Reconstructing Ancient Petroleum Systems: An Example from the Ghadames-Illizi System of North Africa*

Mike Bourne [1], R. Dixon[1], T. Dunn[1], B. Haig[1], J. Hossack[1], J. Moore[1], T. Parsons[1] and C. Simmons[1]

Search and Discovery Article #30080 (2009)
Posted March 31, 2009

*Adapted from oral presentation at AAPG International Conference and Exhibition, Cape Town, South Africa, October 26-29, 2008

[1]BP North Africa Regional Team, Sunbury, London, UK (mbourne@bp.com)

Abstract

The Ghadames-Illizi Basin system of North Africa is a large sedimentary system (Figure 1) that has formed a highly productive petroleum province with a long history of exploration success (Figure 2), but is still considered to provide attractive exploration targets. Basin formation has been characterized by multiple phases of subsidence and inversion events, with stratigraphy ranging in age from Cambrian to Pliocene (Figure 3). Two main source rocks of different geological age but similar depositional environment and geochemical character and complex burial histories complicate the understanding of the petroleum system, which is key to exploration success. Migration trajectories are strongly influenced by basin development, the presence of regional seals and stratigraphic relationships formed across unconformities. Capturing such complexity in order to make predictions is challenging without the aid of 3-dimensional basin reconstruction and fluid flow modeling software ('basin modeling'). If basin modeling techniques are to be optimally applied in such settings a fully integrated approach involving sedimentologists, structural geologists, geophysicists and geochemists is required (Figure 4). A modeling approach, workflow and some results are presented.

