Transcurrent Faulting and Thermal Wave, Middle Amazon Basin Potential*

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Abstract

An important feature of the Middle Amazon Basin area is its association of transcurrent faults with a thermal pulse caused by magma injection (Figure 6). The transcurrent faults and the connected succession of Reidell conjugates caused widespread fracturing along near-vertical surfaces. Each transcurrent fault has two near-vertical Reidell conjugates (Figure 4). Thus a series of faults amounts to a geometric progression and corresponding fracturing.

All of these faults are clearly indicated and aligned, on the first order on the Precambrian, on both sides of the sedimentary section, and can be traced through the sedimentary section (Figure 7). By horizontal drilling and fracturing, the porosity and permeability can be extended in great concentration, which would improve the potential of the area.

Conclusion

Because of the possible pervasive natural fracturing, which occurred in the Triassic/Jurassic by the generalized transcurrent faulting (Figure 3), the potential for induced additional fracturing by horizontal drilling and fracturing is enhanced. Consequently, there is an accumulation of favorable conditions for the realization of local trial to verify potential of the Middle Amazon Basin.

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- **Fabiano Sayão Lobato**

- **Presented AAPG Geoscience Technology Workshop (GTW)**
- **Shale Plays: An Integrated Approach for Enhanced Exploration Development and Valuation**
- **November 12-14, 2012, Houston, Texas**

Figure 1. The location of Amazon Paleozoic basins. The Upper Amazon Basin covers approximately 70 million acres, and the Middle and Lower Amazon basins cover approximately 130 million acres.

