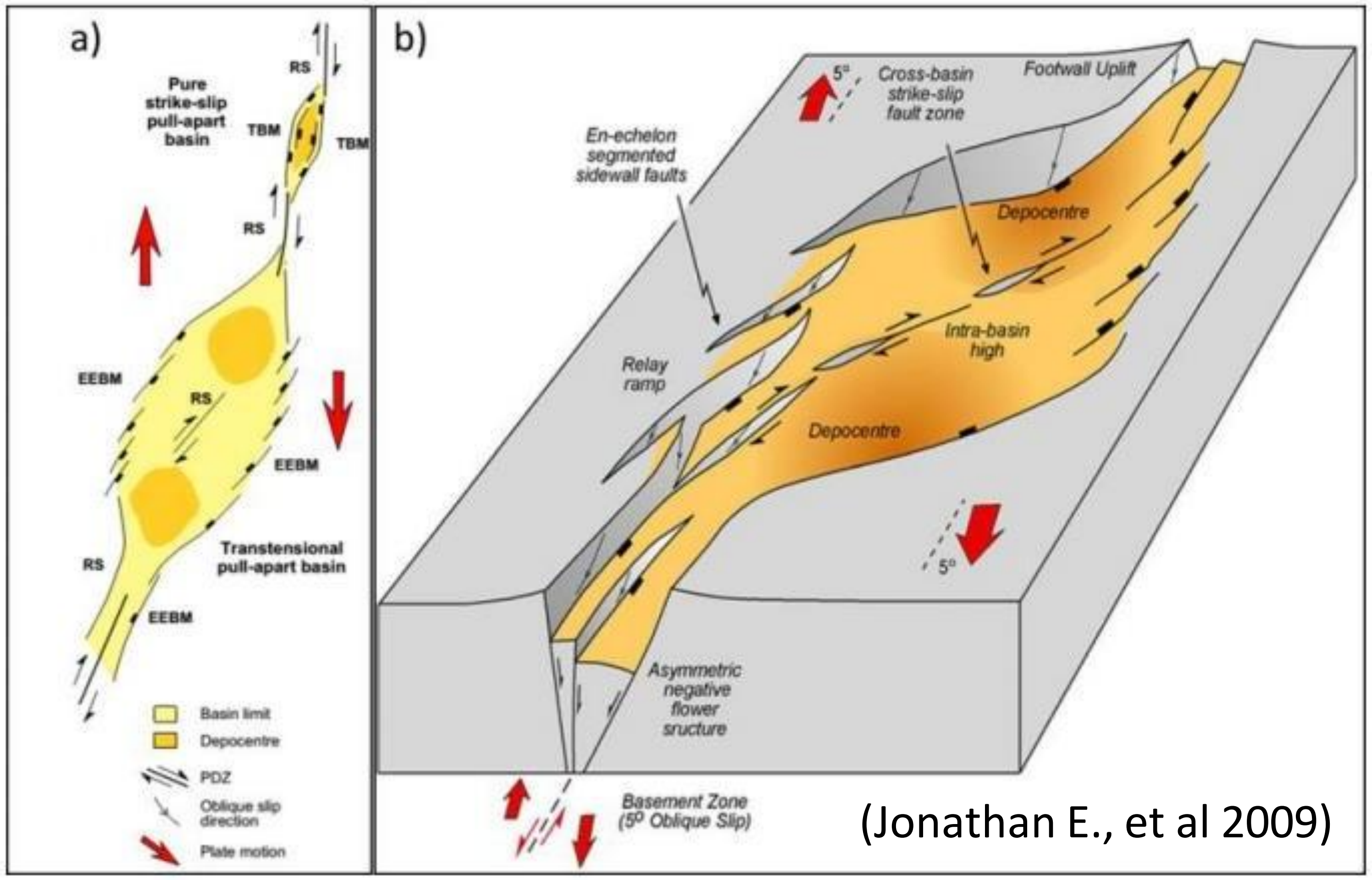
Major Faults:
- Right-lateral strike-slip faults trending **NNW-SSE**.

