# Structural Geometry and Evolution of BED 17 Field, Abu El Gharadig Basin, Northern Western Desert of Egypt: An Example of Restraining Stepovers in Strike-Slip Fault Systems*

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## Abstract

The Qattara Fault system in BED 17 Field area provides an exceptional opportunity to study the contractional structures at strike-slip restraining stepovers associated with principal deformation zones (PDZs) using high resolution three-dimensional (3-D) seismic reflection data, as well as the evolution of a pop-up structure developed coevally with a rejuvenation of the pre-existing Abu El Gharadig Basin northern bounding fault. The Abu El Gharadig Basin is perhaps the largest basin in the northern Western Desert, is bordered to the north by the Qattara Platform and to the south by the Sitra Platform. The Abu El Gharadig Basin has a stratigraphic sequence having a variety of lithologies and facies with ages extending from the Paleozoic to Miocene. The BED 17 pop-up structure shows strong similarities in structural geometry with the analog models discussed by previous study which provided guidelines for interpretation of seismic sections. In this case study the pop-up structure is a small and narrow positive flower structure. The 3-D geometry of the pop-up structure is well-defined in Cretaceous sedimentary rocks above restraining stepovers in an offset dextral strike-slip fault. Because of uplift, unconformity was formed due to partial erosion and subsequent on-lapping within Khoman strata. The bounding faults to the pop-up structure are very steep with dips of ~75$^{o}$ in cross section view and have a rhomboidal shape in map view. Within the Abu Roash sequence, the strongly uplifted region was interpreted across the center of the pop-up structure and largely shows symmetrical doubly plunging anticline with a hinge line striking counter to the overall dextral shear displacement of the main fault system.

The initiation of the pop-up structure was coeval with the Syrian Arc deformation at the climax of the convergence motion between the African and Eurasian plates during the Late Cretaceous. Hence locally the inversion started in Santonian time and continued during the deposition of the Khoman strata in pulses, as demonstrated by unconformities (on-lapping and truncation), and ended in Middle Paleocene.

## Reference Cited

McClay, K., and M. Bonora, 2001, Analog models of restraining stepovers in strike-slip fault systems: AAPG Bulletin, v. 85/2, p. 233-260.

# Structural geometry and evolution of
# BED 17 Field
# Abu El Gharadig Basin
# North Western Desert of Egypt

## "An example of Restraining stepovers in strike-slip fault systems "

W. S. Said, M. Yousef, H. Z. El-Mowafy, A. Abdel-Halim

May 2014

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- BED17 old structure model.
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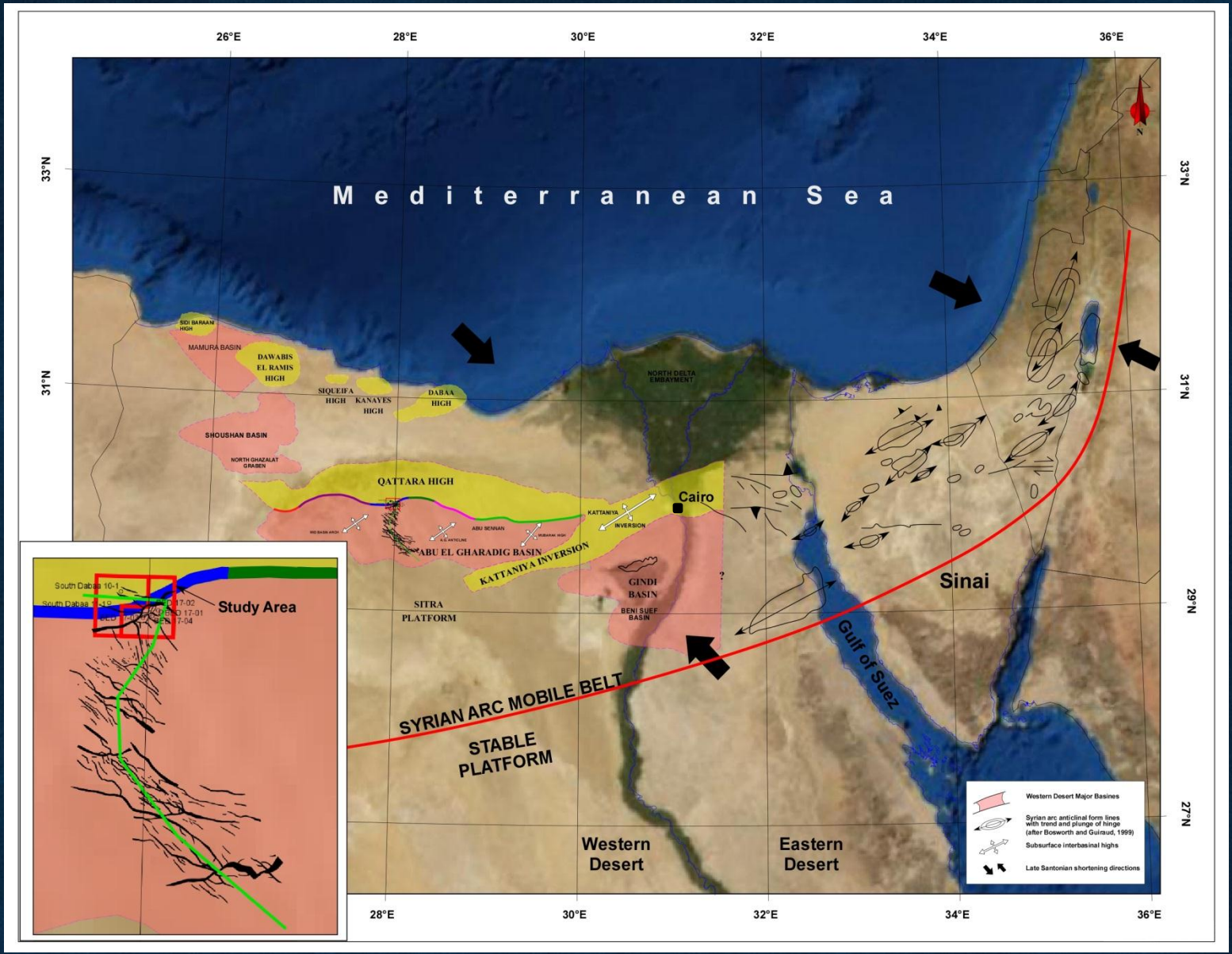
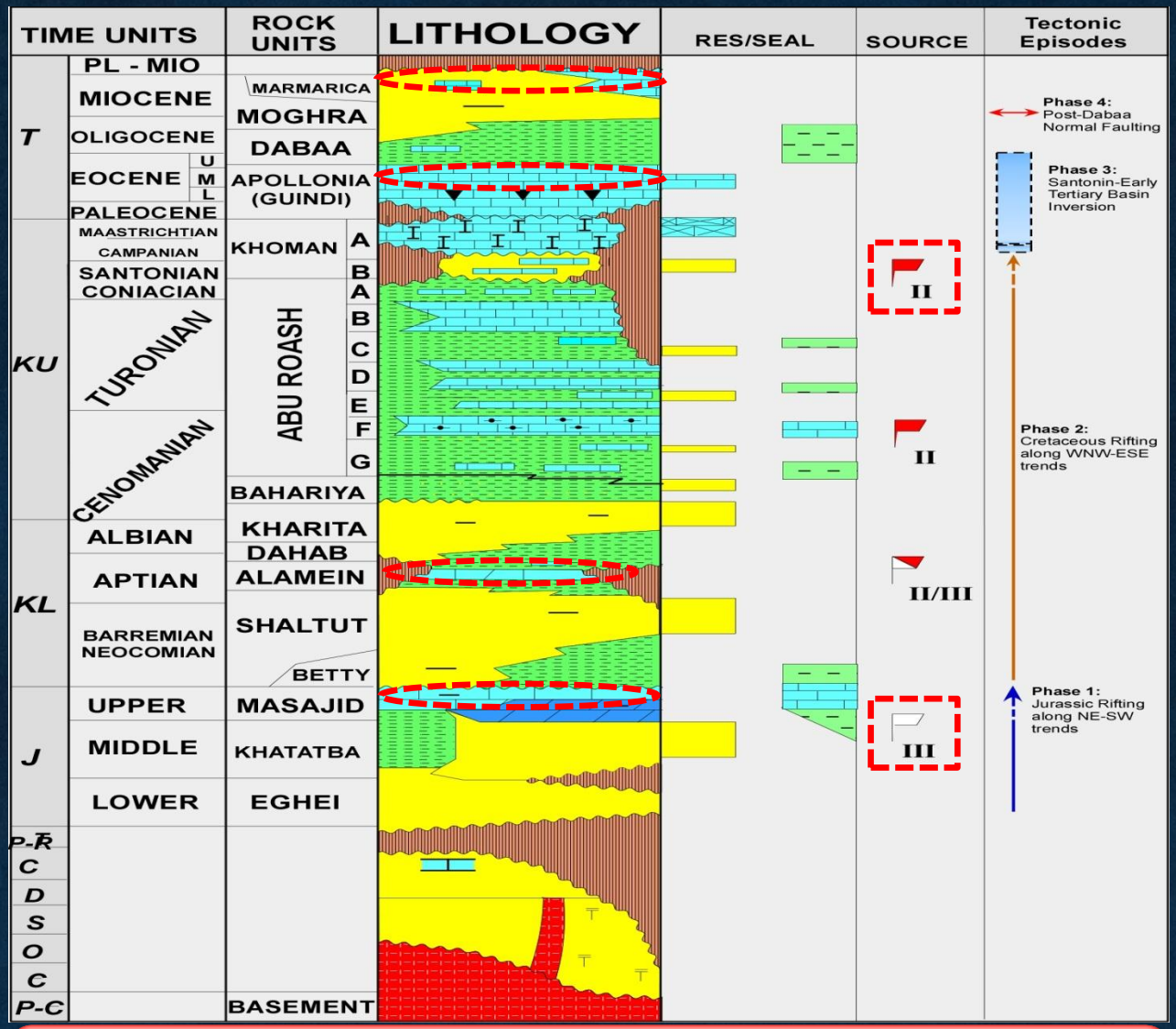
- BED17 new structural interpretation.
- Outcrops Examples of Pop-Up Structures.
- The impact of new model on hydrocarbon potential.