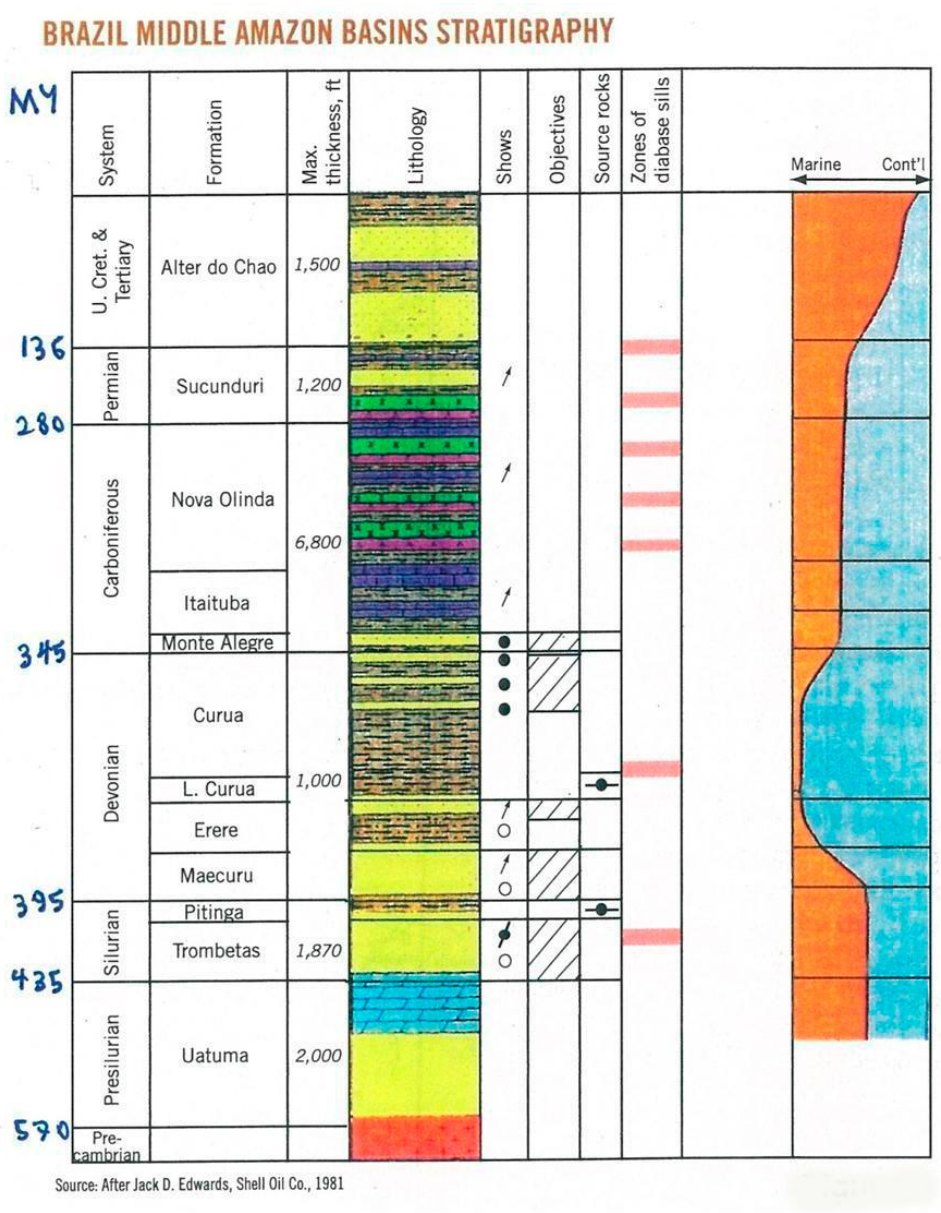

Figure 2. Stratigraphic column, showing the two main source beds: the Devonian Barreirinhas Member of the Curuá Formation, and the Pitinga Formation (by Jack D. Edwards, 1981, retired from Shell Oil Company).