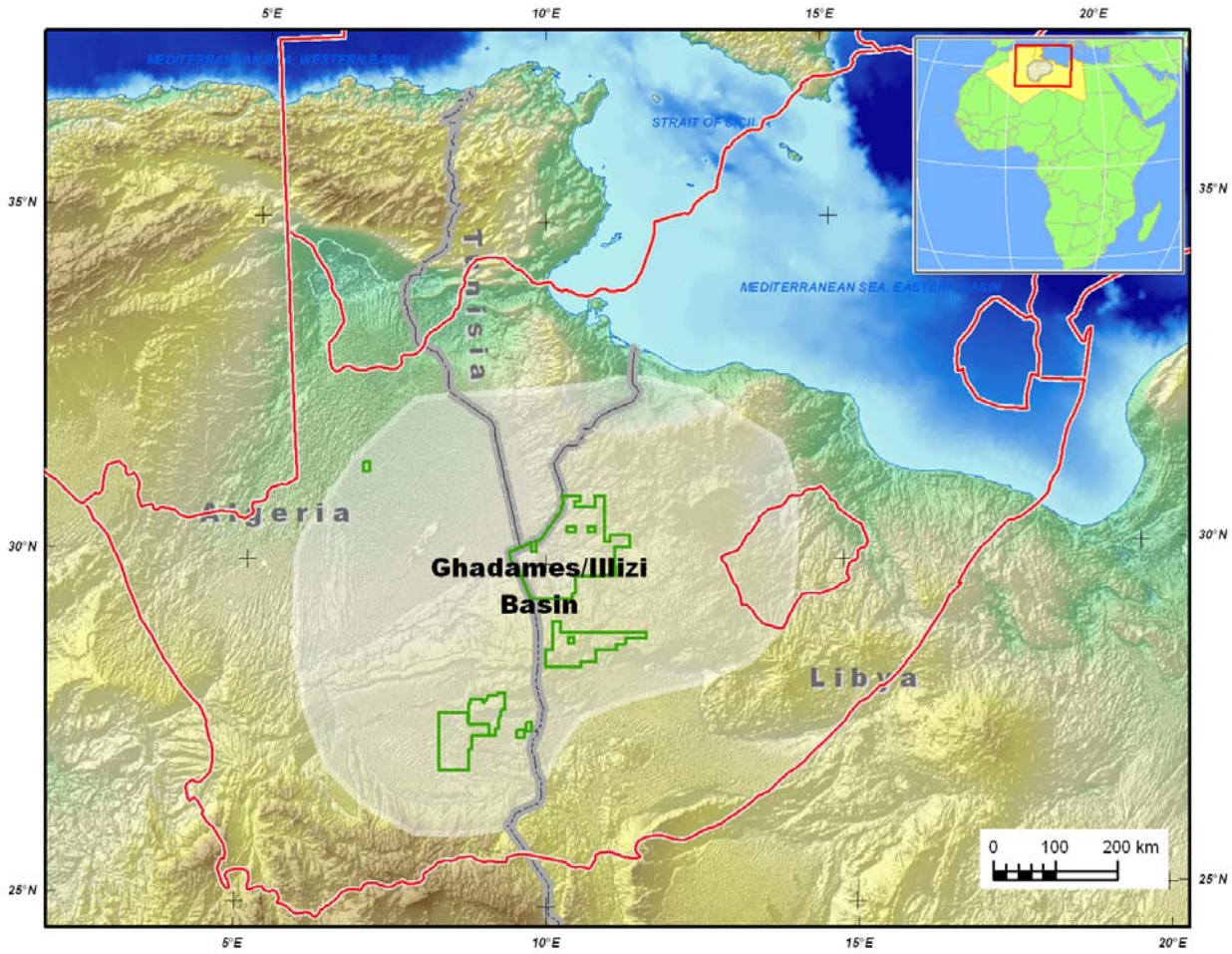

Figure 1. Location map for the Ghadames-Illizi basin system of North Africa with an overlay of South Africa for comparison.

