Geophysical Research Abstracts, Vol. 9, 11183, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-11183

Chaotic megabreccias and deep water carbonate facies, Lower Oligocene, Costa Blanca, Spain

J. Bova (1), S. Agar (2), A. Derewetzky (3), N. Hartley (4), P. Hillock (5), T. Hughes (6), C. Iannello (7), A. McKerron (8), and T. Simo (9)

(1) ExxonMobil Upstream Research Company, Houston, USA, (john.a.bova@exxonmobil.com / Fax: +1 713-431-6166 / Phone: +1 713-431-7620, (2), ExxonMobil Upstream Research Company, Houston, USA, (3), ExxonMobil Exploration Company, Houston, USA, (4), ExxonMobil Development Company, Houston, USA, (5), ExxonMobil Development Company, Houston, USA, (6), ExxonMobil Upstream Research Company, Houston, USA, (7), ExxonMobil Production Company, Houston, USA, (8), Esso Australia LTD, Melbourne, Australia, (9), ExxonMobil Upstream Research Company, Houston, USA,

Deep-water, allochthonous carbonate reservoirs have important economic significance but, the distribution and reservoir potential of these types of carbonates have not received much attention. Recent studies in SE Spain suggest that a significant thickness of chaotic deposits can occur along a tectonically active margin but, may have large lateral and vertical heterogeneities. Oligocene strata near the town of Villajoyosa in the Costa Blanca region of eastern Spain comprise a variety of allochthonous and autochonous carbonate platform, slope and basin lithologies. These sediments provide an analogue for sub-surface deposits similar to those observed in seismic images in other parts of the world. Members of the ExxonMobil Carbonate Internship Program conducted an integrated field study using photo-pans, measured sections, and aerial photographs to understand the facies, geometries, and processes that impact reservoir distribution and quality.

Huge chaotic megabreccias up to 40m thick occur at the base of the measured sections, and are interbedded with and overlain by grain and matrix supported conglomerates, bio- and lithoclastic grainstone to lime wackestone, and argillaceous mudstone. Megabreccias are generally tabular and laterally discontinuous bodies that are bounded by erosional basal surfaces or basal glide planes developed on argillaceous

limestone. Brecciated clasts and cobbles within the megabreccias are comprised of a variety of slope, margin and platform derived lithologies that are organized into repetitive packages. Megabreccias are orverlain by and pass upward into thick-to-thin bedded carbonate turbidites and hemipelagic limestones. The turbidites are weakly confined channels and sheet deposits that are laterally continuous up to several kilometers. Turbidites locally amalgamate into units that are several meters thick and have basal scour surfaces and graded bedding.

A wide range of transport mechanisms ranging from slumps/slides to high- and low-density turbidity currents and submarine rock falls have been interpreted from sedimentary structures and syn-depositional deformation features. Chaotic megabreccias probably formed in response to catastrophic depositional events possibly associated with faulting or gravitational collapse of margin and slope sediments. These deposits formed during tectonic activity in the Betic range, and gravitational instabilities may have been triggered by faulting and locally may have been overprinted by near-surface Betic contraction. Other triggering mechanisms such as eustacy are possible but, difficult to prove given the coeval carbonate margin is not exposed. Polyphase intraslope deformation and re-deposition are clearly supported in the lower part of the sequence and may represent progressive back-cutting of the carbonate margin. Change in debrite clast composition upward in the sequence reflects the progressive erosion of the platform from margin to interior. Thicker-bedded and coarser, amalgamated turbidites overlie megabreccias and conglomerates and appear to fill in differential topography on the slope between slides. The turbidites pass upward into thin-bedded and finer-grained turbidites and hemipelagic limestones. Thin-bedded turbidites show no apparent cyclicity and are distributed over a wide area.

Reservoir quality appears to be limited by poor-sorting, lateral heterogeneity and a lack post-depositional meteoric dissolution, nevertheless, the predominantly grain-dominated succession provides a positive analogue for similar facies elsewhere in the geological record. Partly sealed and locally abundant fractures observed in these outcrops could also enhance porosity and permeability.