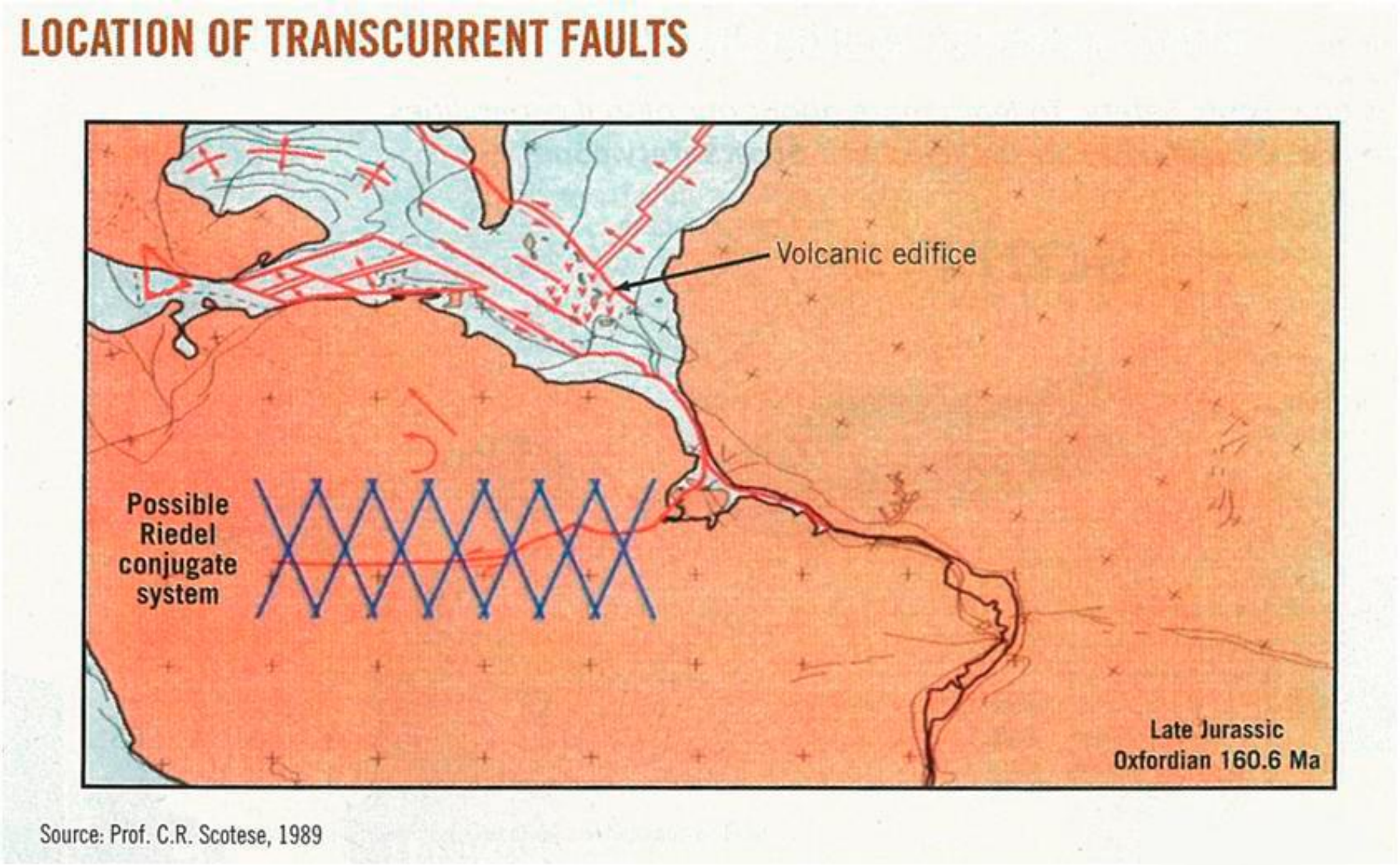

Figure 3. The main transcurrent fault and its conjugate Reidell system (added by Fabiano Sayão Lobato). From Professor Chris R. Scotese, 1989.

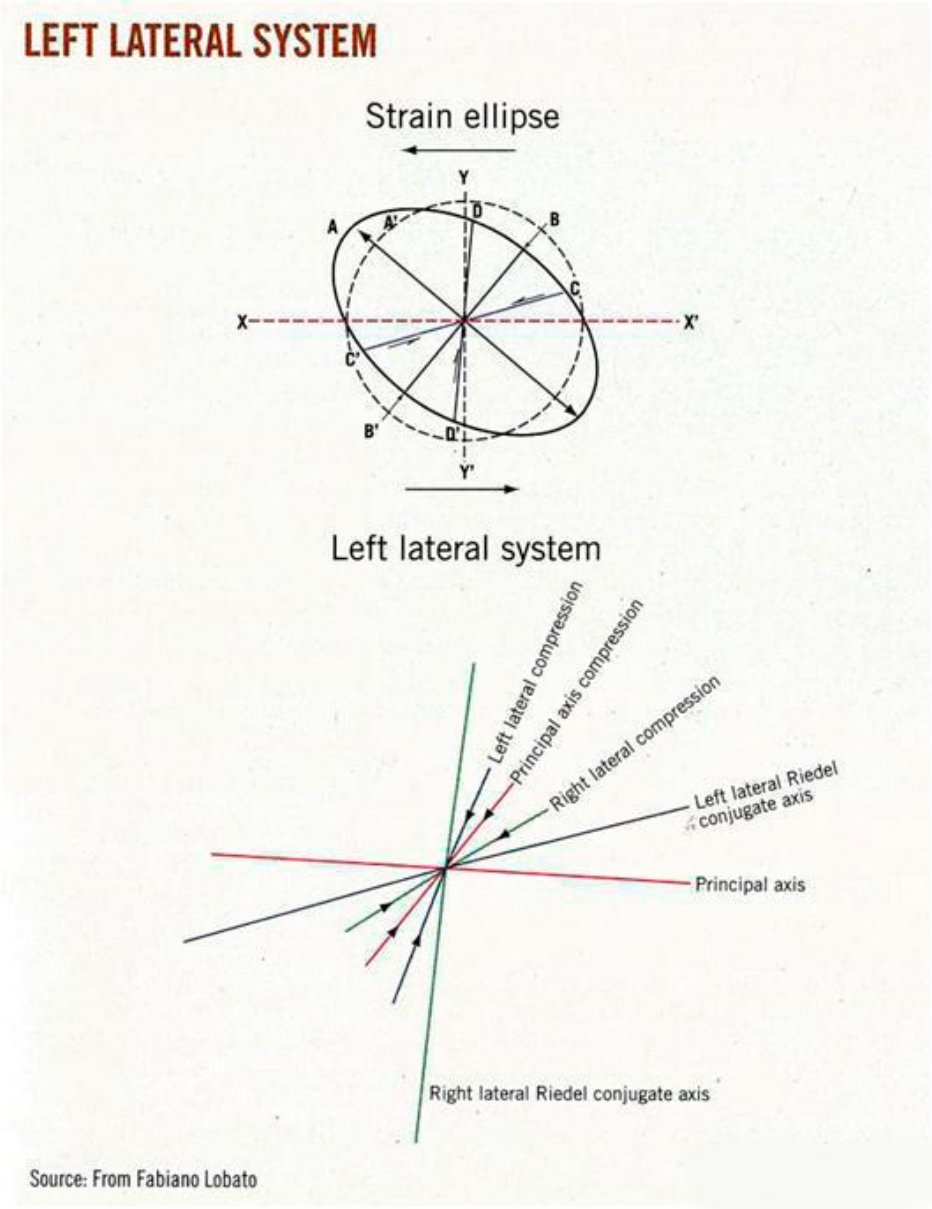

Figure 4. Left lateral system. Starting from a circle, deformation by a left-lateral transcurrent fault produces an ellipse with the associated left and right Reidell conjugates.