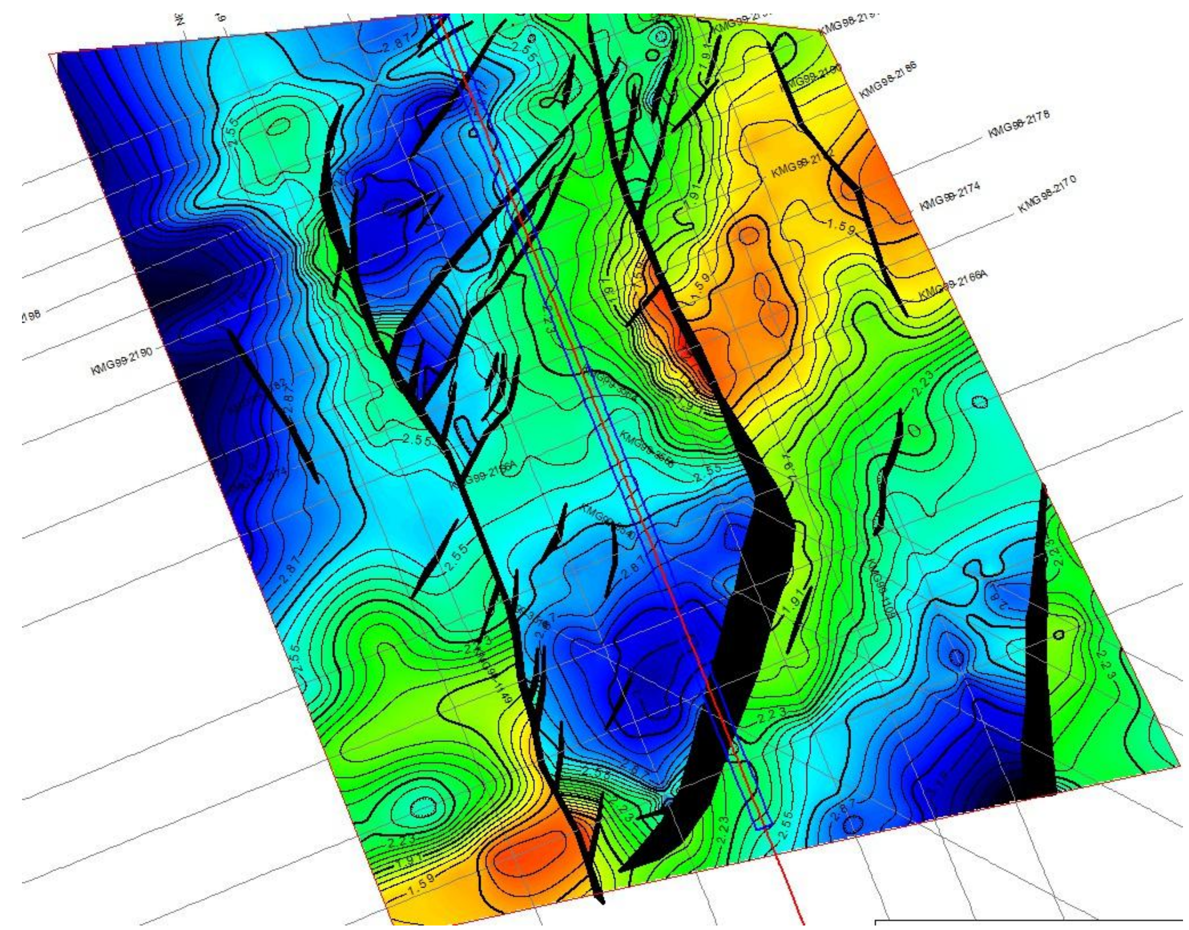
Minor Faults:
- Result from transtension.
- Oriented in a **NE-SW trend**, indicating Riedel shear fracturing (Figure 7).

Regional Dynamics:
- The oblique nature of the stress field explains the coexistence of strike-slip faults and extensional features.