# Abu El Gharadig Basin



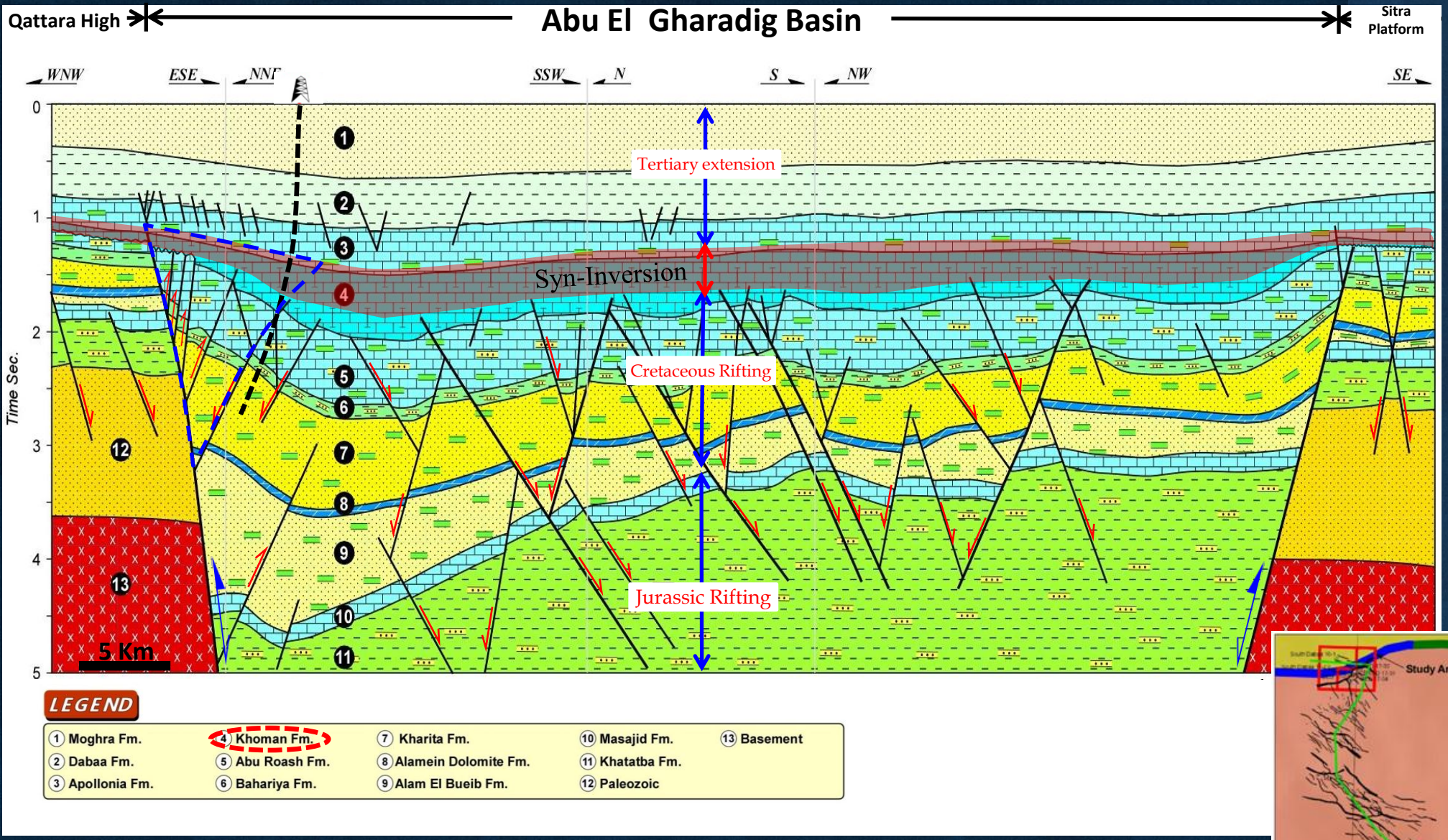

Simplified tectonic map showing the main basins in the Northwestern Desert

# Western Desert Stratigraphy & Tectonic Episodes



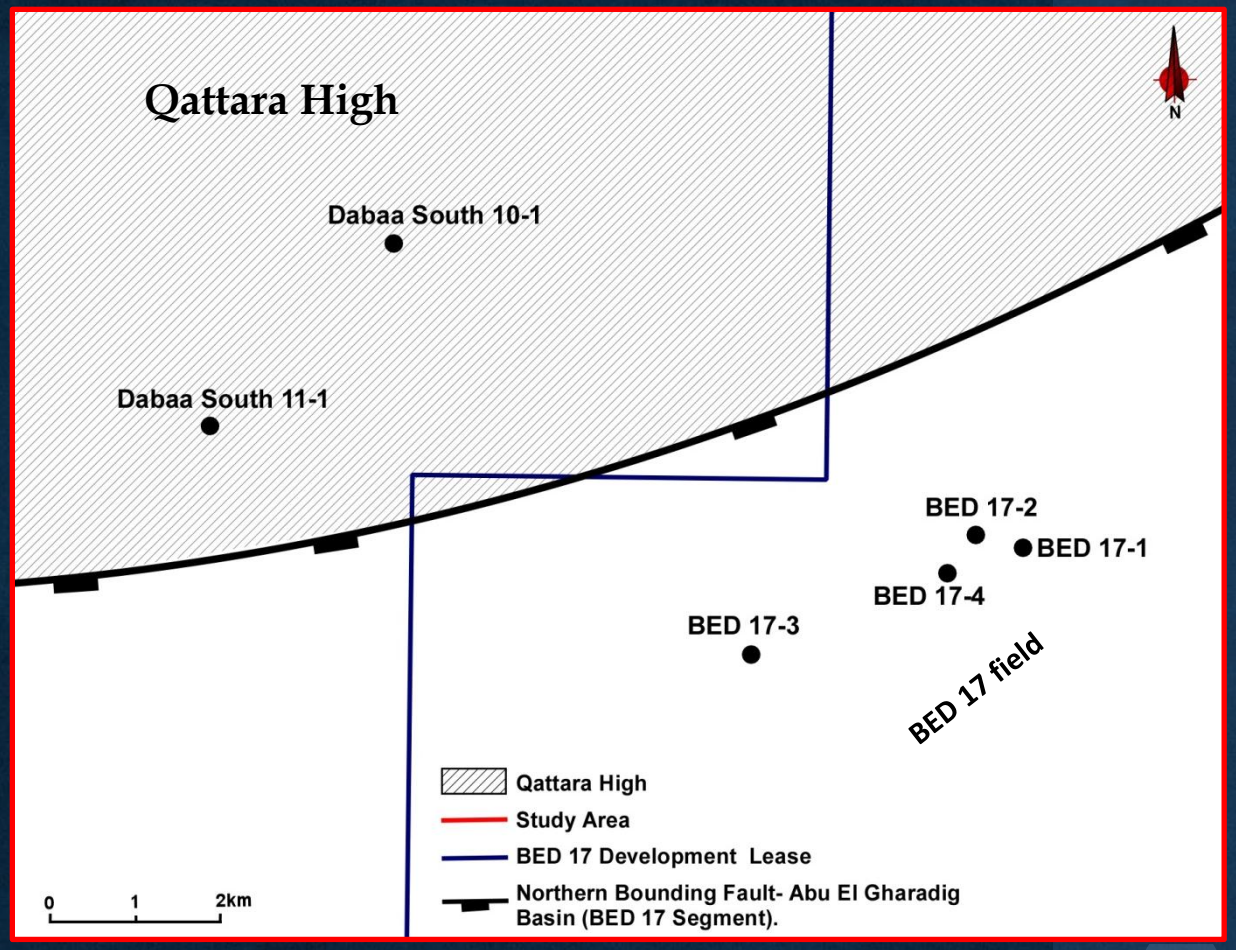

GENERALIZED STRATIGRAPHIC SEQUENCE OF NORTHWESTERN DESERT

# Regional Geo-Seismic Cross-Section

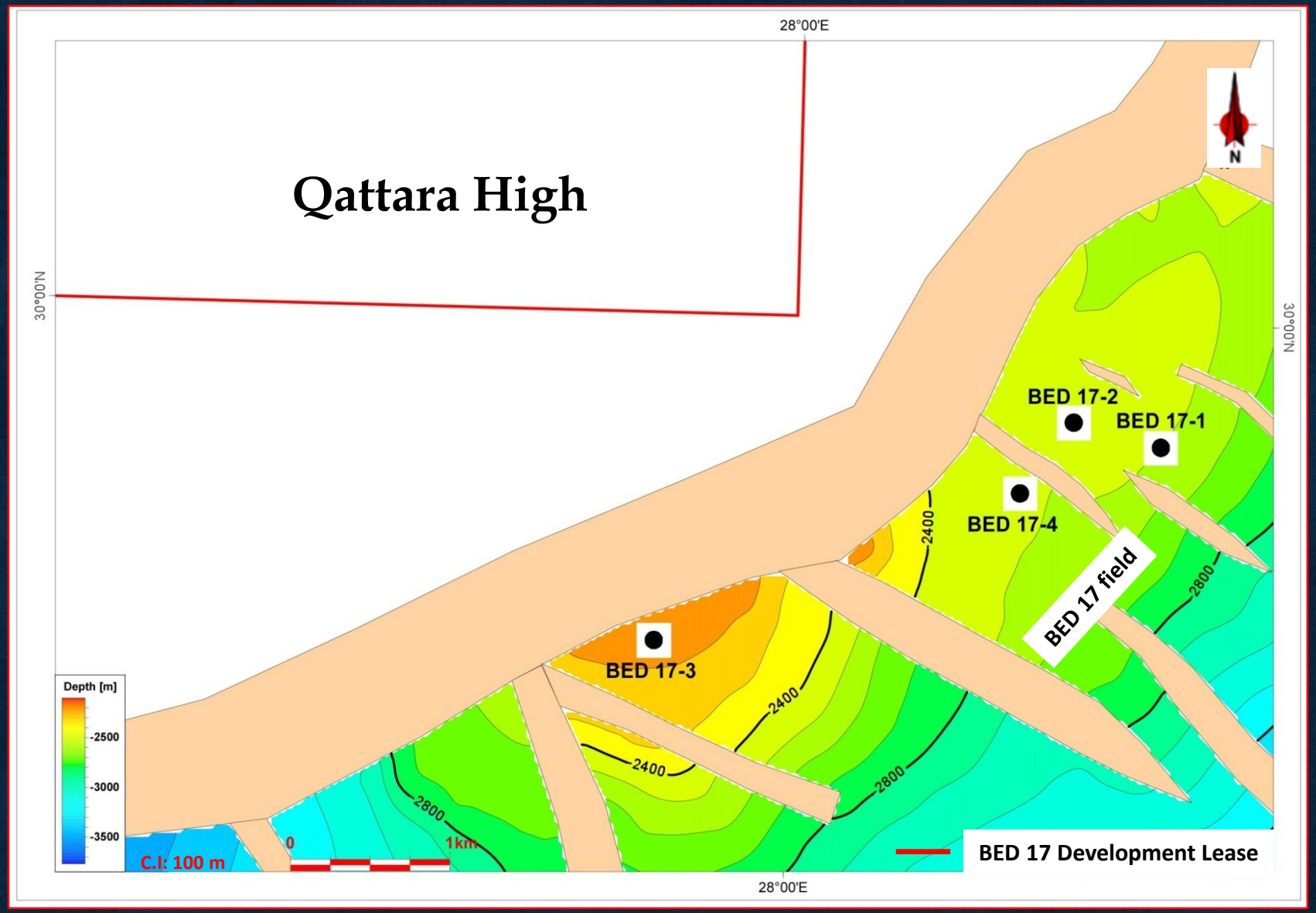


# BED17 field overview

- BED 17 field lies on the downthrown side of the northern main bounding fault of the Abu El Gharadig
- It was discovered in 1989 through BED17-1.
- Four wells have been drilled to date.
- The production mainly comes from the upper Cretaceous ,Abu Roash C sandstone oil-bearing reservoir. Deeper reservoirs were found water bearing in all wells .