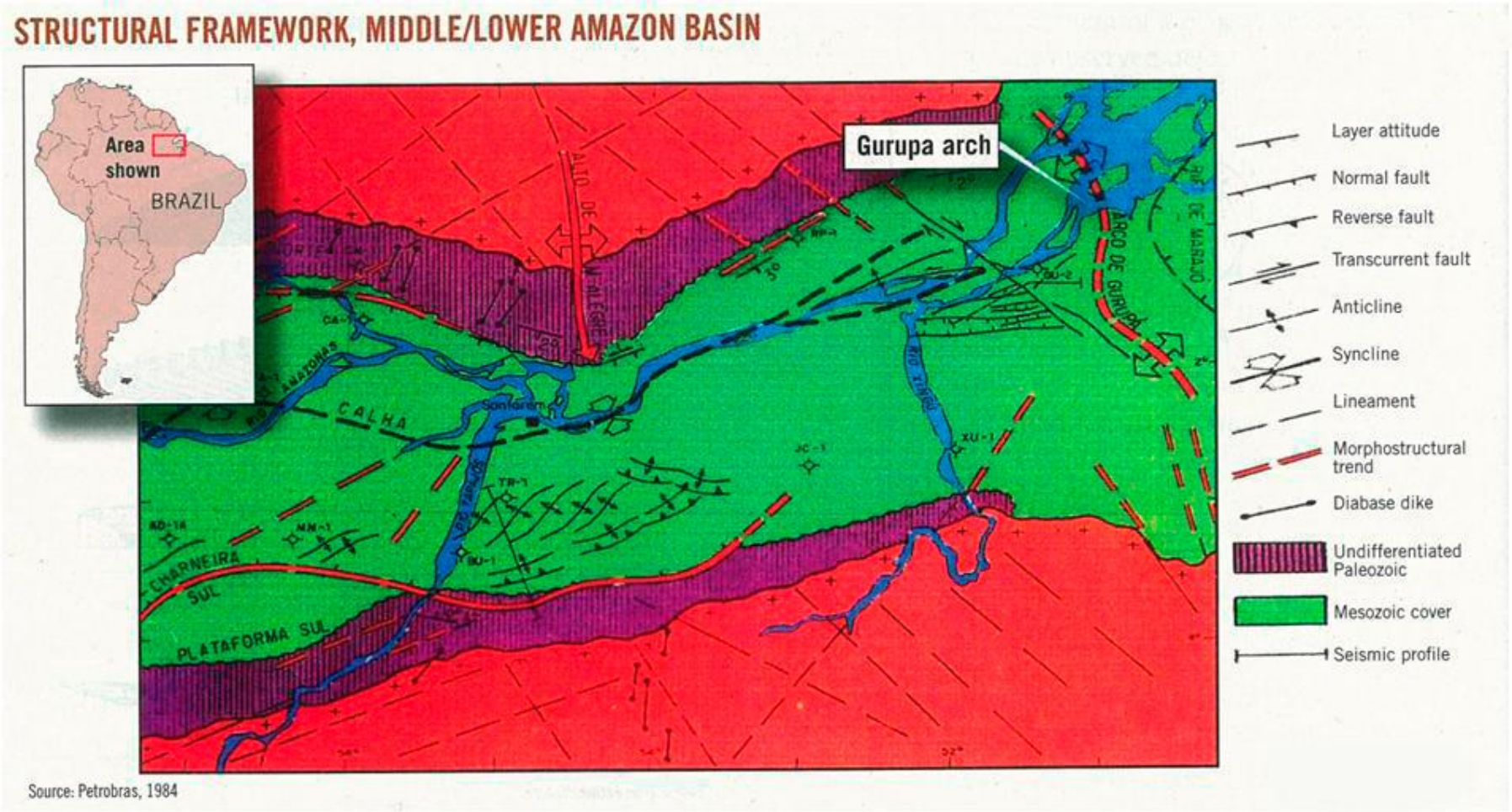

Figure 5. Middle/Lower Amazon basin structural framework. Observe on the east side the right-lateral Reidell conjugate which was traced through the sedimentary section. A left-lateral Reidell conjugate was identified south of the sedimentary section on outcrop. Several Reidell fault systems are parallel. From Petrobras, 1984.

