AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Complex Structural Traps in the Foothills of the Neuquen Basin, Argentina: Products of Oblique Convergence since 100 Ma

In the Neuquen basin of Argentina, Triassic to Early Cretaceous marine sediments accumulated in a transtensional to extensional setting, caused by slow subduction of oceanic plates beneath the Pacific margin of South America. After 100 Ma, rapid convergence caused compression, creating the modern Andes. Western parts of the basin became inverted, forming the Andean foothills.

The Neuquen basin accounts for about half the hydrocarbon production of Argentina. The main source intervals are Jurassic black shales. Exploration started in the Andean foreland and then moved into the foothills.

Although the foothills have been described as a typical fold-and-thrust belt, many folds are upright and doubly-plunging, faults are steeply inclined and bear oblique striations and major structures have sigmoidal traces in map view. We attribute these styles to a component of right-lateral wrenching, in response to oblique convergence. From subsurface data, the main traps in the foothills are positive flower structures and narrow triangle zones, that involve Pre-Triassic basement. Complications are due to (1) thin-skinned detachments on evaporites or black shales and (2) synkinematic stratigraphic wedges and progressive unconformities.

Many authors have attributed deformation in the foothills to a Neogene (Quechua) phase of Andean orogeny. We have obtained new radiometric ages from magmatic rocks, showing that most deformation occurred during an Eocene (Incaic) phase. Late Cretaceous (Peruvian) phases created fewer structures, but were responsible for regional flexures that accommodated foreland basin deposits.