Figure 8: Strike -Slip fault interpretation on seismic line comparing with model







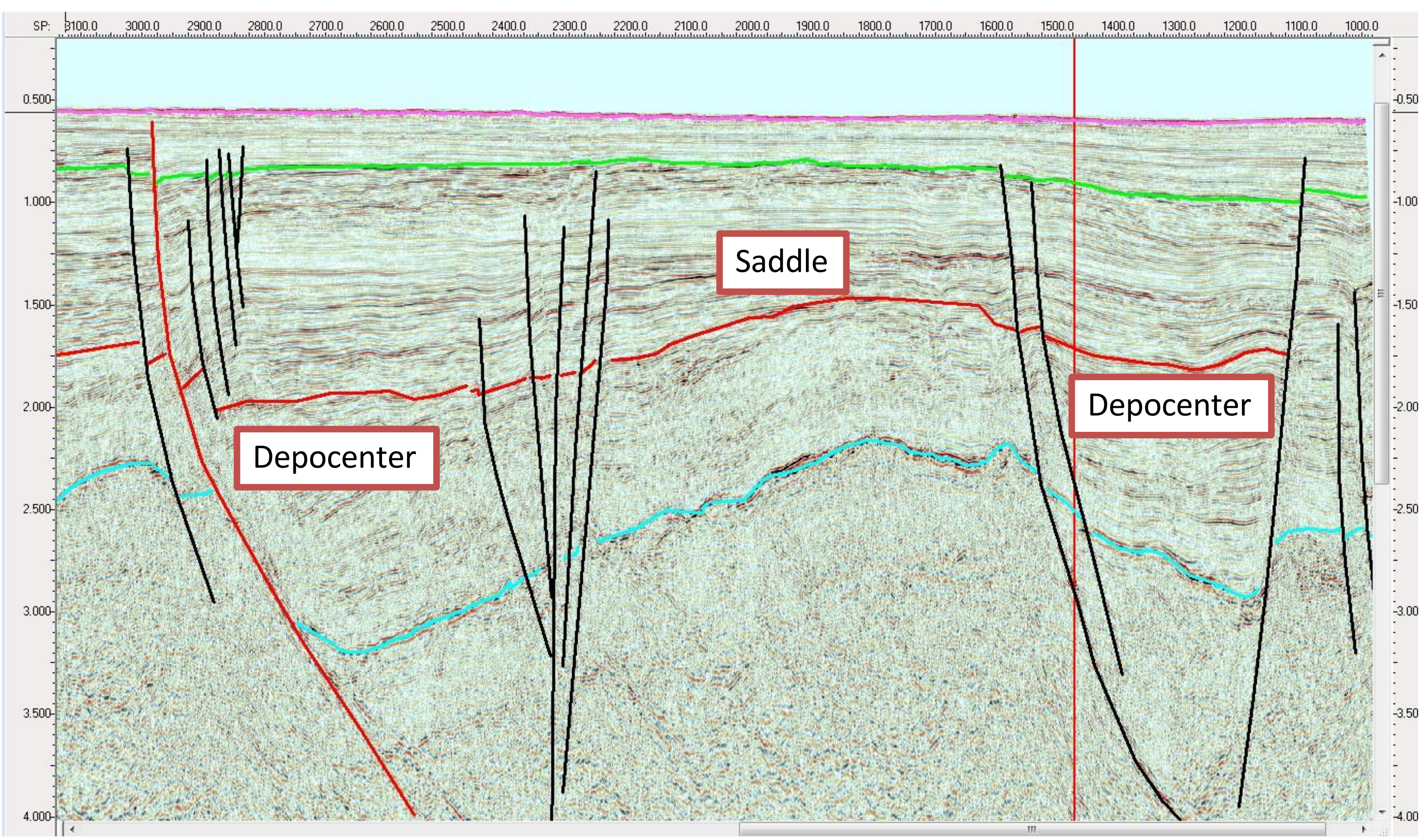


Figure 9: Comparison of vertical seismic section and Three-dimensional geometry of an idealized early stage pull-apart basin developing in transtension.

Structural Style

Fault Overview:
- Two major dextral strike-slip faults: Fault 1 (NNW-SSE trending) and Fault 2 (NNE-SSW trending).
- Faults identified by polygonal geometries on the map view.

Characteristics of Faults:
- Fault 1: Larger, straight segments with northern termination.
- Fault 2: Straight segments transitioning to low-angle faults in SE, forming a dipper extensional basin.

Secondary Faults:
- NE-SE trending splays oriented obliquely to the main faults.
- Interpreted as Riedel shear fractures (R-fractures).

Seismic Interpretation:
- Negative flower structures observed in vertical seismic sections, indicating extensional overlapping (releasing bends) along the strike-slip faults.

Basin Configuration:
- Pull-apart basin structure divided by a saddle into two depocenters.
- Oblique faults reflect high strike-slip dominance over dip-slip motion.