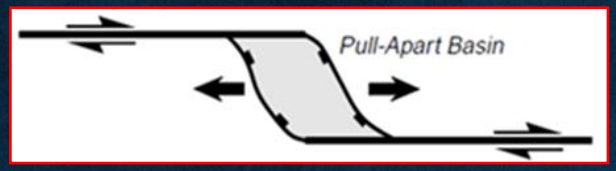


# BED17 old structure model

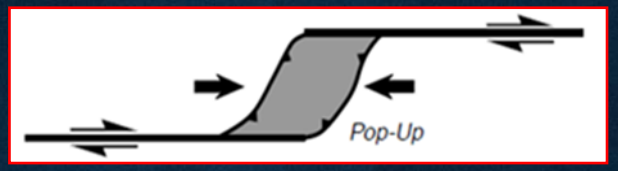



Old Abu Roash C Depth Map

# Strike-Slip Stepover structure styles



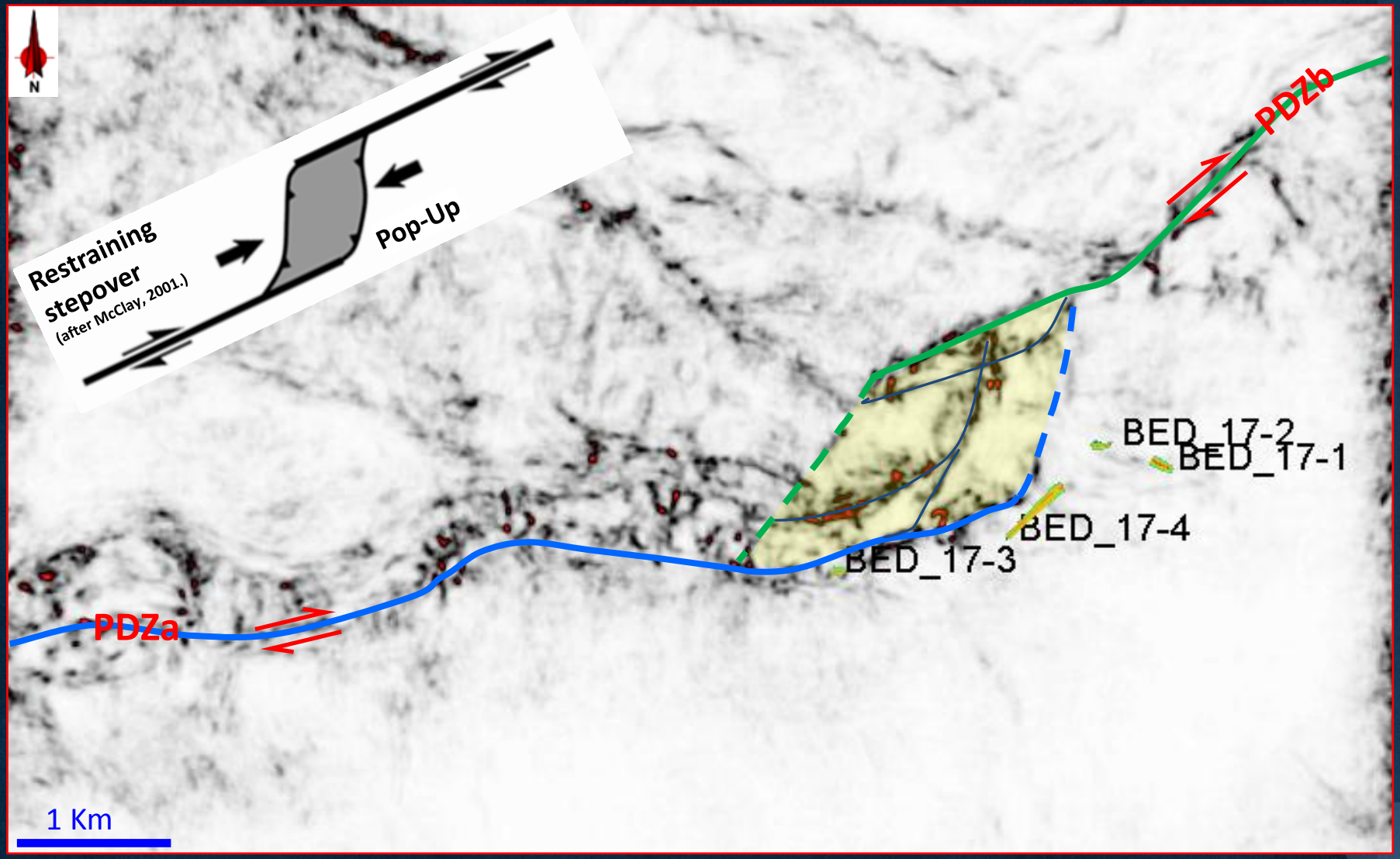

Releasing stepover