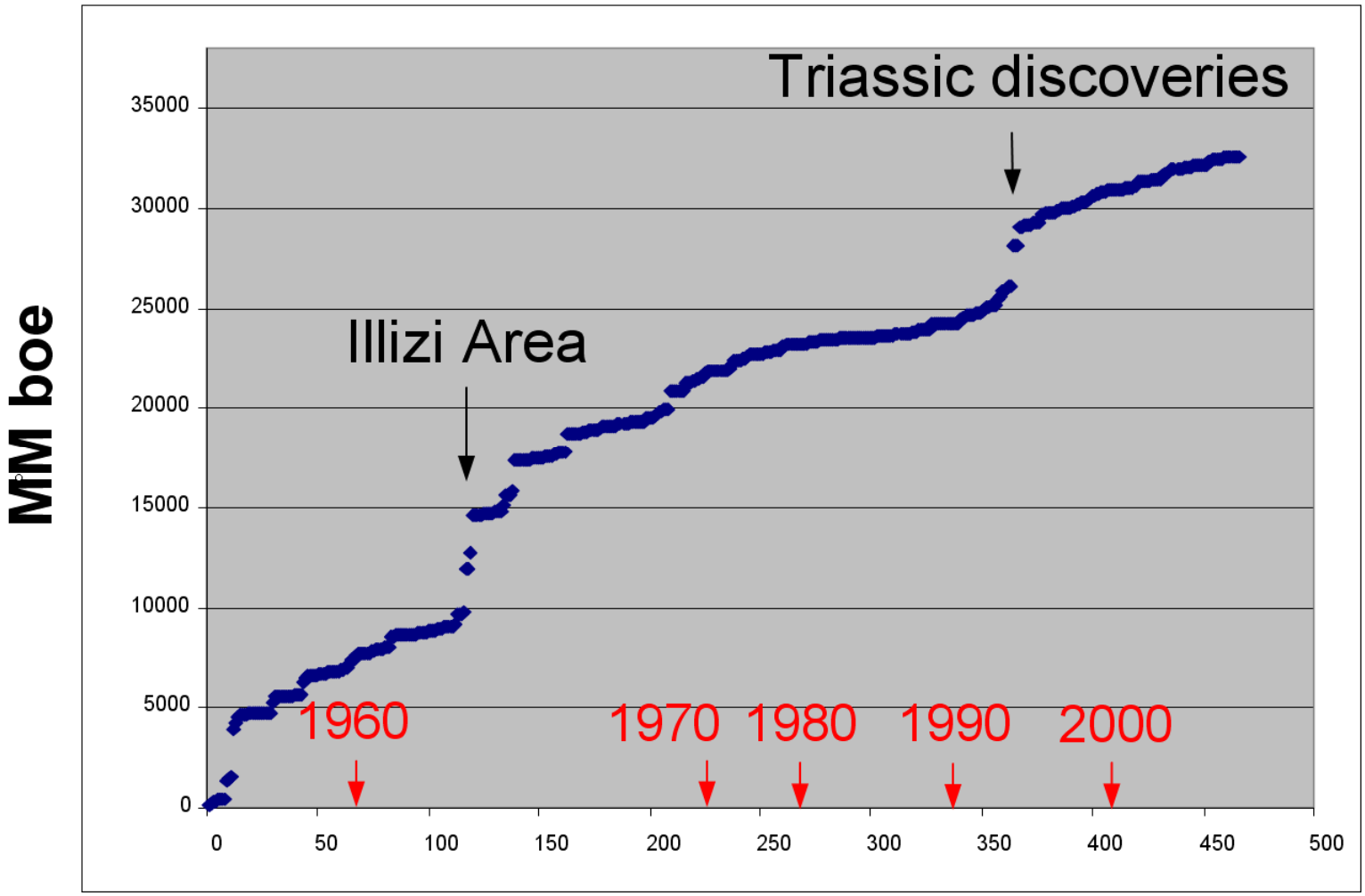

Figure 2. Creaming curve for the Ghadames-Illizi basin system of North Africa; over 32 B boe have been found to date.

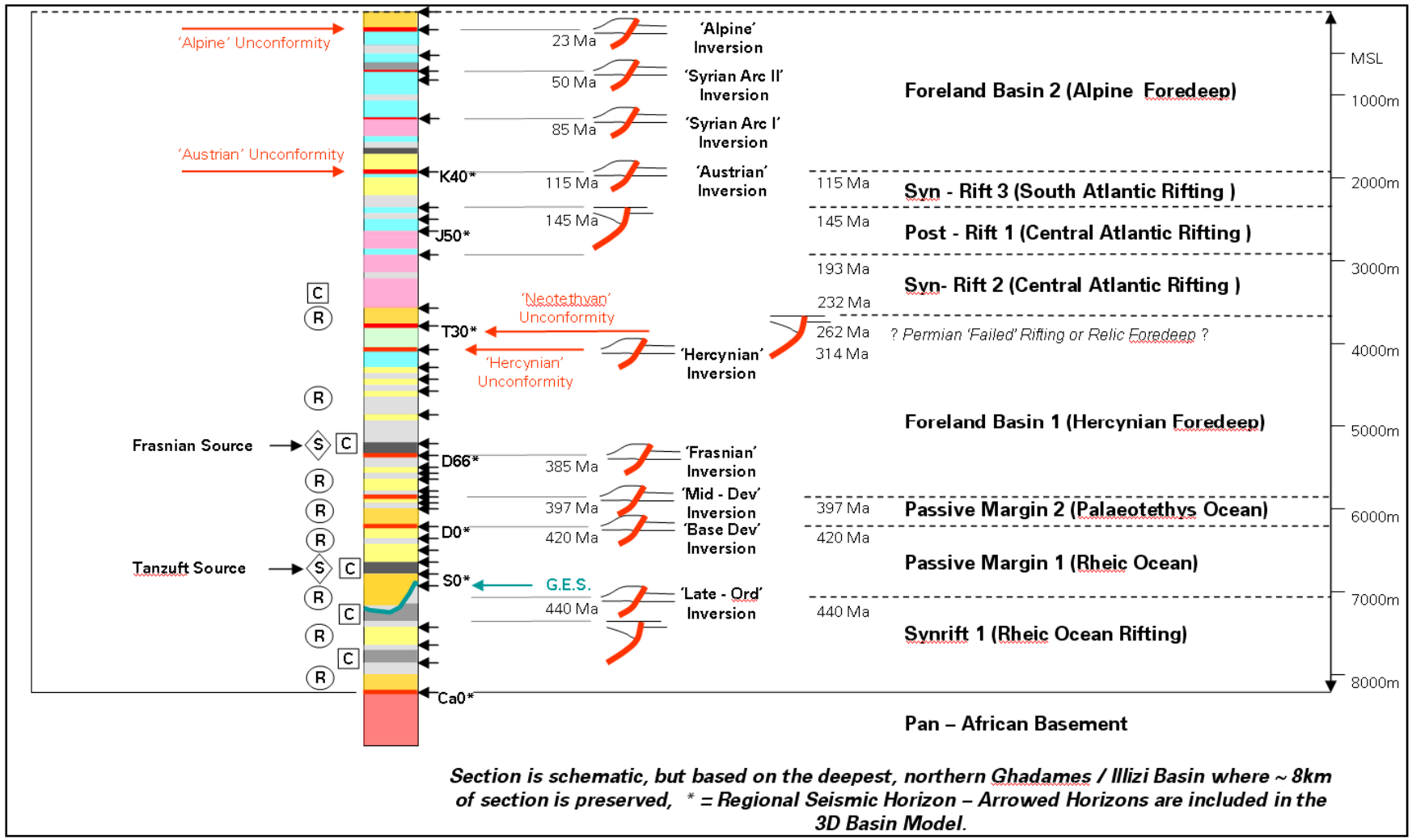

Figure 3. Tectono-Stratigraphic column and petroleum systems of the Ghadames-Illizi basin.