Figure 10: Time structure map of Base Syn-rift

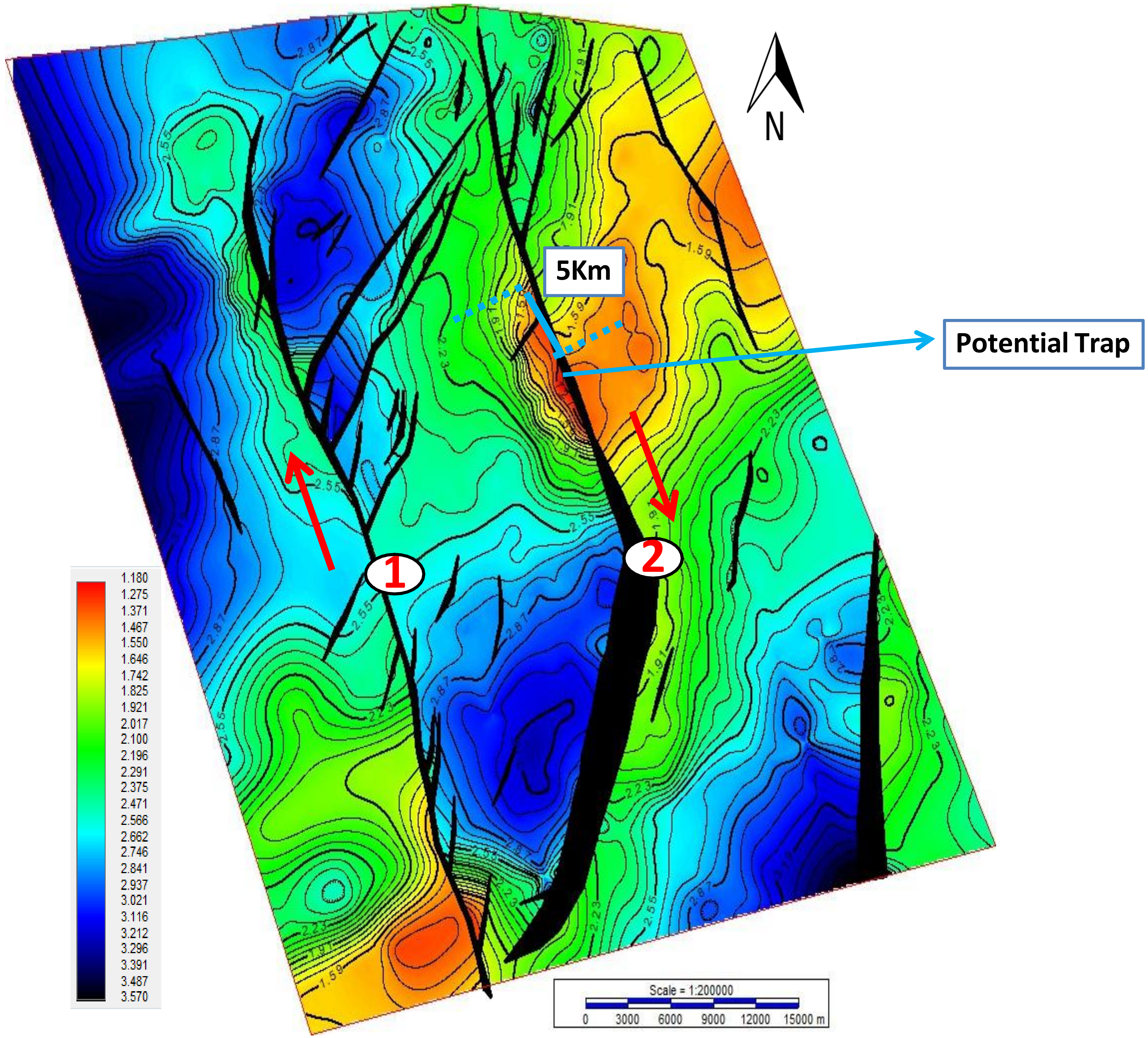
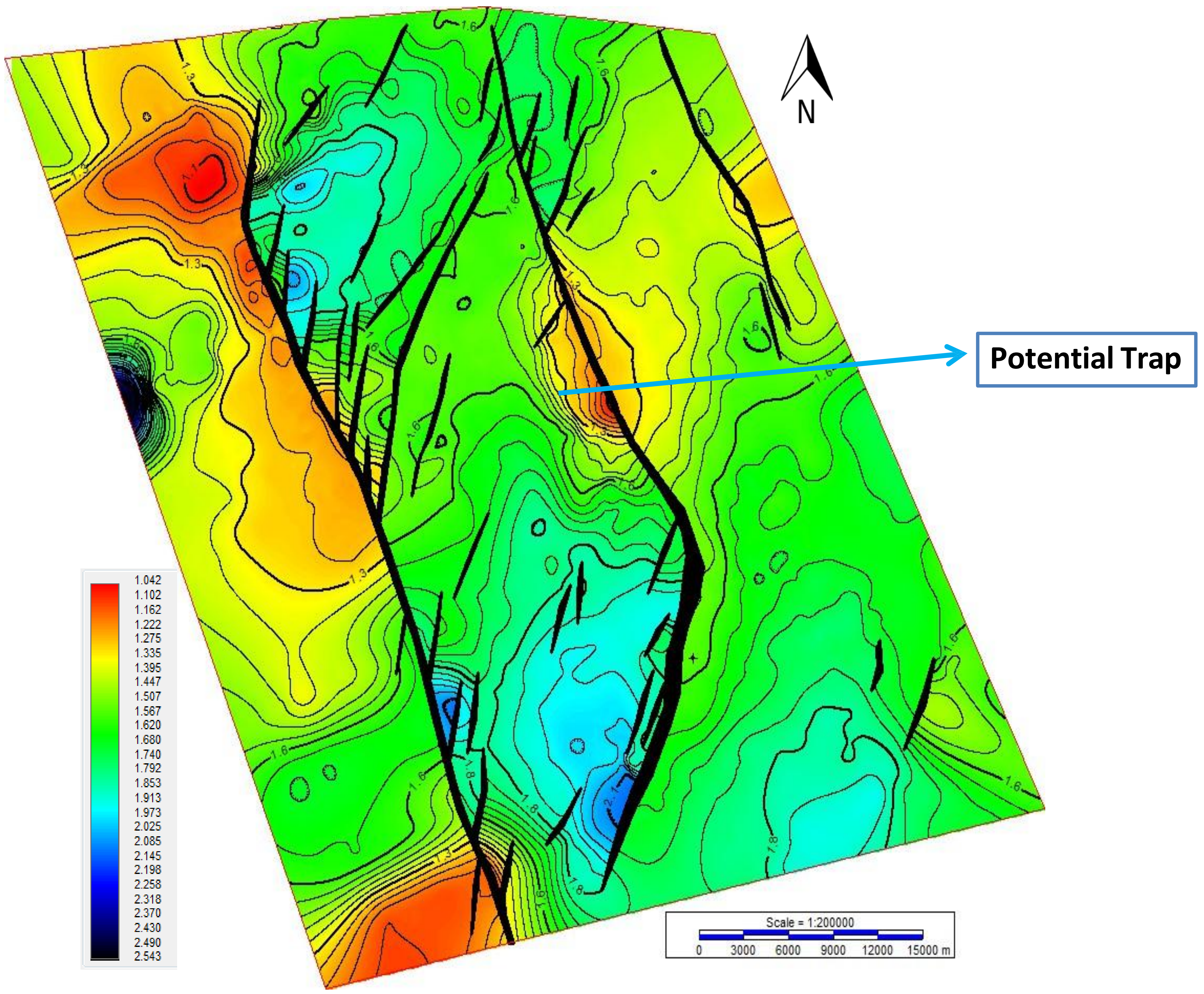


Figure: 11 Time structure map of Top Ranong



Potential Hydrocarbon Trap Styles

Fault-Controlled Structural Highs:
- Hydrocarbon traps are primarily associated with **fault-controlled structural highs**.
- Related to **uplifted basement blocks** formed by strike-slip faulting (Figures 10 and 11).

Saddle Structures:
- The **saddle between two depocenters** within the pull-apart basin acts as a potential hydrocarbon trap (Figure 9).

Negative Flower Structures:
- Segmented blocks associated with negative flower structures offer trapping potential within the basin.

