

Reef, Reef-Topped Volcano, Volcano or Carbonate-Topped Horst? Discriminating Examples from Indonesia's Offshore North Makassar, Gorontalo and Arafura Sea Regions

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What are the buried features in Indonesia's frontier exploration areas? Without wells, how do we measure likelihoods of finding reservoir versus non-reservoir and sealing versus non-sealing intervals in seismic anomalies like volcanos, reefs, tilted blocks with reefal or volcanic buildups or some combination of these? We try to narrow the interpretive uncertainties.

First bathymetry. An atoll or volcano is verified by its shape. We use 1 km or 500 m grids; some interpreters (per recent papers) have broad coverages of very-high resolution multibeam data.

Second, gravity. With satellite altimetry interleaved with re-levelled ship track data, we have spatial resolutions of 5 - 7 km. The shape of a tilted horst versus a conical anomaly is partially diagnostic. Combined with scattered seismic from publications or licensed surveys, gravity features are tracked line to line and assigned to depths.

Third, magnetics. Satellite coverages of magnetics provide very long wavelengths (>250km) for the regional framework. Re-levelled ship-track surveys have short wavelengths but often suffer because of long times between base station visits and variable line spacings. Locally, we incorporate published aeromag. We observe local spatial resolution of 1 - 2 km which distinguishes some features as volcanic or not.

Fourth, seismic. Published lines often show features clearly but may not cross our anomalies so we use gravity to "read between the lines". Seismic chimneys, where observed, increase our confidence in source maturity.

Fifth, SAR slicks. Few high-ranked slicks locate in our reviewed areas. Most associate with clearly-defined gravity highs, strong regional tectonic trends or seismic chimneys which provide natural avenues for seepage. Other slicks can be reclassified (up or down the confidence scale), given their associations with our other indicators.

We illustrate linear and circular anomalies along the roughly nne-ssw thrust front in N. Makassar Strait offshore Sulawesi. Another example looks at SAR slicks in Gorontalo Bay near a known volcano and along the trench and strike-slip zones separating Sulawesi from the Celebes Sea. Finally, we consider associations in the Arafura Sea where our interpreted sedimentary thicknesses range from >10km in Australian waters to <3km between Aru and Kolepom islands.