Increasing Interpreter Capability in Structurally Complex Settings*

John G. Solum[1], Steve Jolley[2], Ron Lawson[3], and Steve Naruk[4]

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[1]Shell Global Solutions BV, Rijswijk, The Netherlands (j.solum@shell.com)
[2]Shell Canada Limited, Calgary, AB, Canada
[3]Shell Global Solutions Inc., Houston, TX, USA
[4]Shell International Exploration and Production, Houston, TX, USA

Abstract

Interpretation of faulted reservoirs is hindered by an industry-wide lack of structural specialists, which in turn hinders the development of structurally proficient interpreters. The consequences of this are interpretations that violate geological rules, which ultimately lead to expensive errors since fault property predictions and reservoir flow models based on invalid interpretations are meaningless.

Introduction

Two related strategies to address this problem are 1) focused training using paper maps, outcrop visits and digital models of the same structures, and 2) development of automated QA/QC tools that guide the non-specialist during interpretation, in essence providing a virtual structural geologist.

Discussion

The first component of the focused training is to provide participants with a structure map with data near faults removed to simulate seismic no-data zones and structural uncertainly (Figure 1). Participants are tasked with drawing fault polygons that honor simple rules such as conservation of throw at fault intersections, identification of fault tips, and consistent sense of offset along strike. The second component is a visit to the outcrop from which the paper map was derived, providing the opportunity for modifying their maps. The final component provides participants with a digital model (with or without synthetic seismic) of the outcrop, giving them the opportunity to create a geologically valid interpretation that can be used for fault property prediction or reservoir model creation.

Summary

This three-pronged training provides grounding in structural geology, and lets interpreters know the rules that their fault framework models should obey. Once the interpreters are working in the digital realm, automated QA/QC tools help them keep their structural skills fresh. These tools include ensuring that fault planes do not change vergence, that the sense of offset does not change along strike, that relays are not interpreted across, and that faults have realistic fault throw profiles and length throw relationships. Applying these tools during interpretation saves time by ensuring that 'busts' are caught and fixed before they become institutionalized, and also close the gap between the geophysicist/seismic interpreter and the geologist/static modeler.

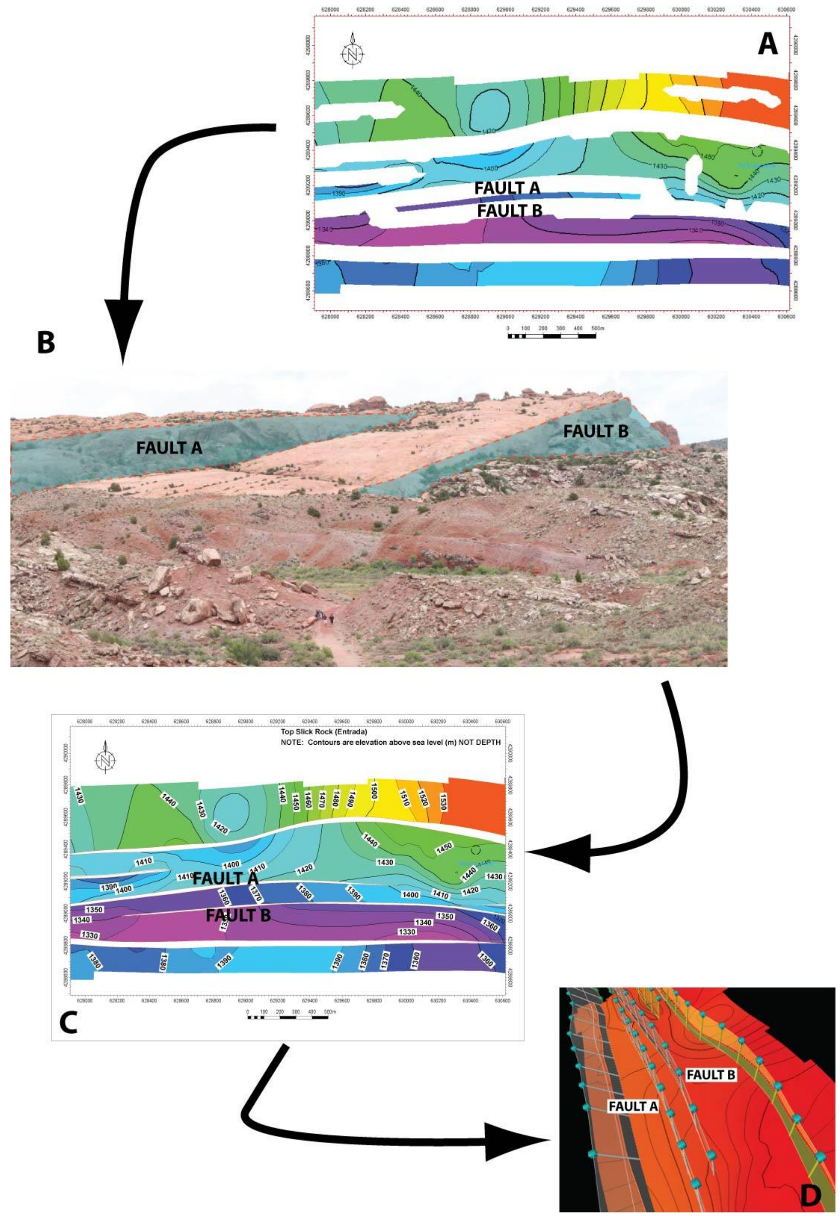

Figure 1. (A) Example of a map with gaps representing no data zones, (B) outcrop photograph of the map area, (C) Geologically-valid map created by using an outcrop visit to fill in the gaps in the map shown in A, (D) Fault framework model of the fault system (Delicate Arch area, Arches National Park, Utah).