Challenges to Trapping:
- **Seal Rock Juxtaposition**: Strike-slip displacement can cause poor sealing if reservoir rocks are juxtaposed against non-sealing formations.
- **Shale Smearing**: Effectiveness of the trap depends on the amount of shale smeared along the fault plane.

Figure 12: Time structure map of Top Clinoforms

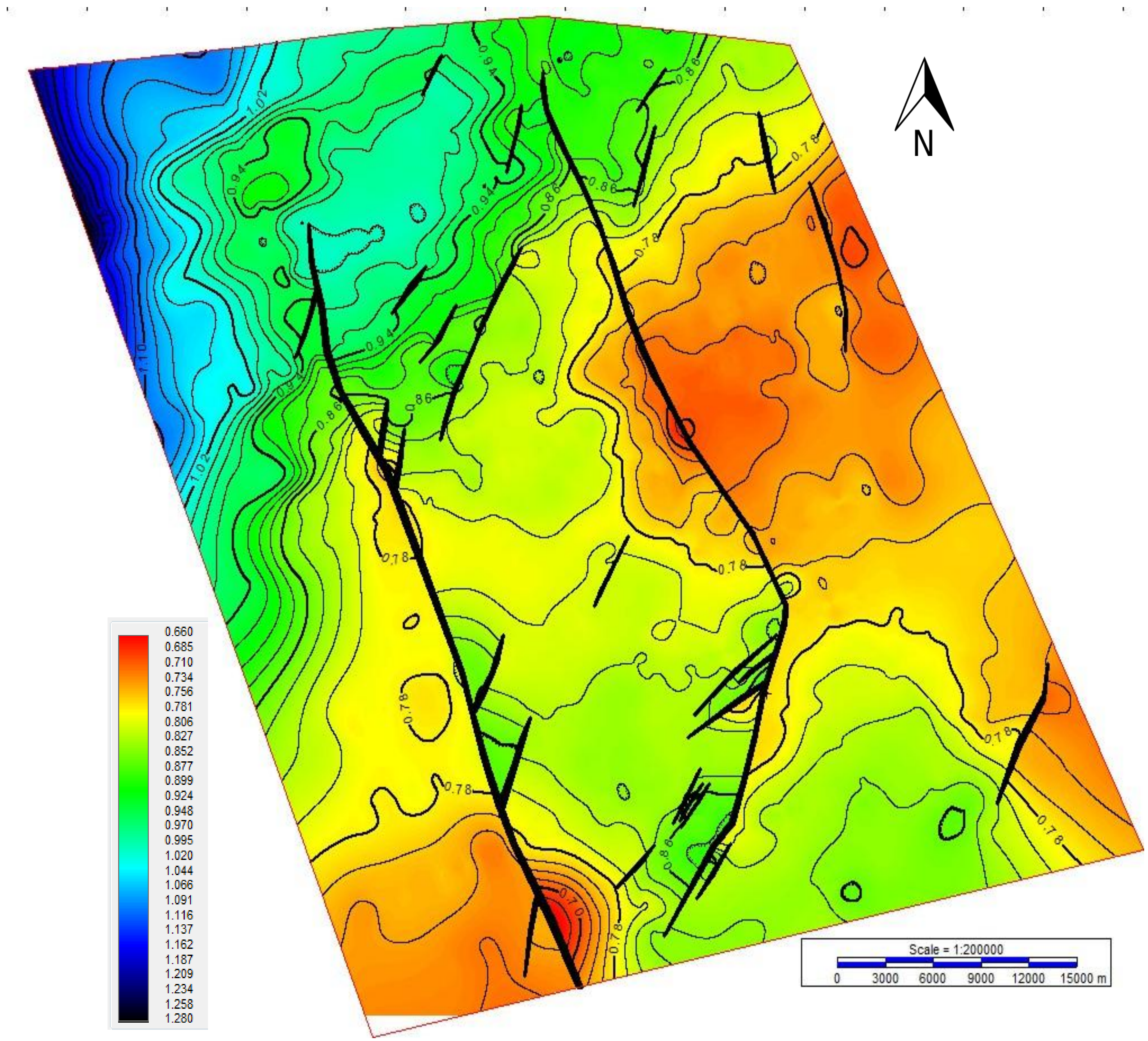


Figure 13: Time structure map of Seabed

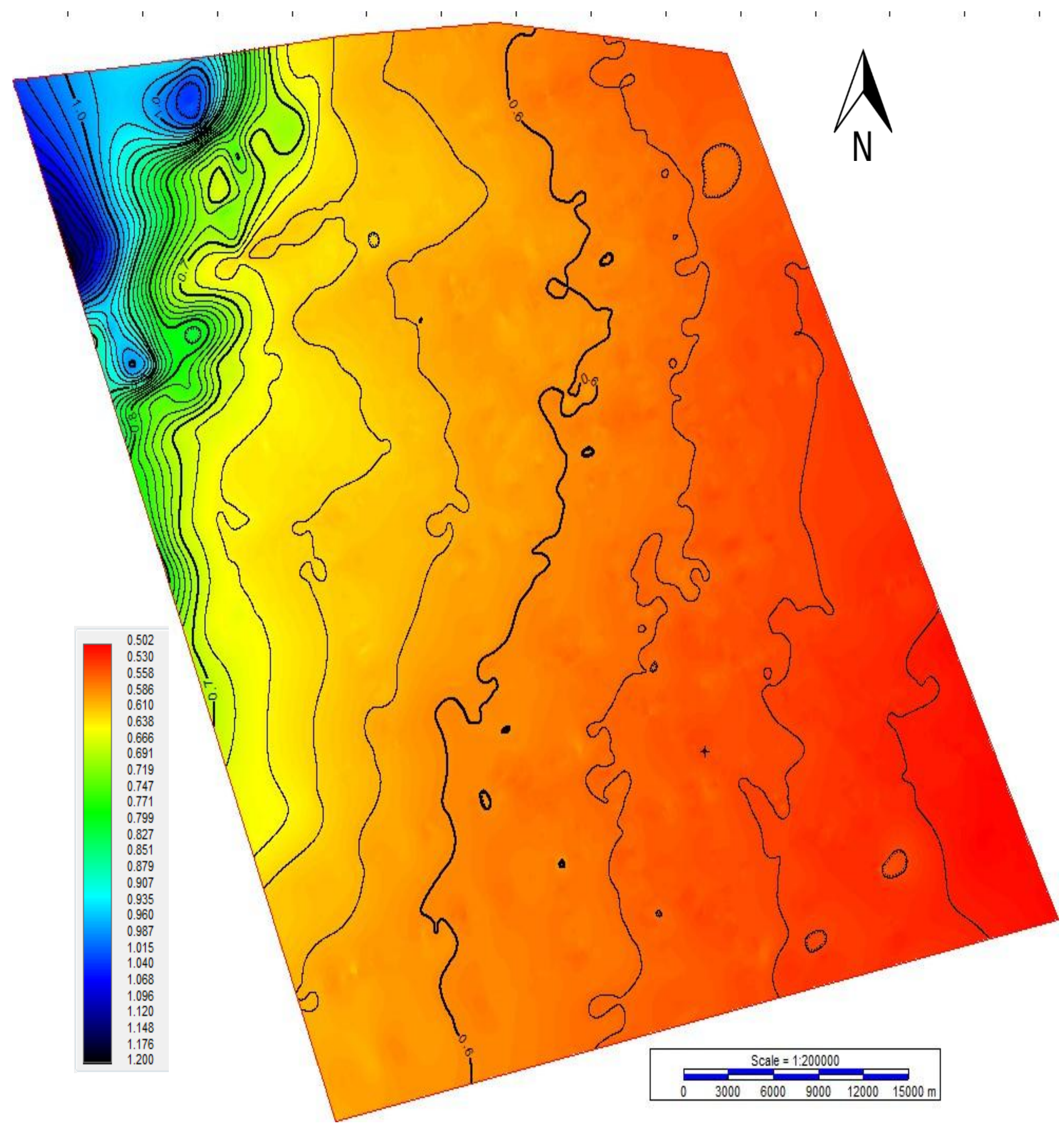


Figure 14: Isochron map between Base Syn-Rift and Top Ranong

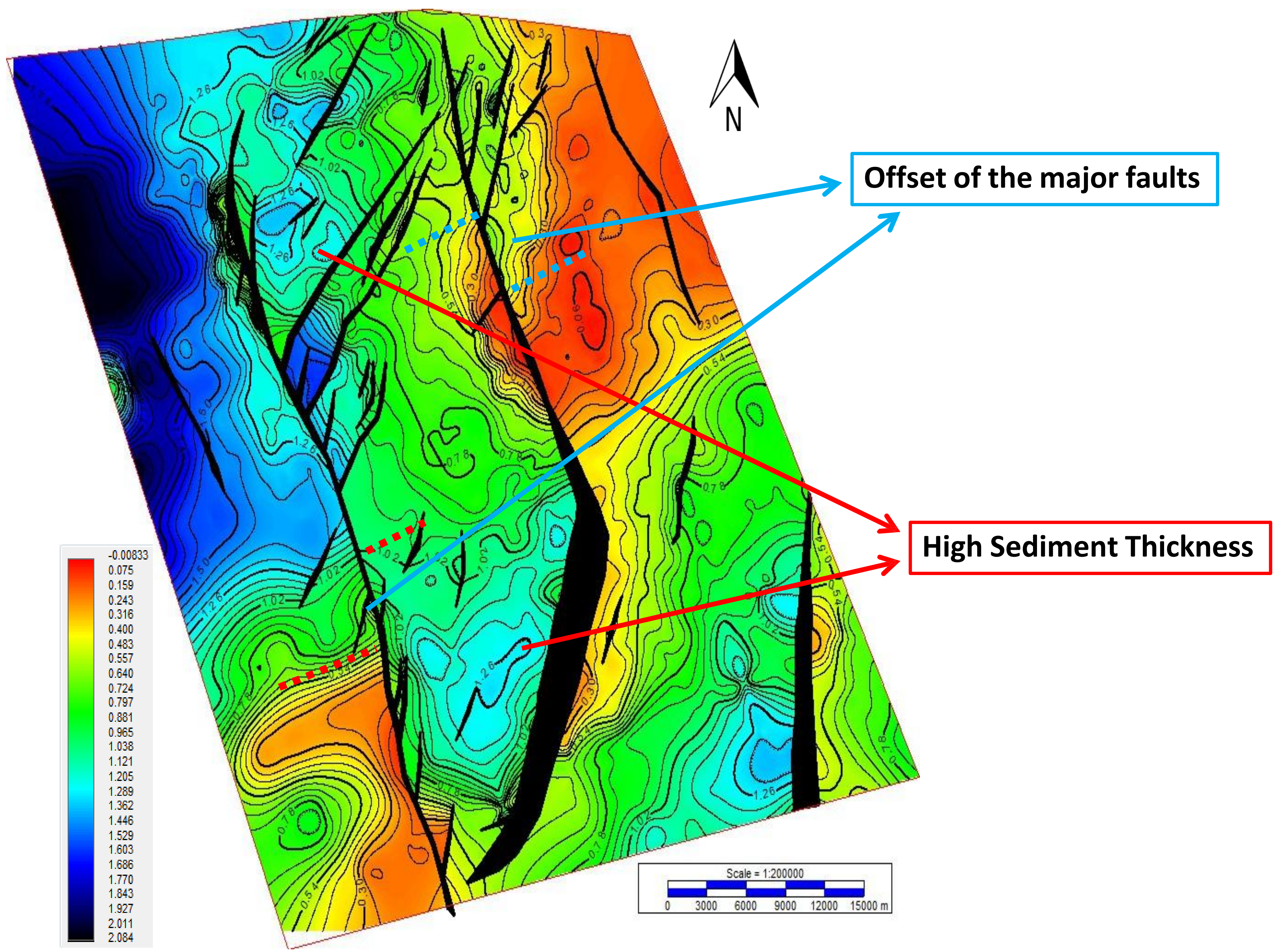