Restraining stepover

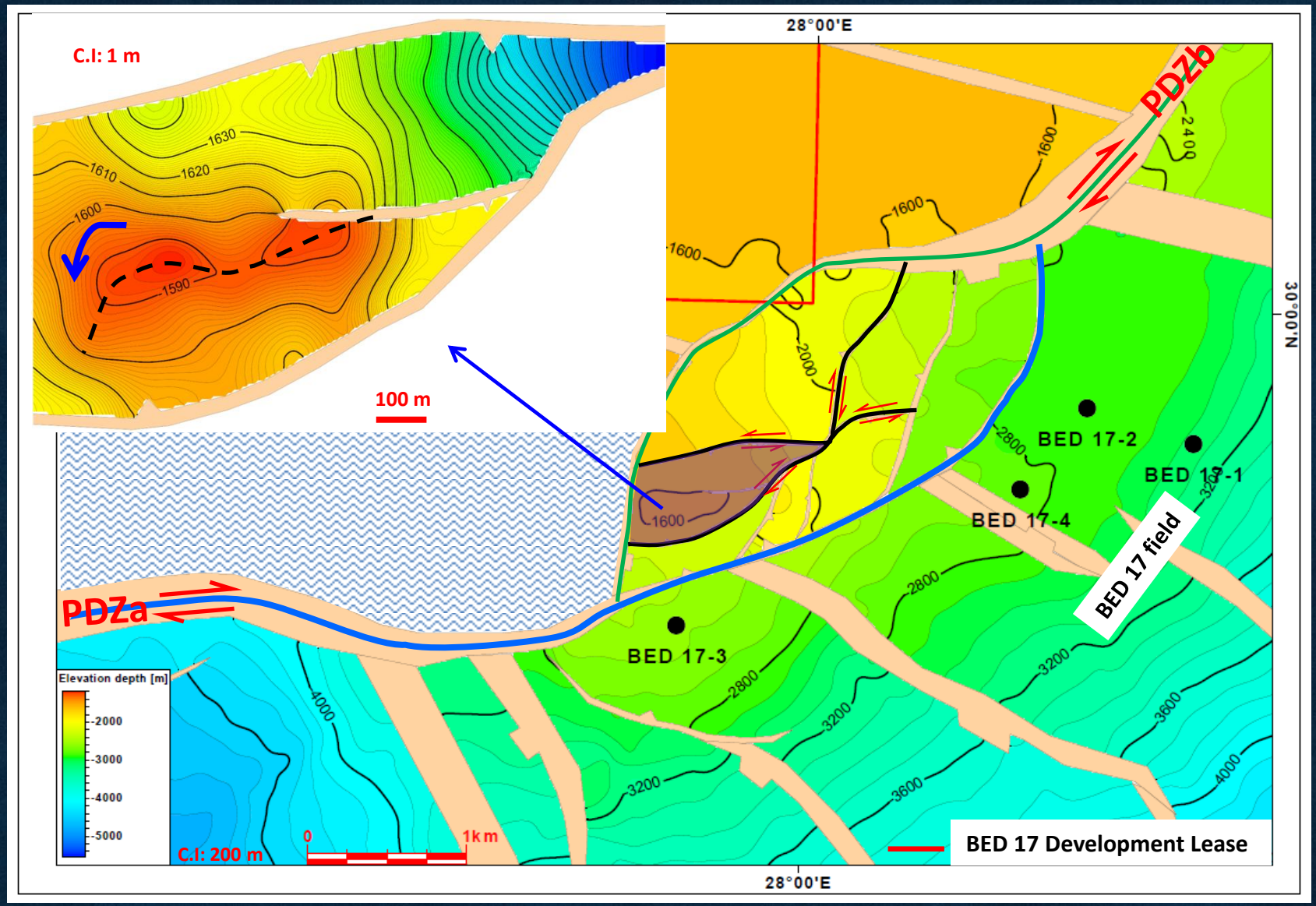
(after McClay, 2001.)

# BED17 New structural interpretation



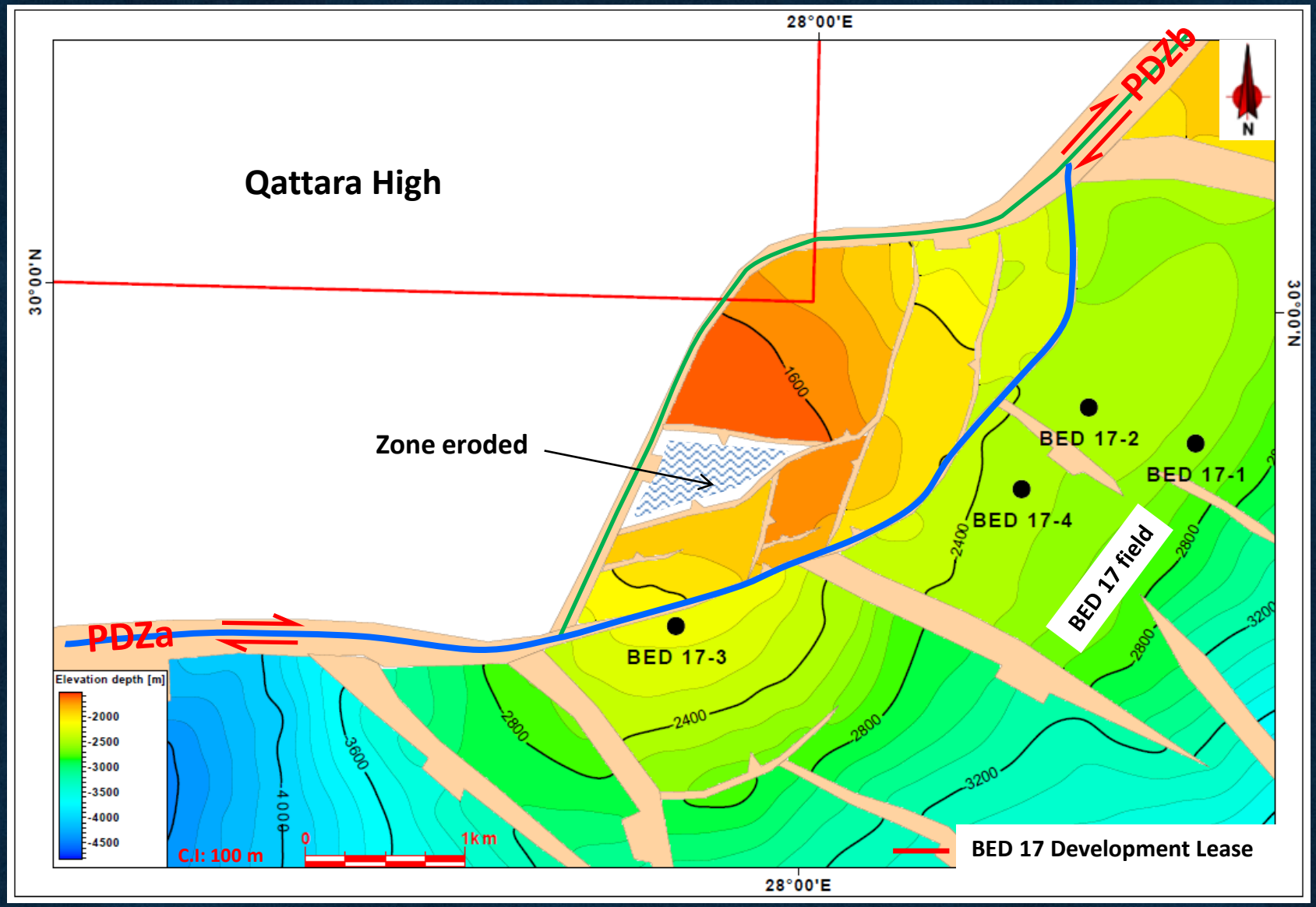

Time slice (Semblance) display at the upper Cretaceous section (Abu Roash Fm. @1350 ms).

