

Amazing Ametista Prospect – Albian Atoll on Top of Exhumed Mantle, Santos Basin

*P. Zalan^{1,2}, M. Cvetkovic², H. Houllévigue², K. Reuber², A. HARTWIG*² (1. ZAG Consulting in Petroleum Exploration; 2. TGS Houston)*

The Santos Basin in southern Brazil became famous for the fabulous reserves of oil and gas in the Aptian microbialite reservoirs of the Pre-Salt Play. Super-giant fields such as Tupi and Búzios, and giant fields such as Sapinhoá and Mero, among others, produce 3.681 million boepd (November 2024). These fields and numbers blur the modest existence of different, but still effectively producing, oil and gas fields in the Post-Salt Plays. Numerous turbidite-hosted and carbonate-hosted oil and gas fields are also noteworthy in terms of reserves and production. The objective of this work is to present one quite unusual prospect in the Post-Salt Play.

The Ametista Block in southern Santos Basin contains a one-of-a-kind prospect, named Ametista Prospect. Recently acquired 3D data shot specifically to unravel the potential of this block displayed a rather unusual, but highly prospective, petroleum system. Geologically, it is the only exploratory block in Brazil situated entirely over exhumed mantle. This unique economic basement is the tip of a V-shaped sub-crop of mantle termed “Propagator”. This tectonic element is considered to be a failed crustal zipper-like rupture, propagated from south to north, during the breakup stage (syn-rift) of Western Gondwana. A strong V-shaped positive Bouguer gravity anomaly and direct visualization in seismic sections set the foundation for this interpretation. The exhumed mantle forms an outstanding structural high along the center of the block, Central High. Over this high, no salt is visible, although it is plentiful around it, onlapping the mantle. On top of it, along its crest, lies the other unusual aspect of this block: a possible Albian atoll constituting a possible prospect with all the characteristics that can be found in Pacific atolls of French Polynesia.

The Ametista Block has an area of 1,587 km² and is slated to be offered to the industry in the 3rd Round of Production Sharing in 2025. A Multi-Client 3D marine survey acquired in 2021 completely covered the Ametista Block (3,400 km²). The modern acquisition and processing techniques employed built confidence in the exploration geologists’ perspective of this unique opportunity:

In the southern Santos Basin, close to the Ametista Block, there are several discoveries and producing oil fields distributed as a string of pearls (Tubarão-Estrela do Mar-Coral-Caravela-Cavalo Marinho) (few tens of million boer each) hosted in oncolite grainstones of Albian age. The producing petroleum system is the Cretaceous Marine Anoxic Shales-Albian carbonates (!). The reservoirs are Albian carbonates that are bountiful producers in Campos and Santos Basins. The source rocks are marine anoxic shales of Albian-Cenomanian-Turonian ages (ACT); and the traps consist of classic rollover structures developed upon mobile salt. The same successful petroleum

system is expected to be working in the Ametista Block. The only difference is the type of trap. The Ametista Prospect consists of a 4-way closure central buildup developed on top of the exhumed mantle, consisting of a layered seismic facies displaying several characteristics of carbonate lithologies. Its circular shape and close association with volcanic constructions reminds atolls. The prospect is surrounded by the ACT strata that onlap onto it, making this the ideal geometry of a direct relationship of mature source rock to reservoir.