

## Post-Rift Hydrocarbon Systems, Greater Amazon Mouth, Brazil: Transition from Shelf to Basin and Source Distribution Controls

Three post-rift marine petroleum systems in the Amazon mouth are characterized, with maturation, migration, and Neogene reservoir distribution controlled by rapid deposition related to Andean tectonics. Two of the potential hydrocarbon source intervals (Upper Cretaceous and Paleogene) are present on the shelf and upper rise, but their basinward extension is only inferred (Fig. 1). Extrapolation of potential sources from the shelf into the basin requires an understanding of the controls on distribution and preservation of organic matter. Amazon mouth sources have three main controls: (1) paleogeography, (2) oceanic conditions, and (3) terrestrial river input (Fig. 2).

The Upper Cretaceous (Limoeiro) clastic source rock is well documented on the shelf, where it is of fair to good quality (TOC 1%–5%, HI 150–500). The source rock quality should improve basinward where terrestrial input and siliciclastic dilution decrease. Source rock thickness may be a risk, but oil-prone, clastic-starved marine shales are predicted in the deep basin. Primary controls on the distribution of the Turonian source rock are productivity and oceanic circulation.

The Paleogene (Amapa) source rock also occurs on the shelf, but is less oil-prone (TOC 1%–5%, HI 200–350) than the Upper Cretaceous source rock in the area. Based on map distribution and biomarker data, we interpret this source to be limited to a back-reef lagoonal environment and absent seaward of the carbonate shelf edge. The key to better organic enrichment is interpreted to be paleogeography: carbonate highs cause restricted circulation and increase the potential for organic preservation.

Source rock potential is also postulated for the Miocene–Pleistocene (Pirarucu) interval. Tropical Tertiary age

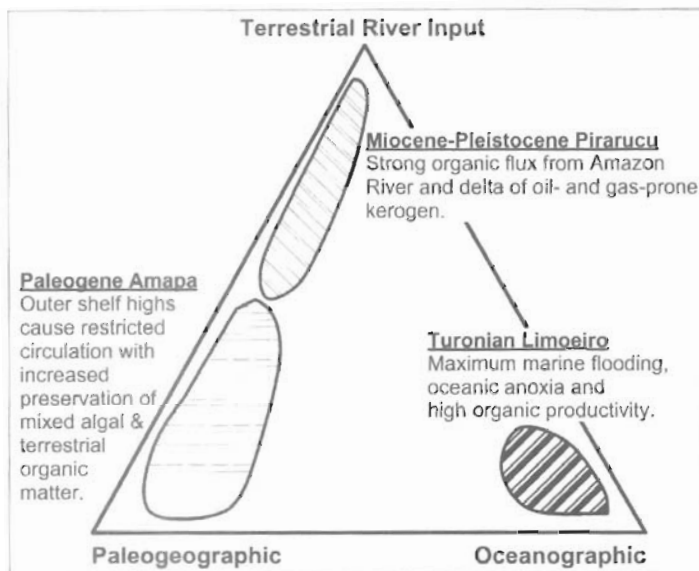
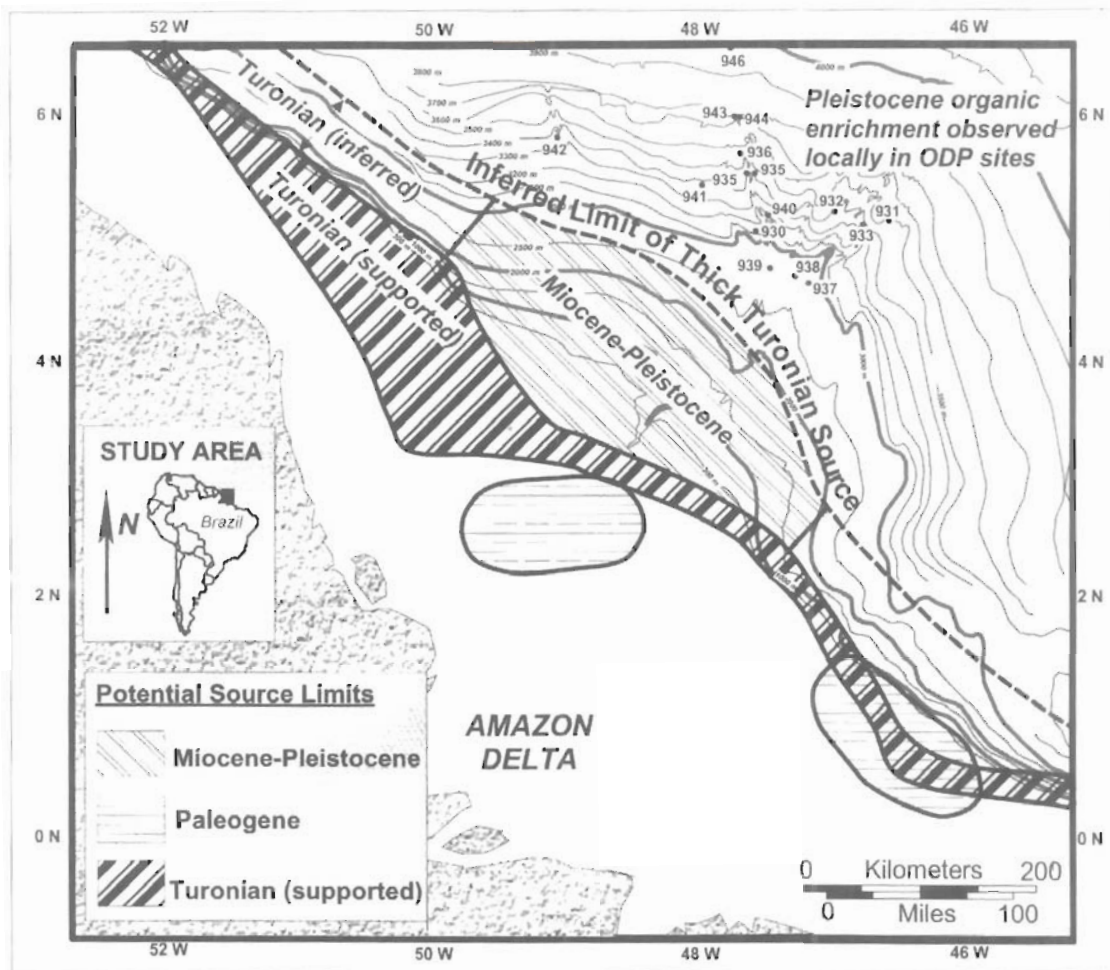
deposits around the world have produced hydrocarbons with distinctly terrestrial signatures, and some of these systems produce large amounts of oil. The Amazon mouth region possesses many attributes which could allow terrestrial sources to be capable of oil generation, but more data are required to test this concept.

