

Public Abstract

First Name:Ajit

Middle Name:

Last Name:Joshi

Adviser's First Name:Martin

Adviser's Last Name:Appold

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SP 2012

Department:Geology

Degree:MS

Title: EVALUATION OF SOLITARY WAVES AS A MECHANISM FOR OIL TRANSPORT IN ELASTIC POROUS MEDIA: A CASE STUDY OF THE SOUTH EUGENE ISLAND FIELD, GULF OF MEXICO BASIN

Oil and natural gas in shallow reservoirs of the Eugene Island 330 field in the Gulf of Mexico basin are thought to have migrated rapidly along low permeability sediments of the Red fault zone as discrete pressure pulses, i.e. solitary waves, from source rocks at depths of about 4.5 km. The aim of this research was to evaluate the mechanics of solitary wave formation and motion and wave oil transport capability. A two-dimensional numerical model of Eugene Island minibasin formation predicted overpressures at the hydrocarbon source depth to increase at an average rate of 30 Pa/year, reaching 52 MPa by the present day and oil velocities of millimeters per million years, too low for a kilometer scale oil transport to fill shallow Plio-Pleistocene reservoirs within the 3.6 million year minibasin history.

Calculations from a separate one-dimensional model that used the pressure generation rate from the two-dimensional model showed that solitary waves could only form and migrate within sediments that have very low permeabilities between  $1\text{E-}25$  to  $1\text{E-}24$  meters squared and are highly overpressured to 91-93% of lithostatic pressure. Solitary waves were found to have a maximum pore volume of 100,000 cubic meters, to travel a maximum distance of 1-2 km, and to have a maximum velocity of 0.001 m/yr. Based on these results, solitary waves are unlikely to have transported oil to the shallowest reservoirs in the Eugene Island field, but they could be important agents for oil transport in other locations where reservoirs are more proximal to the source rocks.