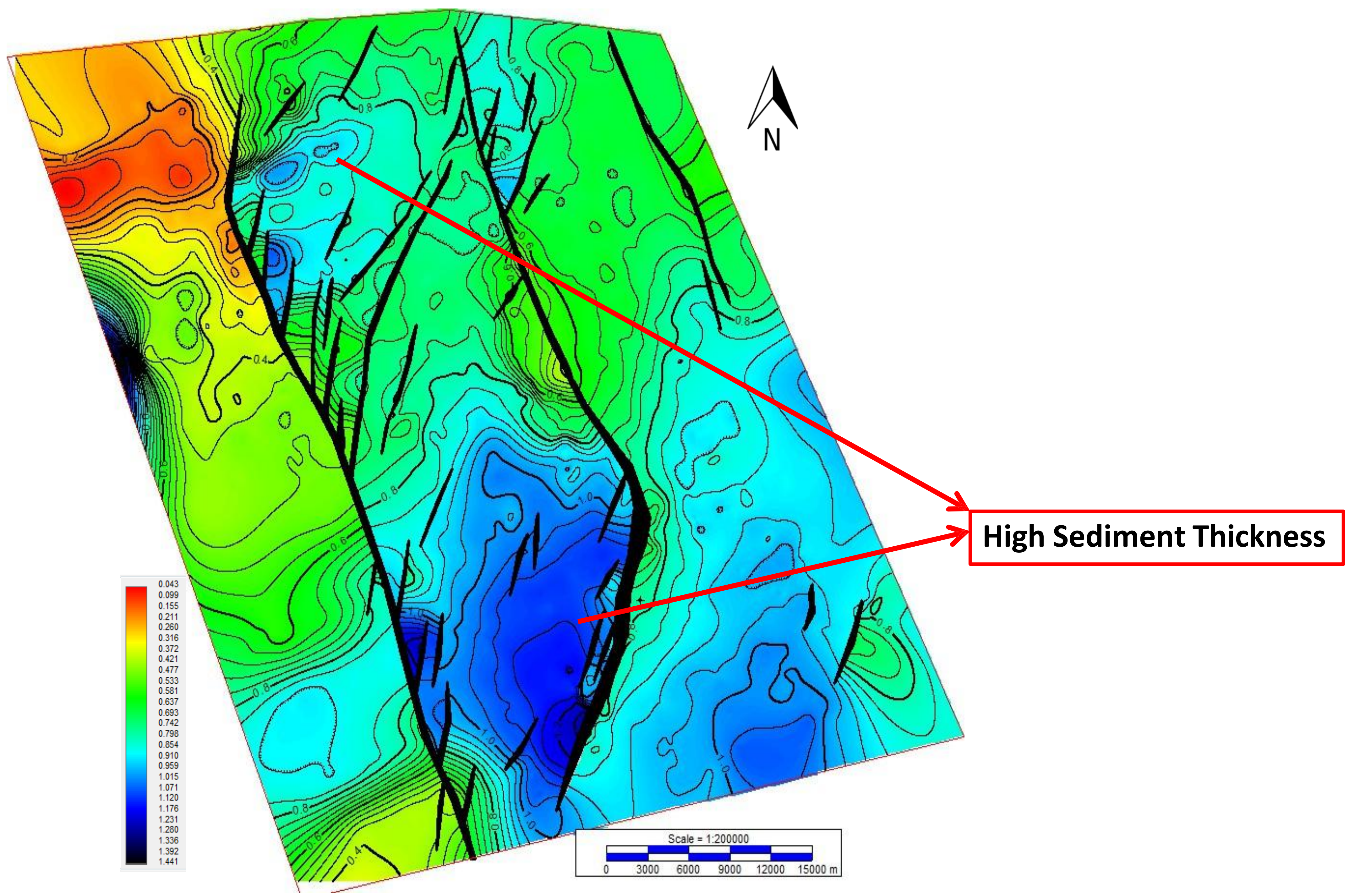


Figure 14: Isochron map between Top Ranong and Top Clinoforms



Isochron Maps and Basin Evolution Analysis

Sediment Thickness Variations:

- Isochron maps illustrate how sediment thickness varies in response to faulting during different tectonic phases.