Hydrocarbon maturation is driven by rapid Miocene-to-present burial that causes the Limoeiro to be locally overmature. Postulated Pirarucu sources may be mature for oil in some areas. Rapid sedimentation resulted in deep listric faults, shale diapirs and toe-thrust structures that provide abundant vertical migration pathways. The presence of interbedded Tertiary sources and sands would allow for simple migration scenarios.

### Biographical Sketches

**David M. Advocate** (M.S., 1983, California State University, Northridge) is a geological associate at EEC with 16 years of E&P experience. His main area of expertise is hydrocarbon systems analysis. **Steven W. Young** (Ph.D., 1975, Indiana University) is a geophysical associate at EEC with 22 years of experience in minerals, oil, and gas exploration. His main interests are sequence stratigraphy, and reservoir geometry and quality. **Art H. Ross, Jr.** (M.S., 1965, Virginia Tech) has more than 33 years of domestic and international oil and gas exploration experience. He has conducted geological surveys in Colombia as a captain in the Corps of Engineers. His main area of expertise is seismic interpretation and regional geology. **Thomas P. Buerkert** (completed doctoral studies at Louisiana State University, 1997) has been with EEC for nearly two years as a senior geophysicist. His main area of expertise is trace element geochemistry and application in paleoceanography. **Jack E. Neal** (Ph.D., 1994, Rice University) is a senior research geologist and serves as group leader for

**Figure 1.** Potential source limits for the Amazon Mouth Basin.



**Figure 2.** Main controls on source development.

source evaluation and petroleum geochemistry studies at EPR. He has nearly five years of oil and gas industry experience, and his principal interests are tectonics and sequence stratigraphy. **Keith I. Mahon** (Ph.D., 1996, University of California, Los Angeles) is a senior research geochemist at EPR and is conducting studies in basin modeling, thermochronometry techniques, and uncertainty analysis. He also has nine years of experience developing aerodynamic vehicle simulations and real-time software for Northrop and Hughes. □

**Reservation Code for this meeting is 5-0-1**

**Note:** Reservation Code numbers for all meetings are listed on the calendar (pages 24-25)



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Photos unavailable for  
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