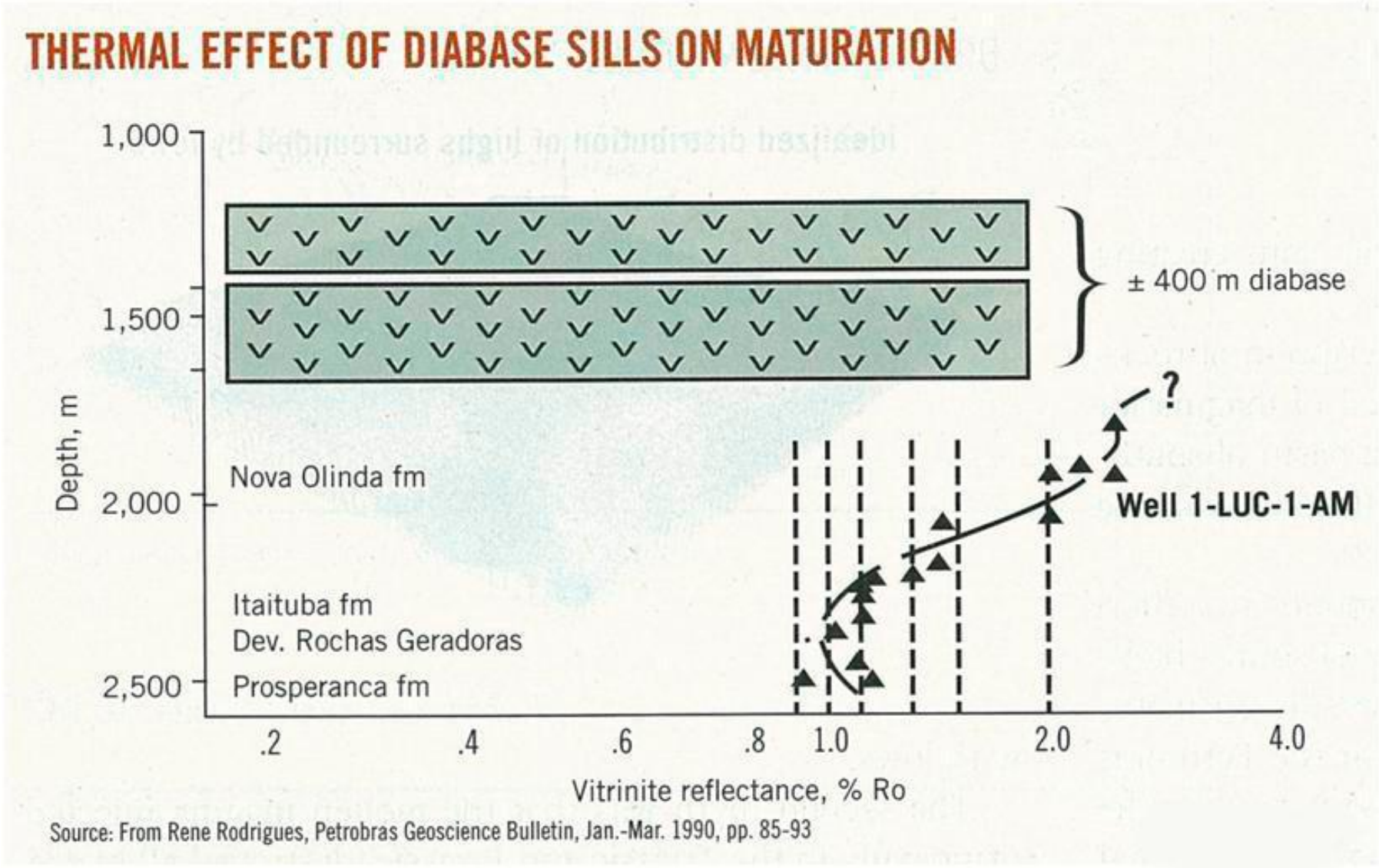

Figure 6. The thermal effect of the injection of magma sills. The maturation is disturbed accordingly to the proximity of the diabase from the hardening of the magma, originating from the mantle after connection to the sediments through the transcurrent main fault. The thermal effect could also be caused by the near vertical dyke, corresponding to the original injection through the main transcurrent fault, or through the near horizontal evaporite layers invaded by the magma. From Rene Rodrigues, Petrobras Geoscience Bulletin, Jan.-Mar. 1990, p. 85-93.

