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Zooming into the Paraná-Etendeka Silicic Volcanics, Southern Brazil: A Physical Volcanological Approach to a Potential Hydrocarbon Question

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ABSTRACT

Silicic volcanism is responsible for some of the most diverse deposit and rock types on Earth. Subtle variations in the properties of silicic magma immediately before eruption (including volatile, bubble, crystal concentration and associated melt temperature and viscosity) and the depositional environment for the erupted magma leads to lithologies and lithofacies that can range in permeability from 10-10 to 10-20 m2. This combined with a full range of deposit morphologies from 10’s of metres to 100's of kilometres in scale, and various combinations of lithofacies associations can provide for some unconventional petroleum-style reservoir and trap-like architectures. Stubby lava domes to calderas (and their associated extensive ignimbrite plateaus) represent the spectrum of silicic eruption types and scales, but also geomorphological features. In the active Taupo Volcanic Zone (TVZ) of New Zealand, where rates of silicic volcanism are the highest on Earth, the juxtaposition of these volcano types and landscape morphologies is obvious. These contrasting features of silicic volcanism are not so pronounced in ancient terrestrial settings, and in submarine settings geophysical techniques like 3-D seismic reflection is needed to reveal and resolve them. A particularly anomalous ancient example where the original silicic volcanic geomorphology has been preserved in the modern landscape is the Paraná volcanic province in southern Brazil, the subject of our research.