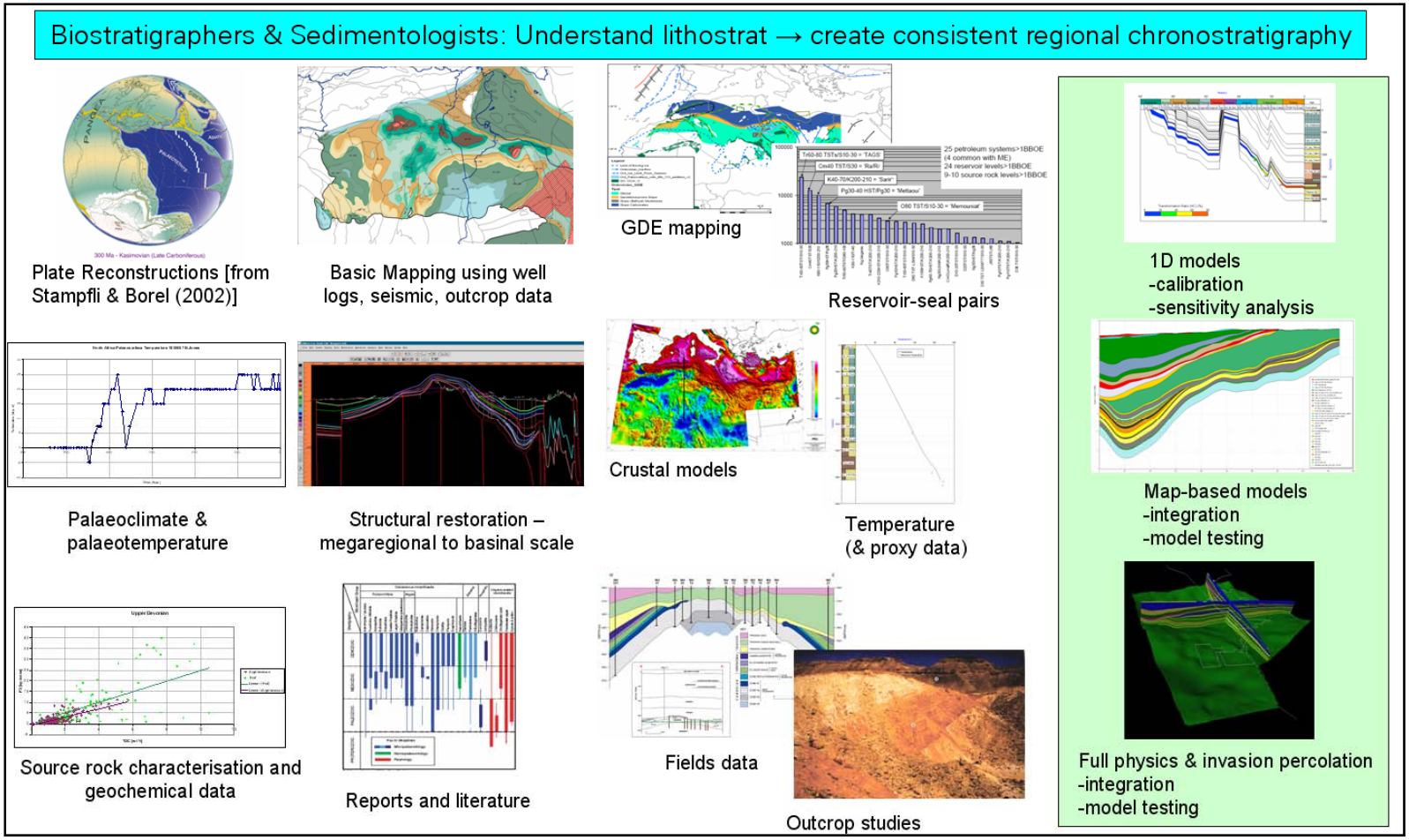

Figure 4. Illustration of the fully integrated and multi-disciplinary approach taken to understand Ghadames-Illizi Basin and its petroleum system(s).

Reference

Stampfli, G.M. and G.D. Borel, 2002, A plate tectonic model for the Paleozoic and Mesozoic constrained by dynamic plate boundaries and restored synthetic oceanic isochrones: Earth and Planetary Sciences Letters, v. 196, p. 17-33.