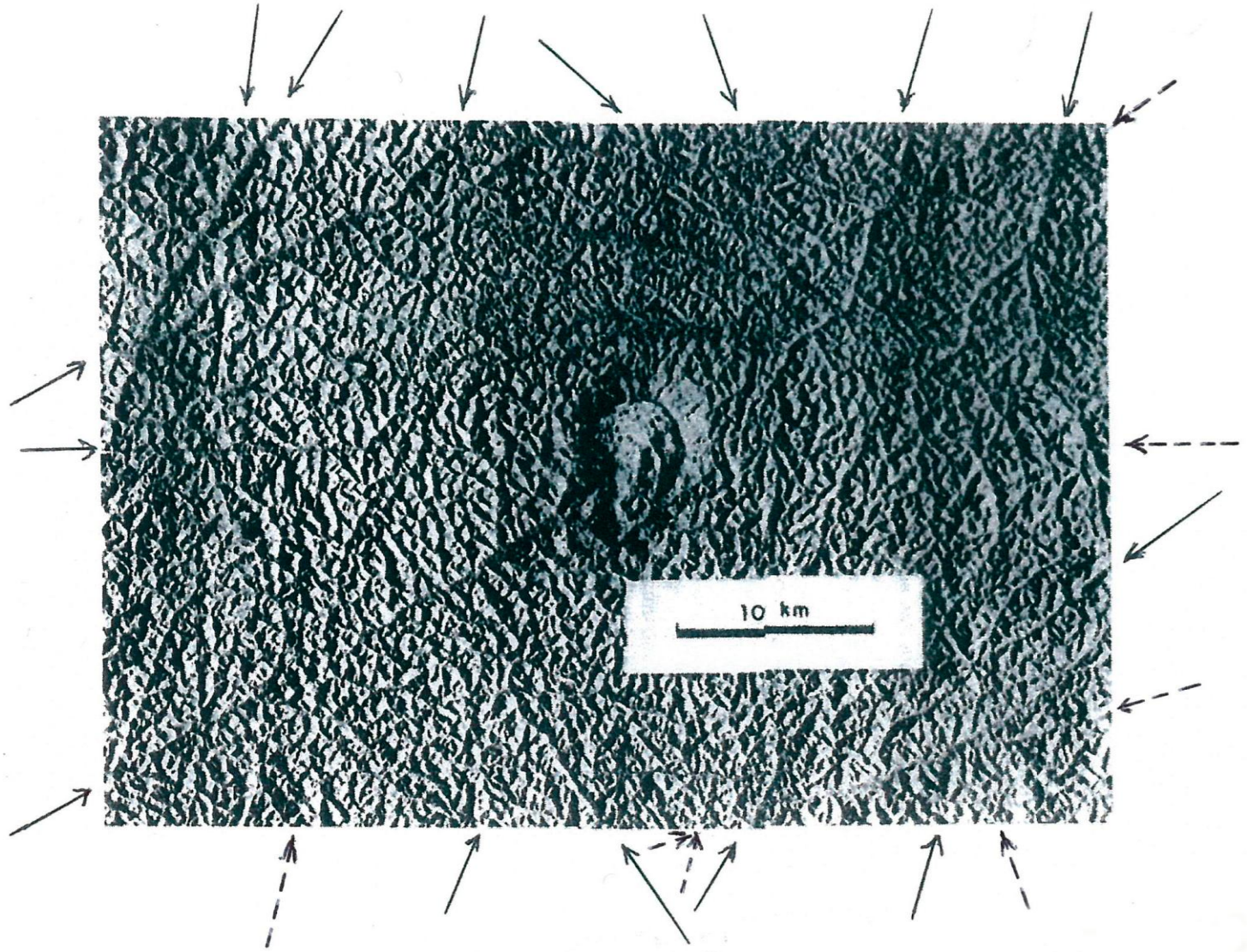

Figure 7. Maicuru Alcaline – ultra basic complex, where the preliminary work of exploration indicated a potential of 5 billion tons of titanium ore in the form of anatase. Also shows several alignments corresponding to Reidell faulting in different directions. A prominent fault strikes adjacent to the volcanic chimney at the center of the figure. Many parallel faults indicate pervasive faulting in the Precambrian that probably extend into the sediments, overprinting and creating a multitude of nearly vertical faults. All the faulting could be expanded by fracking and contribute to drainage of hydrocarbon. From Breno A. dos Santos, 1981, Amazonia Meneral Potential and Development; reproduction of radar image courtesy of Radam Brasil Project.

