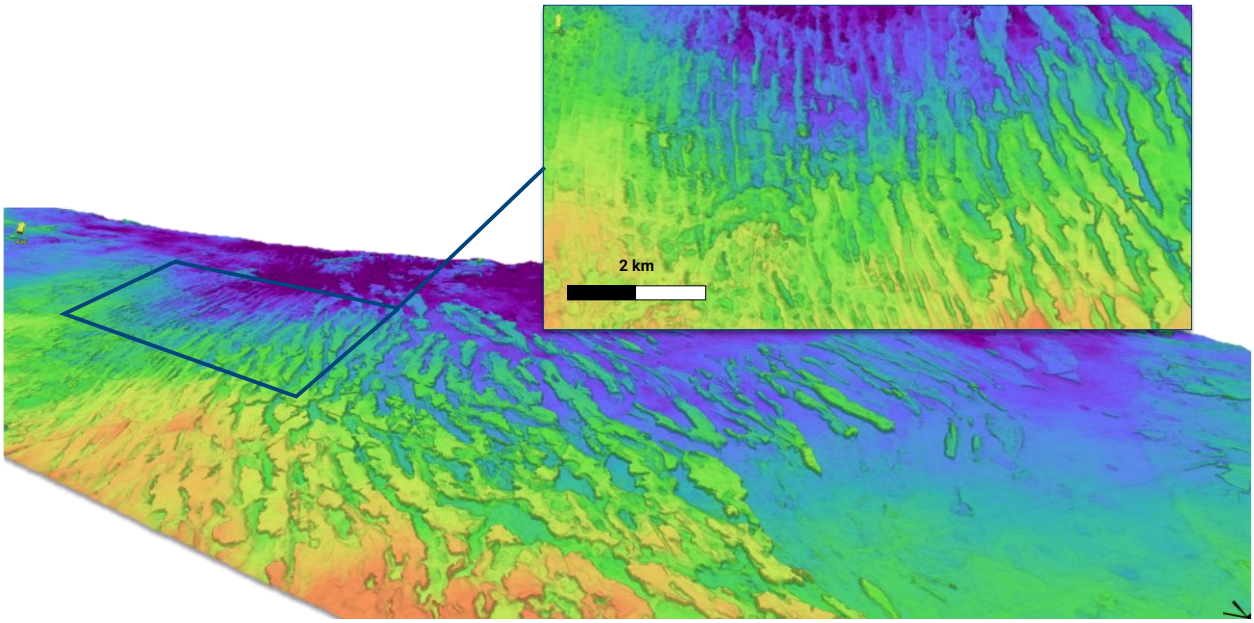
Mega-furrows at base-of-slope, Coral Sea, off Papua New Guinea



RMS amplitude map of a subsurface horizon from a 3D seismic set, paleo-water depth approximately 1500 m. From: Alistair Shakerley, Dorrik Stow and others, Larus Energy.

Problem: What are the linear features in the subsurface and how are they formed?

This is tectonically active foreland basin with marked hinterland uplift to mountainous region in the north and thrust progradation into and over the foreland basin in the south; tectonic pulsing leads to differential uplift along the margin. During deposition of this Miocene interval, there were multiple sediment input points along the margin, active at different times due to regionally varied tectonic pulsing, and with inferred high average rates of sedimentation.

The shelf was narrow and fed by fan deltas and braid deltas, which typically bypassed the shelf and fed directly onto the slope. Sands trapped on the shelf were cleaned by longshore currents, tides and eddies from the strong Coral Sea loop current. The slope was relatively steep with gradients up to 20-25^0 noted in places and prone to downslope processes – MTDs, debris flows and turbidity currents, which were particularly dominant in tectonically active phases. There were overlapping and separated fan-delta systems along the margin and locally incised channels that fed coarse sediment in downslope fairways. A strong Coral Sea paleo-loop current tracked alongslope at mid/upper-slope depths, from which plunging bottom currents followed local topography and created downslope-oriented current features (linear ridges, mega-furrows, and anastomosing furrows). The mega-furrows are 1-10 m deep and 50-200 m wide, and extend from an abrupt base-of-slope into the basin plain. They are associated with plunge pool excavation and large cookie-cutter erosive hollows.