Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07779, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07779
EGU General Assembly 2008


# Lacustrine Organic Matter (LOM) in a saline to hypersaline system: Tracking the relationship between modern depositional environments and organic matter formation and distribution

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Strategies behind oil and gas prone exploration have been traditionally relied upon the presence of marine source rocks. The last quarter of the 20th century, however, was marked by a major development of lacustrine source oil fields in several areas of Africa, Australia, Brazil, China, Indonesia, Russia and the western United States. As a consequence, there has been an increasing interest to characterize depositional settings of these oil generative sequences and their modern analogues. Most of the current-day lacustrine source-models for petroleum exploration are based on the Green River Formation that represents the maximum expansion of the Eocene freshwater Lake Uinta. Hence, these new developments are challenging original interpretations concerning organic facies characterization and distribution. As a result, there is an urgent need to develop alternative analogue models that can be used in different areas. The goal of this study is to foster a new model for lacustrine organic matter (LOM) formation and deposition, with special emphasis on understanding the complex relationship between environmental factors, lake level fluctuations, water chemistry and organic matter production/preservation. Located in the Pampean plains of central Argentina, Laguna Mar Chiquita is a closed-lake basin that has evolved in a tectonic depression formed during the Pleistocene. At present, it is the biggest saline to hypersaline lake

in South America (˜6000 km2). One of the most relevant features of this lake are the large water levels fluctuations induced by changes in rainfall particularly since the second half of the 20th century. Decadal variability in the water budget have dramatically affected primary productivity, mineral precipitation, sediment distribution and associated biological processes in the lake system which has been historically- and instrumentally-recorded. Petrophysical, sedimentary and organic geochemical analyses in a series of well-dated sedimentary cores provide us with unique information to model LOM facies distribution. Pigments preserved in the sediments are used to investigate the organic matter delivered to the basin allowing to identify the source and quality of the LOM and further evaluate its potential to generate hydrocarbons. This model can be further applied to the exploration and development of oil fields at different time windows such as those associated with South Atlantic marginal basins (e.g., Araripe, Sergipe/Alagoas and Reconcavo in Brazil).