Phase 1 (Rifting):

- Maximum sediment thickness observed between **Base Syn-Rift and Top Ranong**.Controlled by low-angle normal faults indicating active fault block tilting and sediment deposition during normal fault development.

Phase 2 (Post-Ranong):

- Sediment thickness variation decreases between **Top Ranong and Top Clinoforms**, reflecting reduced strike-slip influence.

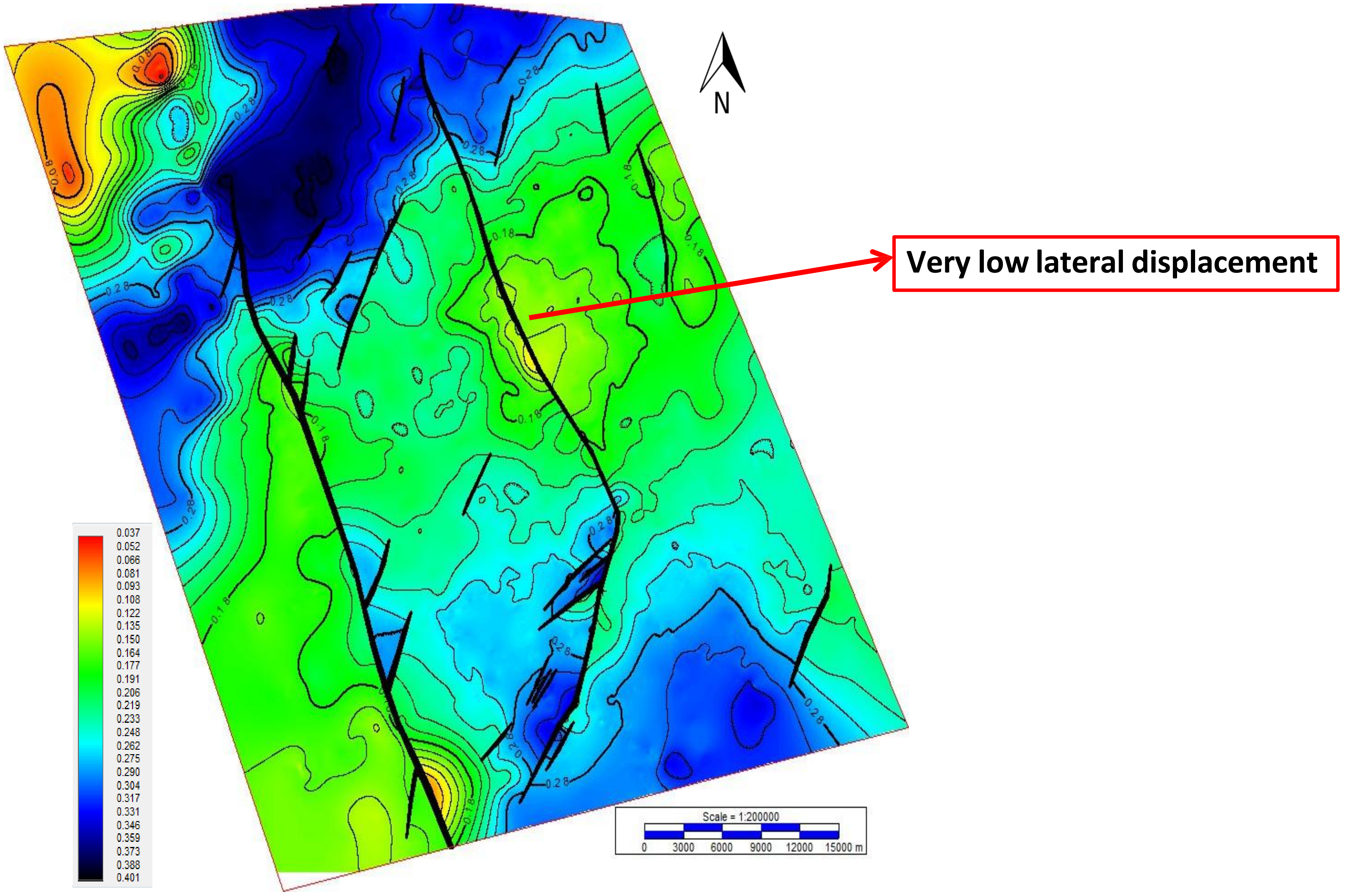
Strike-Slip Fault Impact:

- Limited impact of strike-slip faulting during deposition observed in **Top Ranong–Top Clinoforms Isochron** compared to the earlier phase.
- Minimal fault-induced variations in **Top Clinoforms–Seafloor Isochron**, indicating reduced fault movement during deposition.

Basin Evolution:

- Strike-slip faults became significant during the **post-rift stage**, following the formation of progradational clinoforms.

Figure 14: Isochron map between Top Clinoforms and Seafloor



Thank You