# BED17 New structural interpretation



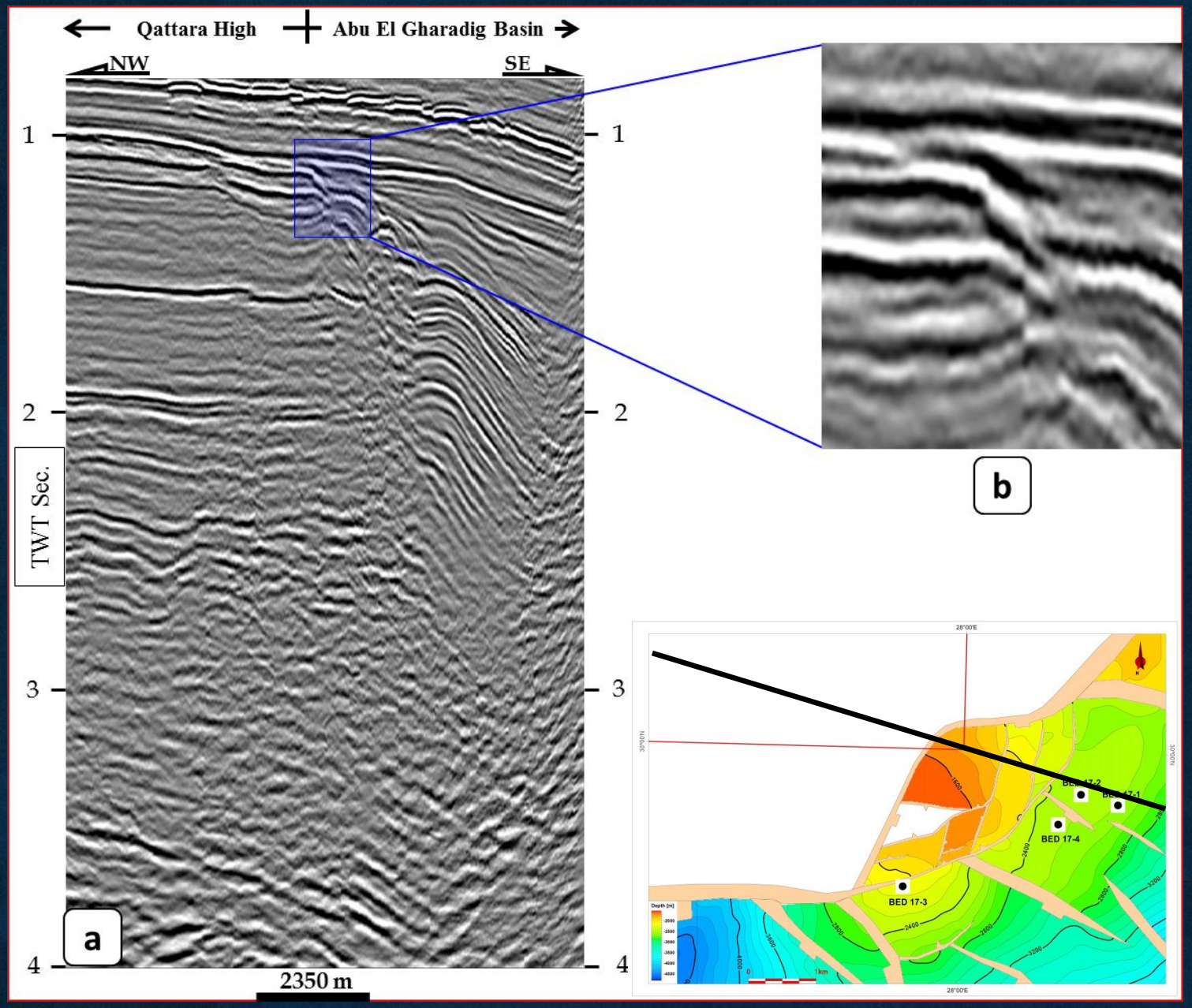

Abu Roash-F Depth Map

# BED17 New structural interpretation

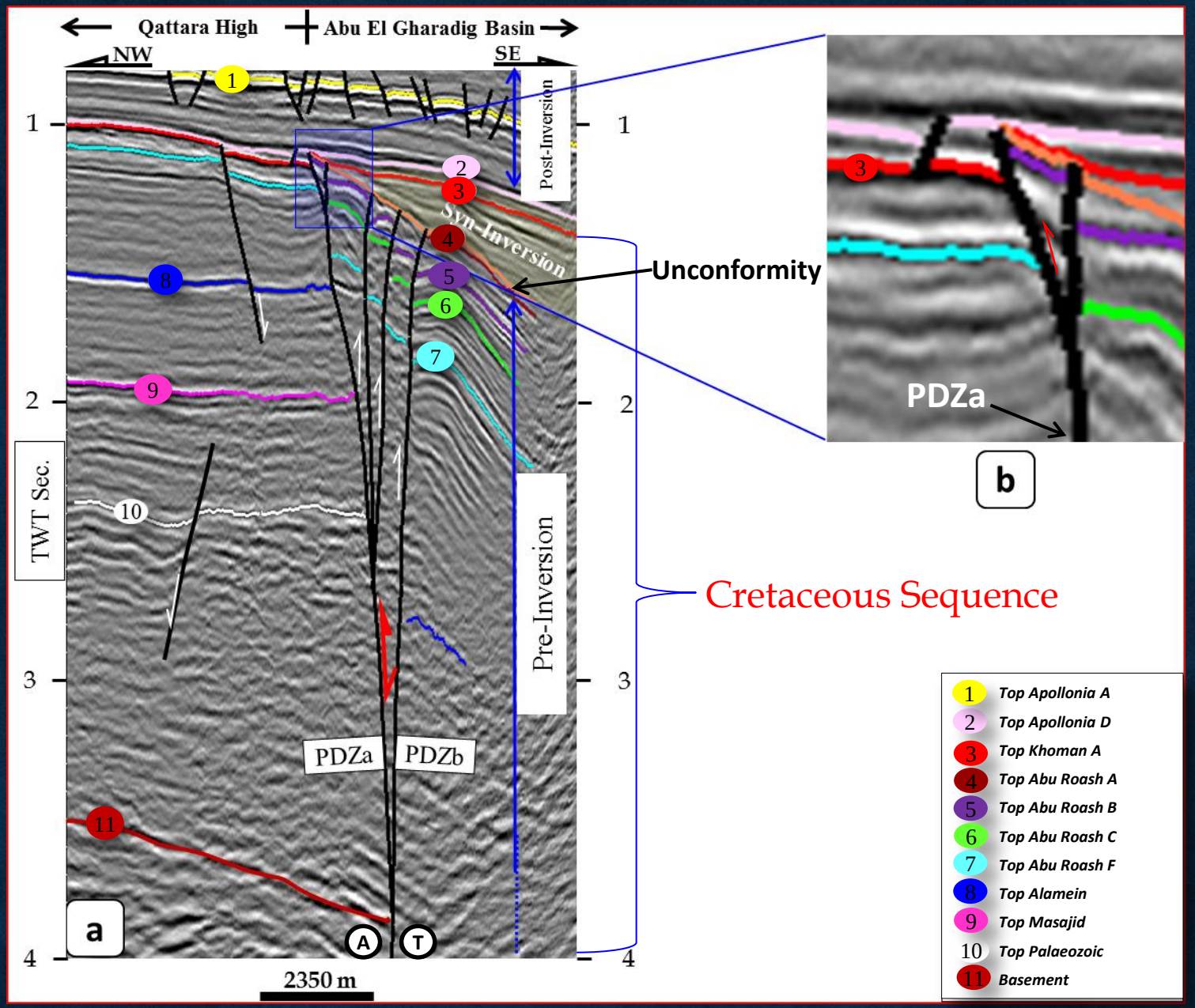



Abu Roash-C Depth Map

# BED17 New structural interpretation



