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## **Basin Modeling and Migration Pathways in the Central Portion of the Neuquen Basin, Argentina: New Ideas in the Origin of Gas Accumulations from Physical-Chemical Models**

Basin Modeling is a powerful tool, which allows us to focus exploration investments, to reduce risks and to gain a better understanding of petroleum systems. After applying this analysis tool in the central zone of the Neuquen Basin, in the west-central portion of Argentina, it can be concluded that the Loma La Lata field (the second gas field in South America) occurred in an old E-W oriented structure parallel to a regional lineament which is known as the Huincul Arch.

The Loma La Lata paleo-structure apprehended the main migration pathways from two pods, which were active in different times. The oldest pod involves a toarcian source rock (Los Molles Fm.), it generated and expelled hydrocarbons below Loma La Lata gas field in the Upper Jurassic. These hydrocarbons filled an old structure by a short and vertical upward migration.

On the other hand, the youngest pod involves a tithonian marl (Vaca Muerta Fm.), which generated and expelled hydrocarbons in the Late Cretaceous from western positions (Aguada Pichana Pod). The hydrocarbons expelled from Vaca Muerta Fm. were apprehended by a paleo-structure originated in the Kimmeridgian times.

Finally, this paleo-structure was modified during the tertiary orogeny and therefore the feature currently mapped from 3D seismic and well data is not consistent with the original structure. Such paleo-anticline, which would have occurred during hydrocarbon generation and expulsion processes, is key to understand the reservoir filling. In this geological setting, mapping Cretaceous unit thickness is crucial to understand of the initial structural framework.