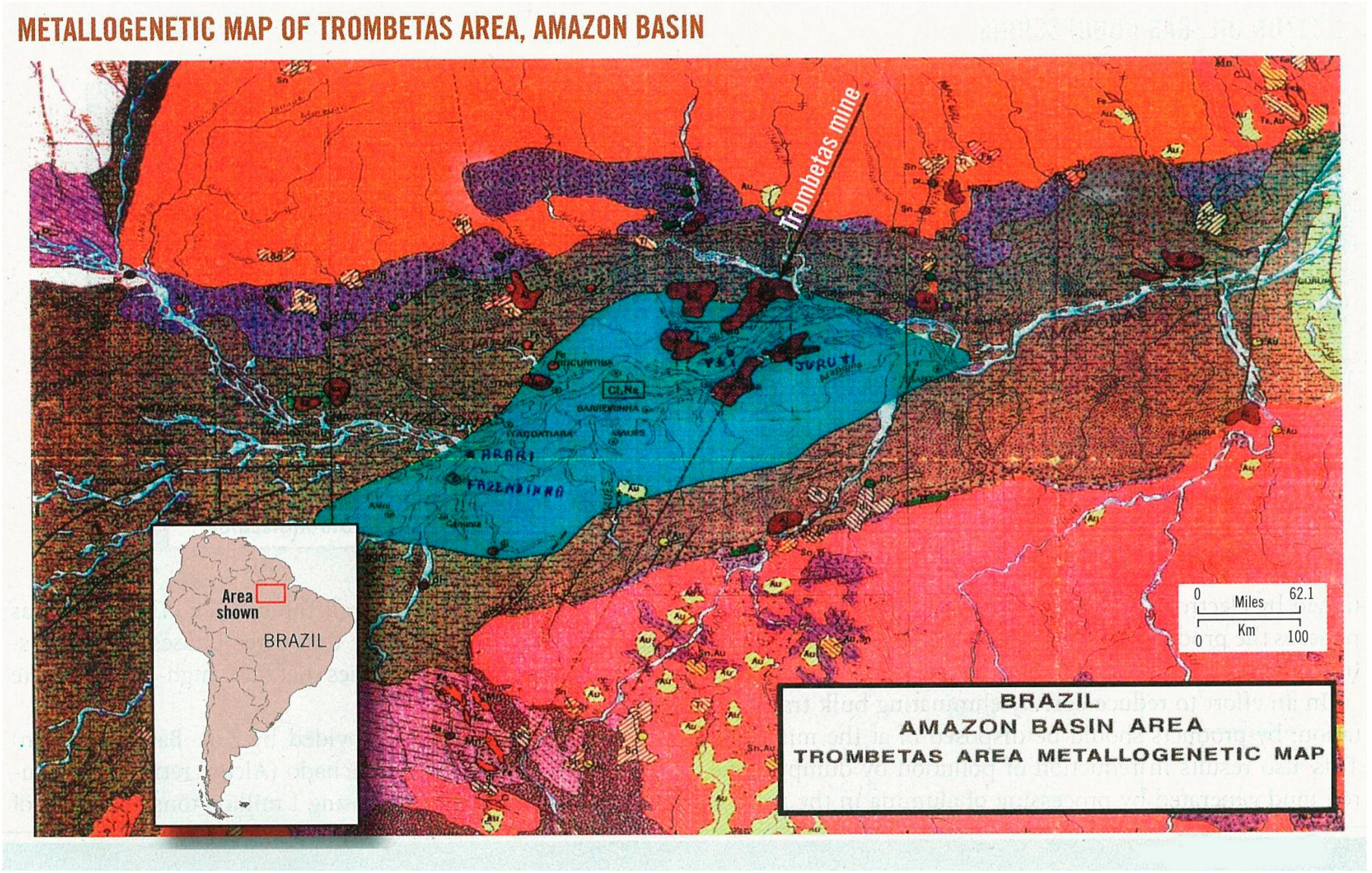

Figure 8. Metallogenetic map of Trombetas area, Middle Amazon Basin, showing an area of 25 million acres of evaporites (500 km by 200 km) which could help contain any liberated hydrocarbons by fracking, thus improving the potential for the area.