# BED17 New structural interpretation



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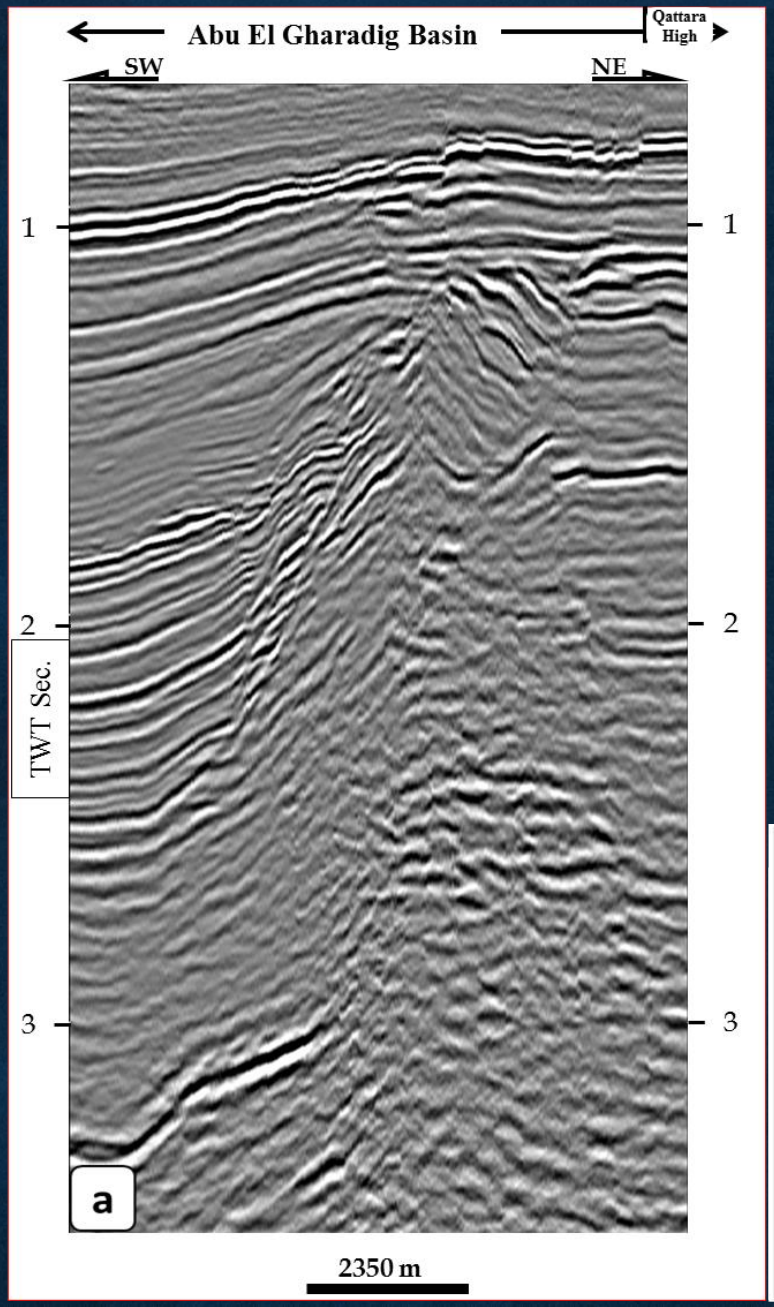
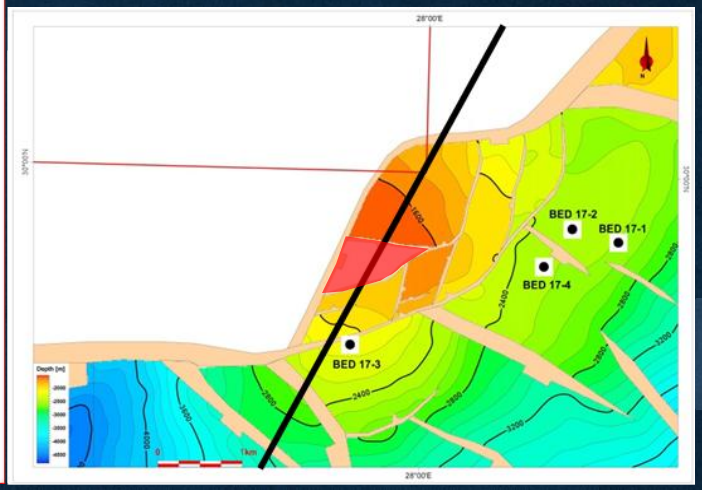
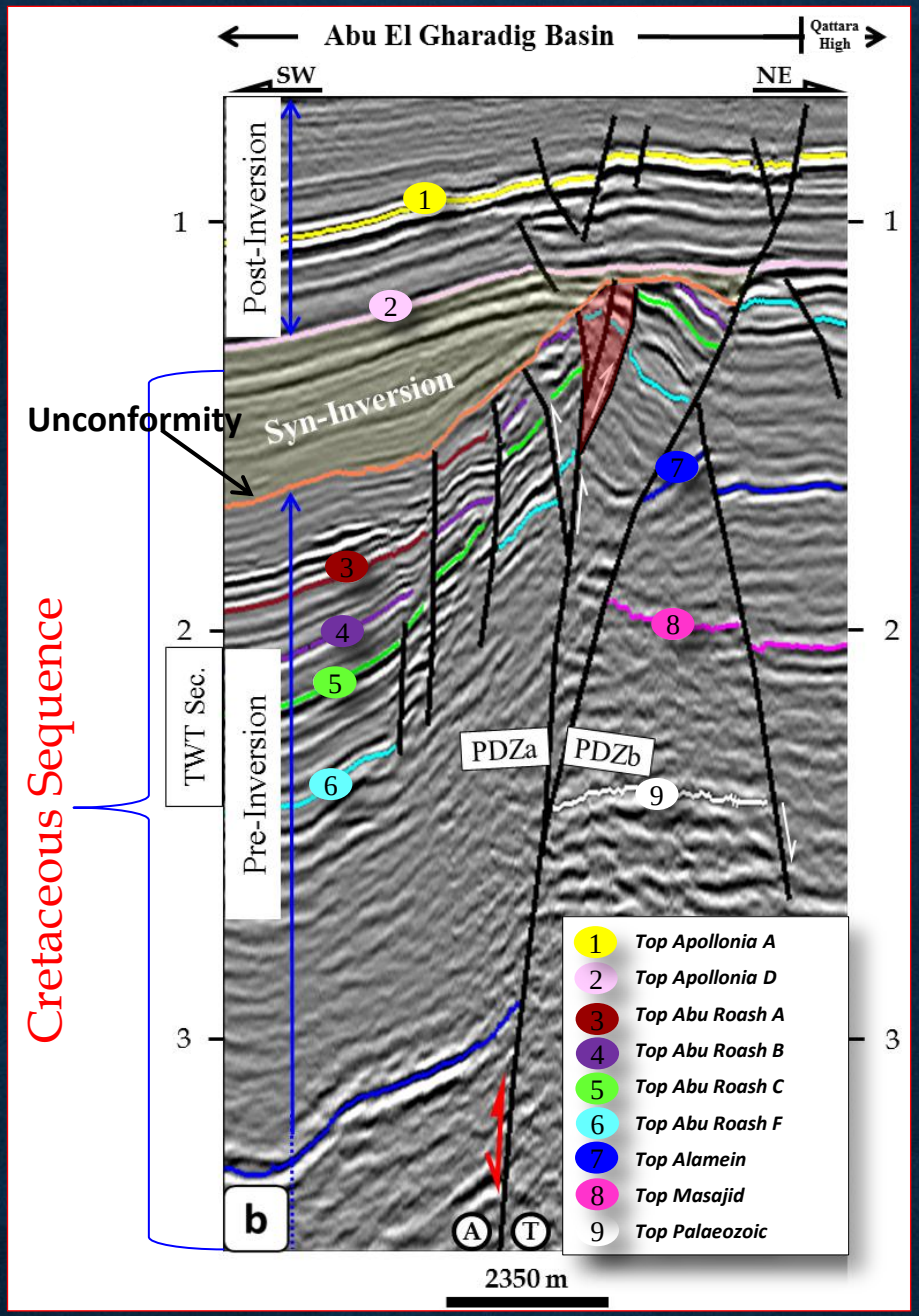
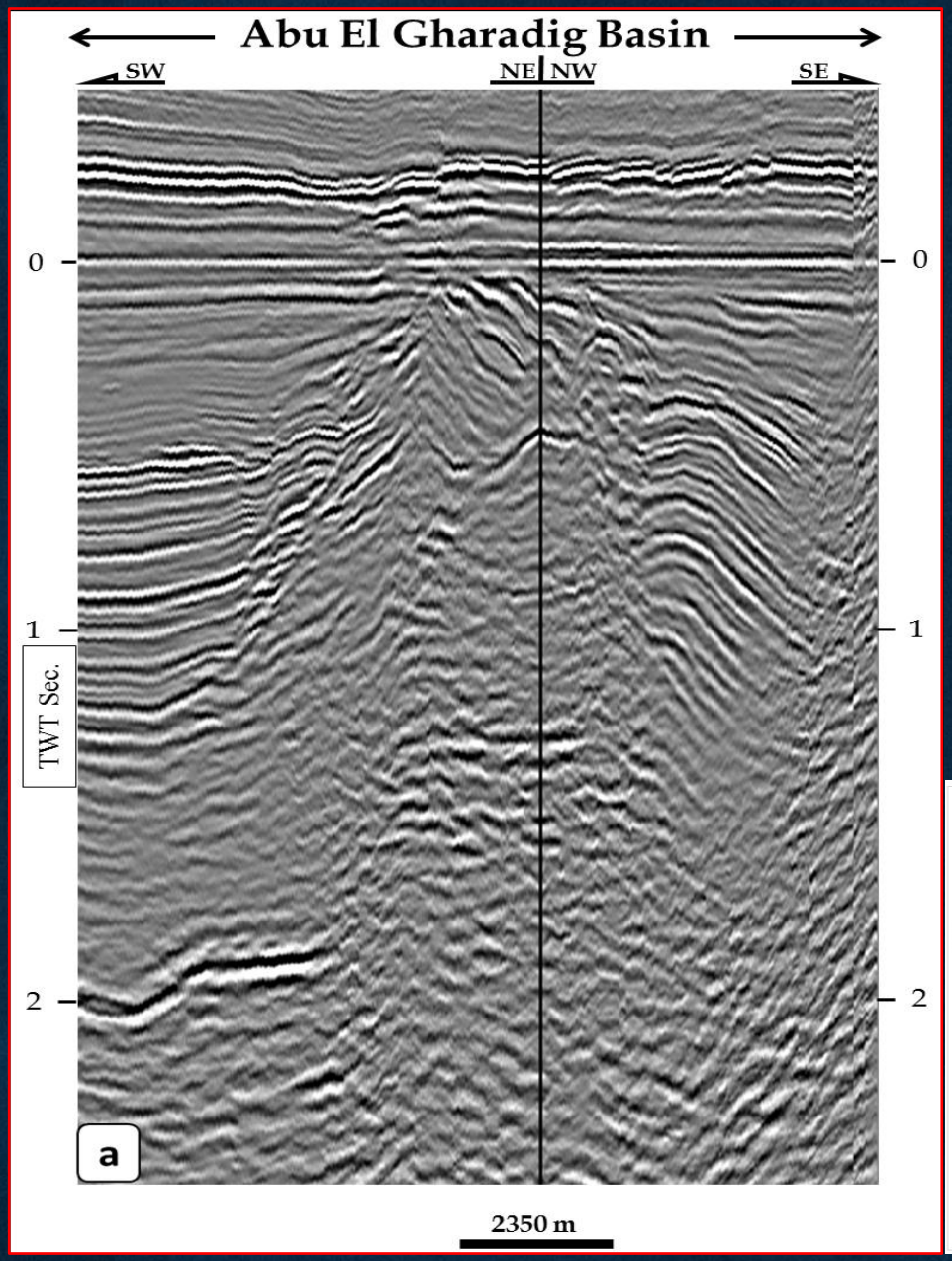