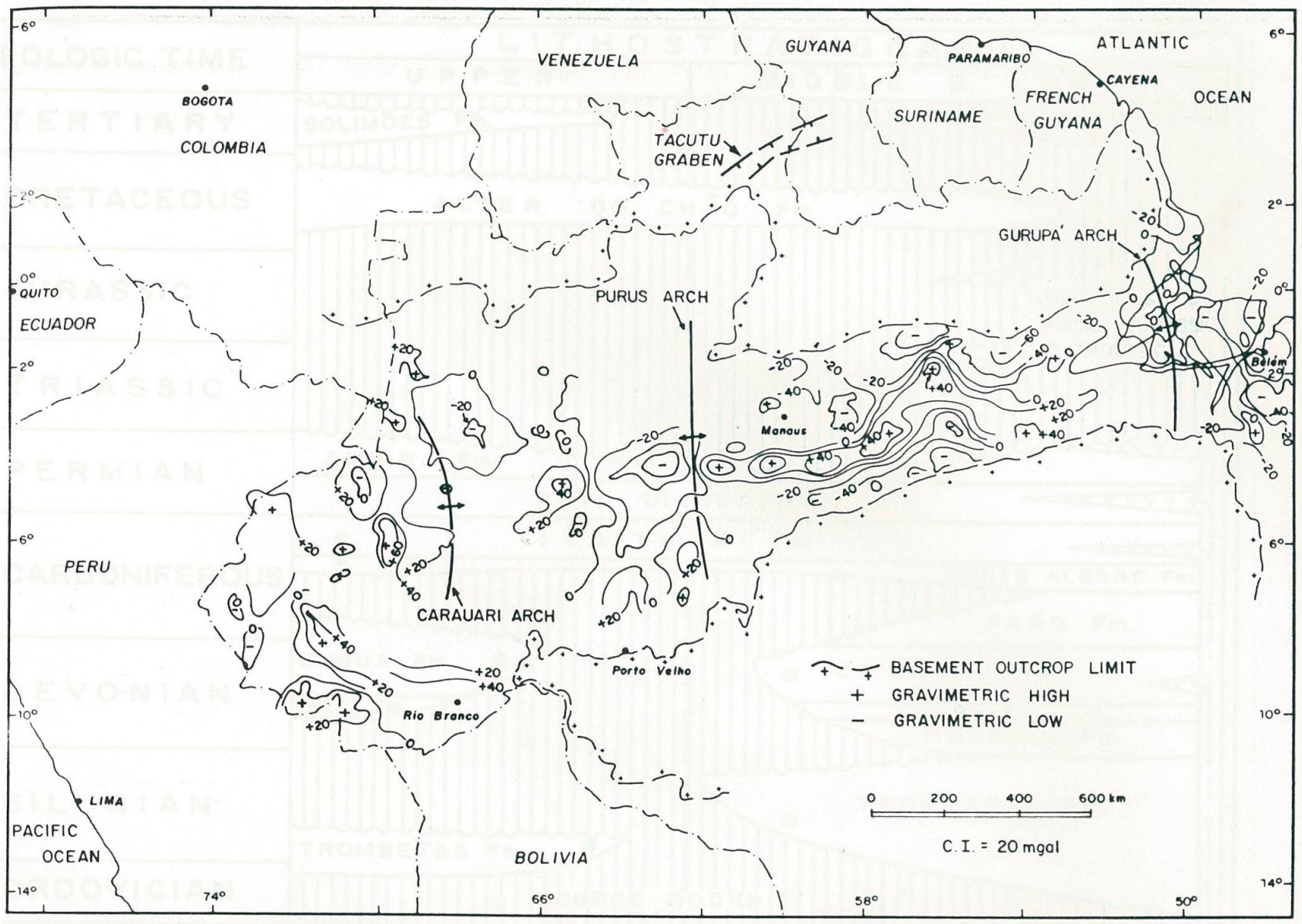

Figure 9. Gravity map of northern Brazil.