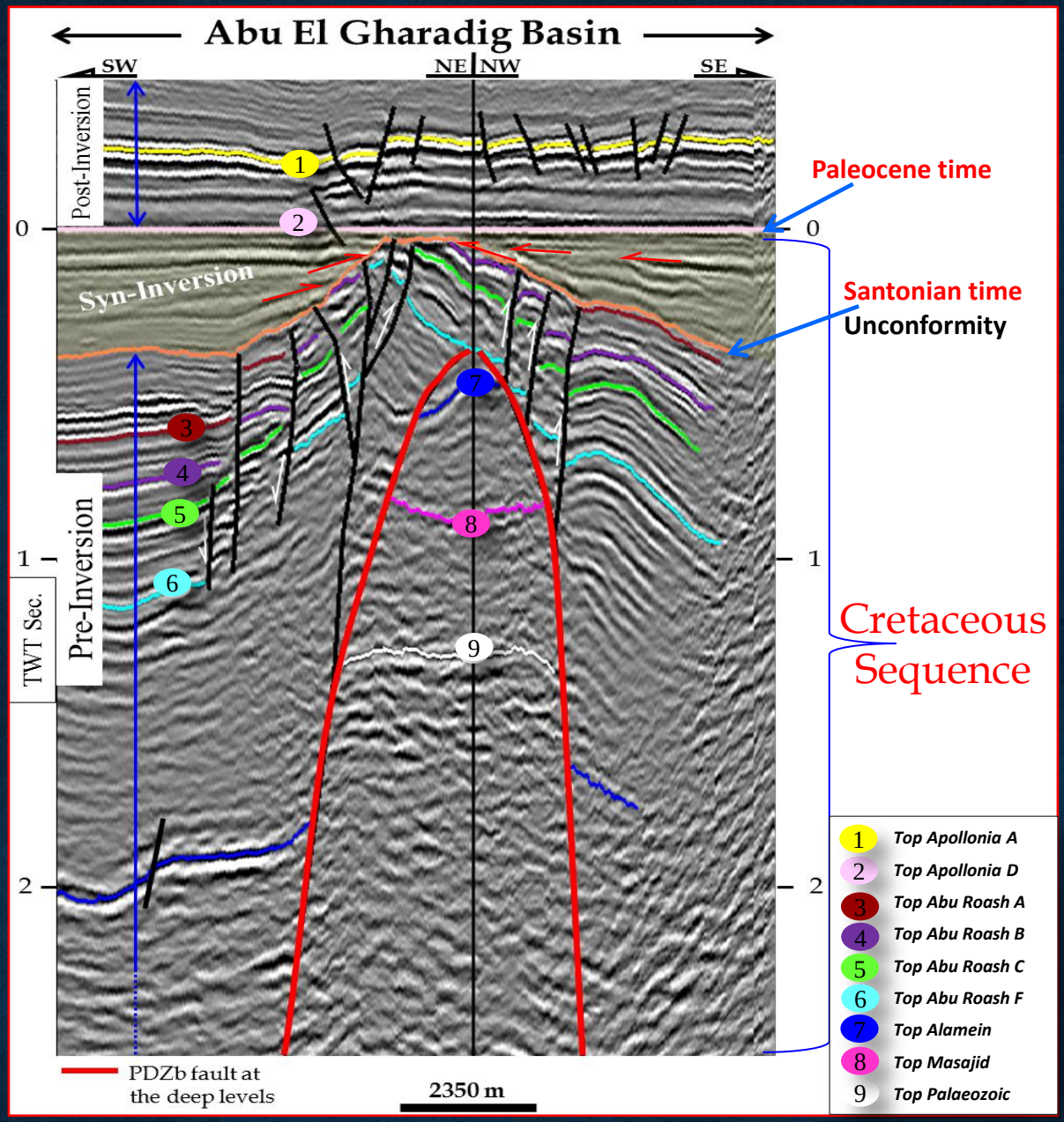
# BED17 New structural interpretation



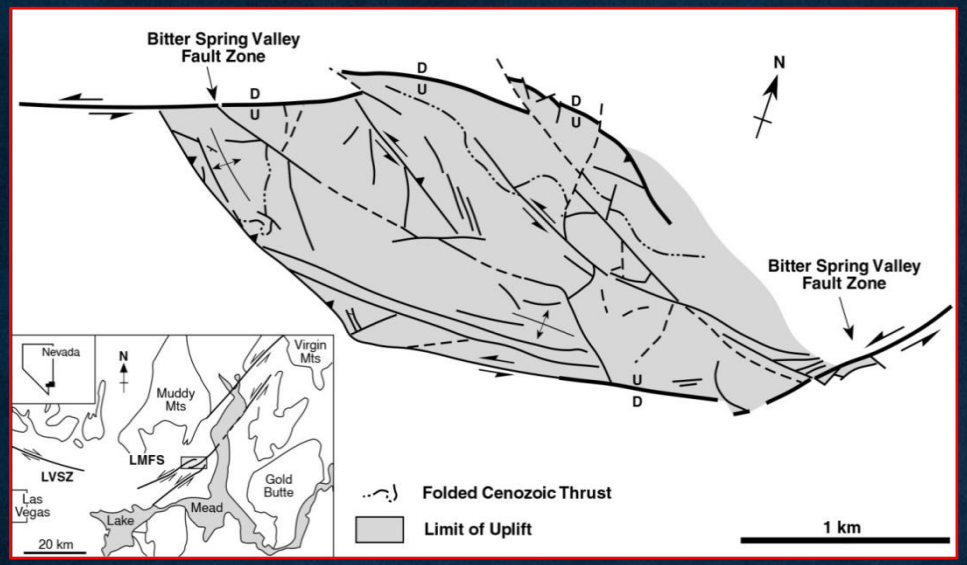
# BED17 New structural interpretation



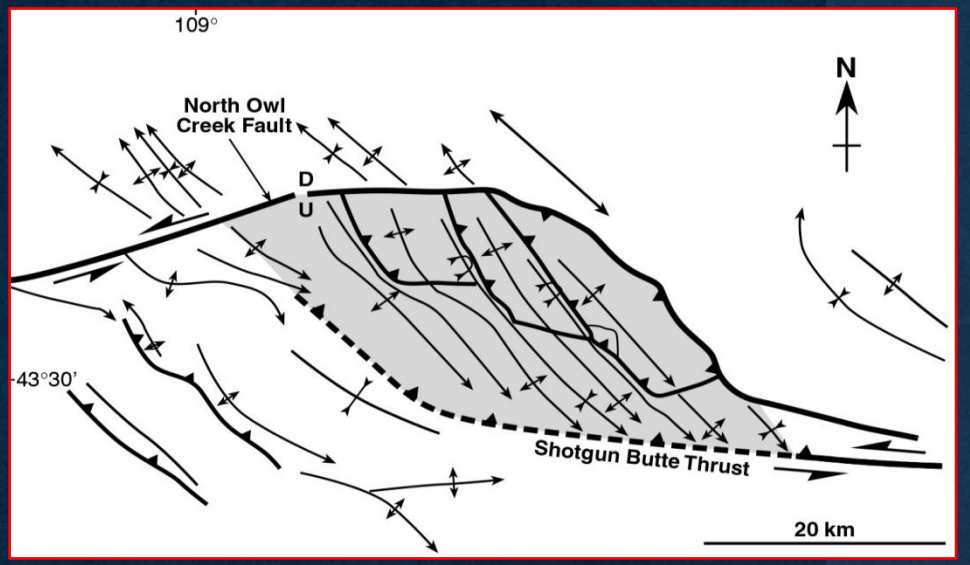

# BED17 New structural interpretation



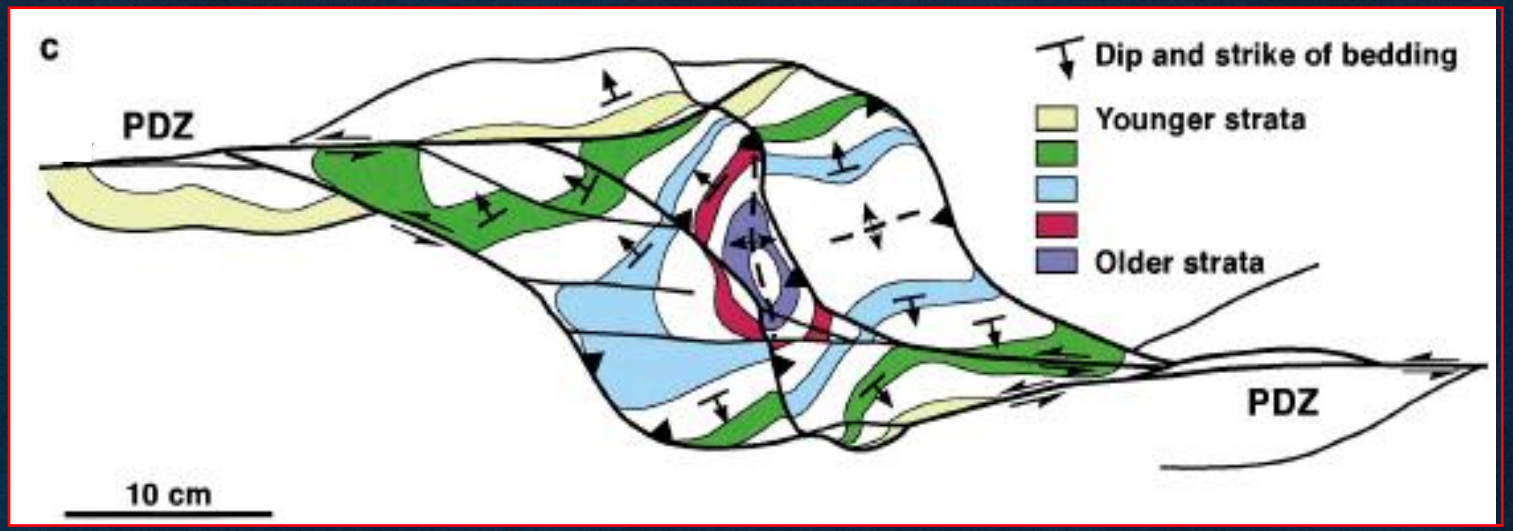
# Outcrops &Experimental Examples of Pop-Up Structures




Echo Hills, Southeastern Nevada, USA

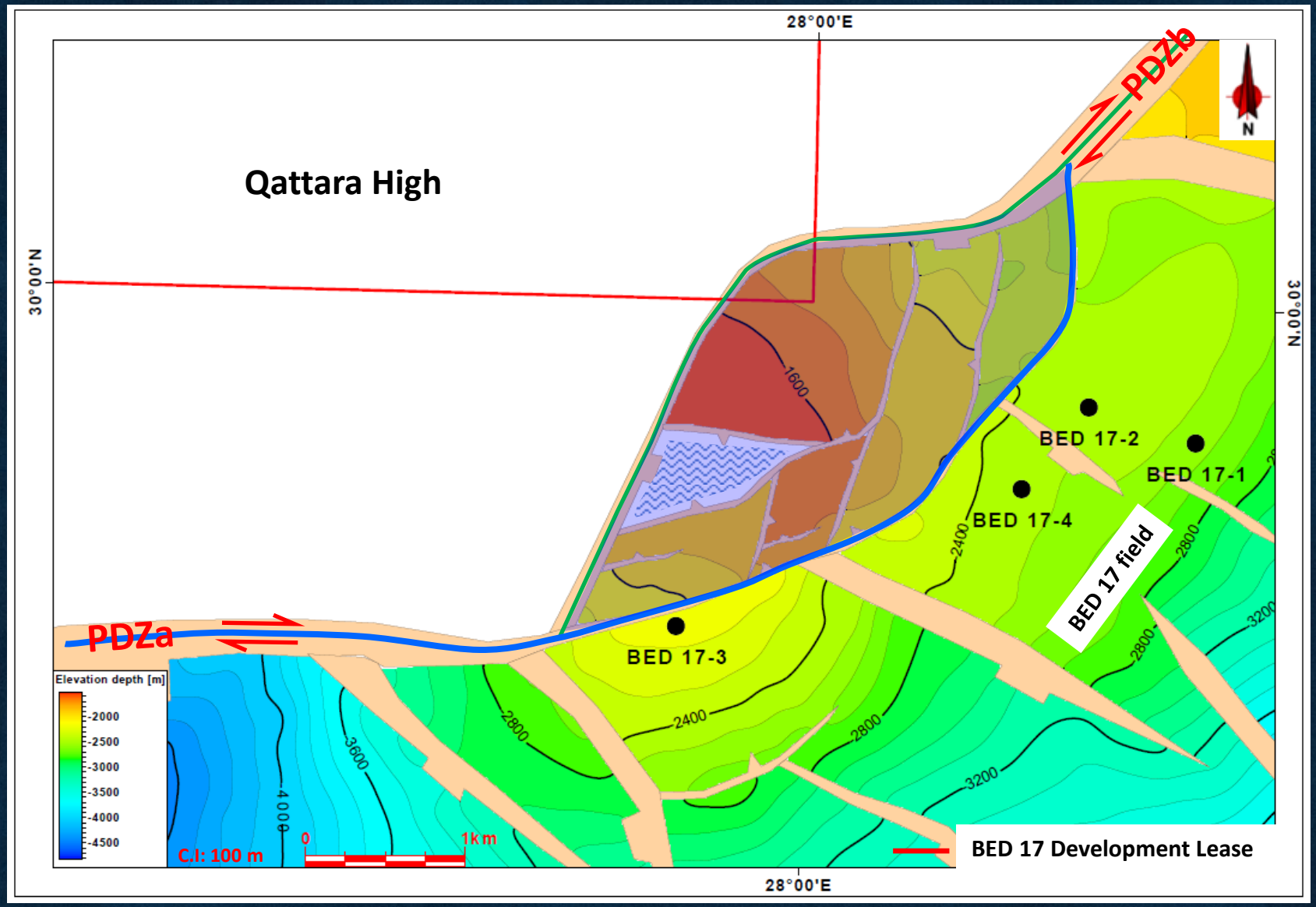



Owl Creek Mountains, Central Wyoming, USA




(after McClay, 2001.)

# Hydrocarbon Potentiality




## Abu Roash-C Depth Map

# Conclusion

- The northwestern desert was affected by Syrian arc deformation, which is evident by the BED 17 field structural interpretation .
- This model shows strong similarities in structural geometries to the analog models from natural and experimental examples of pop-up structures.
- BED 17 field is a good structural example of restraining stepovers in dextral strike-slip fault systems.
- The new field map provides a better understanding of the field and drilled wells.
- Impact: upside potential and new drill locations.