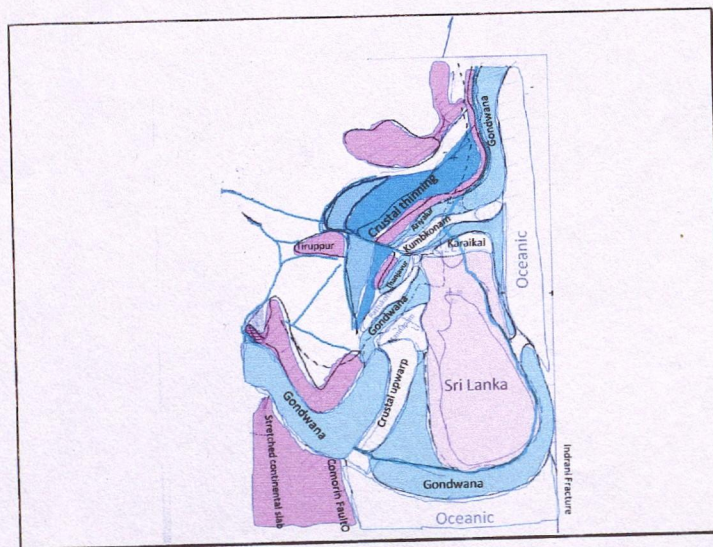


East Coast
T. S. Balakrishnan
Director Geophysics (Retd.), ONGC
ts.balakrishnan@yahoo.com
 January 2014

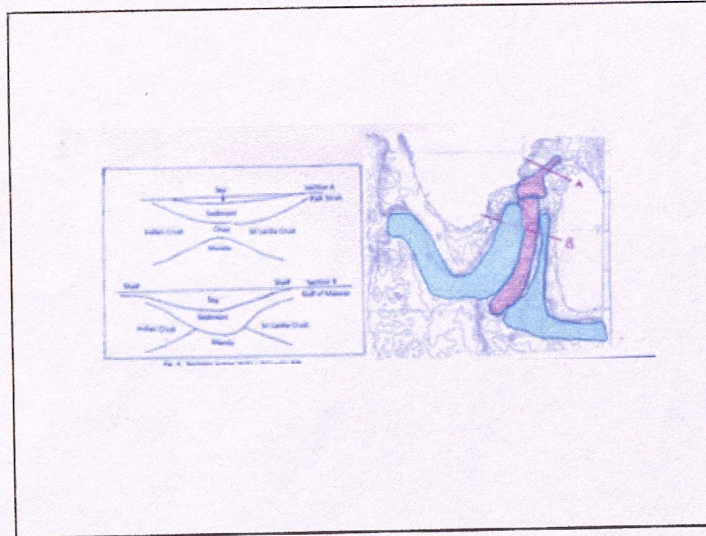
During the Permian period the Indian shield was a rigid part of Gondwanaland. Later it started breaking off resulting in tensional cracks in the crust. This led to the sinking of long narrow linear blocks now called the Gondwana grabens. Well known are the Satpura, Godavari, Mahanadi and Damodar grabens. What is not so well known is the existence of long grabens along the East Coast in the deep sea just beyond the shelf edge. They consist of two parts. The first extends from the mouth of the Krishna river southward up to the southern tip of Sri Lanka. The second extends along the Andhra Coast from latitude 18 degrees up to the mouth of the Godavari River. The continent ocean boundary lies immediately to the east of the graben.

Slide 1



Slide 1: The first graben mentioned above wraps round Sri Lanka and then again round South India to the coastal area near Thiruvananthapuram. It is evident that this line up represents the breakaway from Antarctica. The island of Sri Lanka is a breakaway part of the Indian shield. The intervening part is a stretched and thinned portion of the continental crust. It is broken up into a series of block-faults giving rise to the Kumbakonam, Pattukottai and Mannar ridges. These are swells in the lower crust and mantle and directly connected to the oceanic crust. The corresponding depressions are the Ariyalur, Thanjavur and Ramnad basins, which form continuation of the offshore Gondwana rift. The eastern fracture of the graben continues south as the Indrani fracture zone.

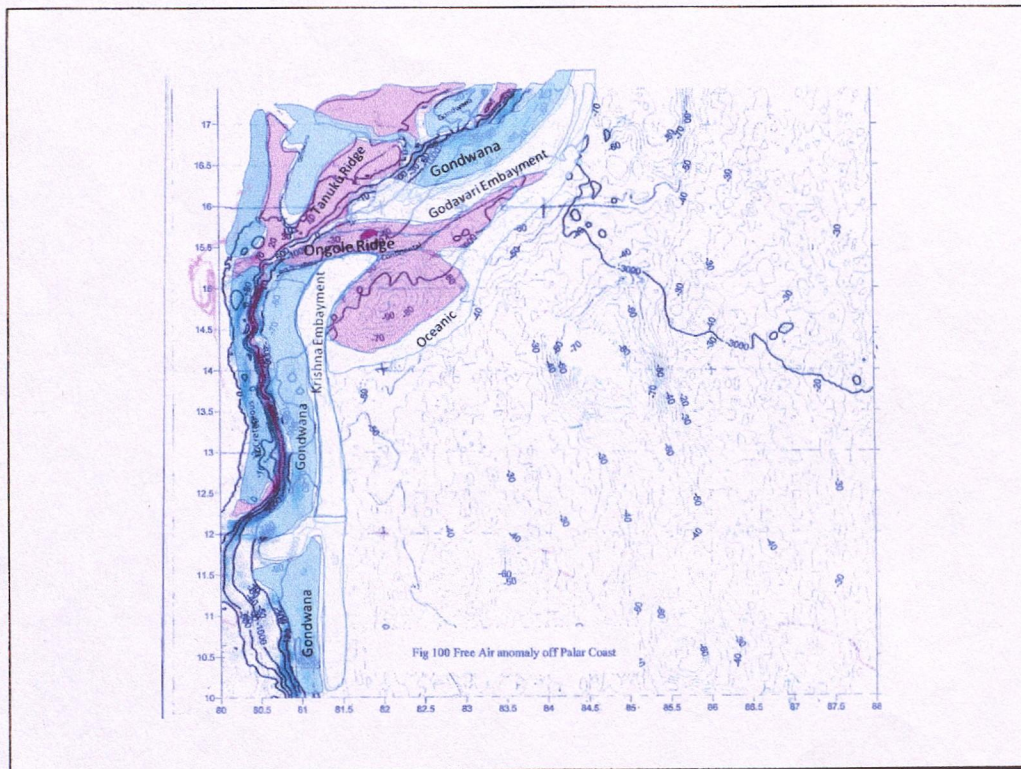
Slide 2



Slide 2:

The Gulf of Mannar is divided longitudinally into the Indian and the Sri Lankan shelves. Adjacent to each shelf lies one Gondwana patch (shown in green). The two Gondwana patches are separated by a crustal swell (shown in red), which is the main divide between India and Sri Lanka.

Slide 3

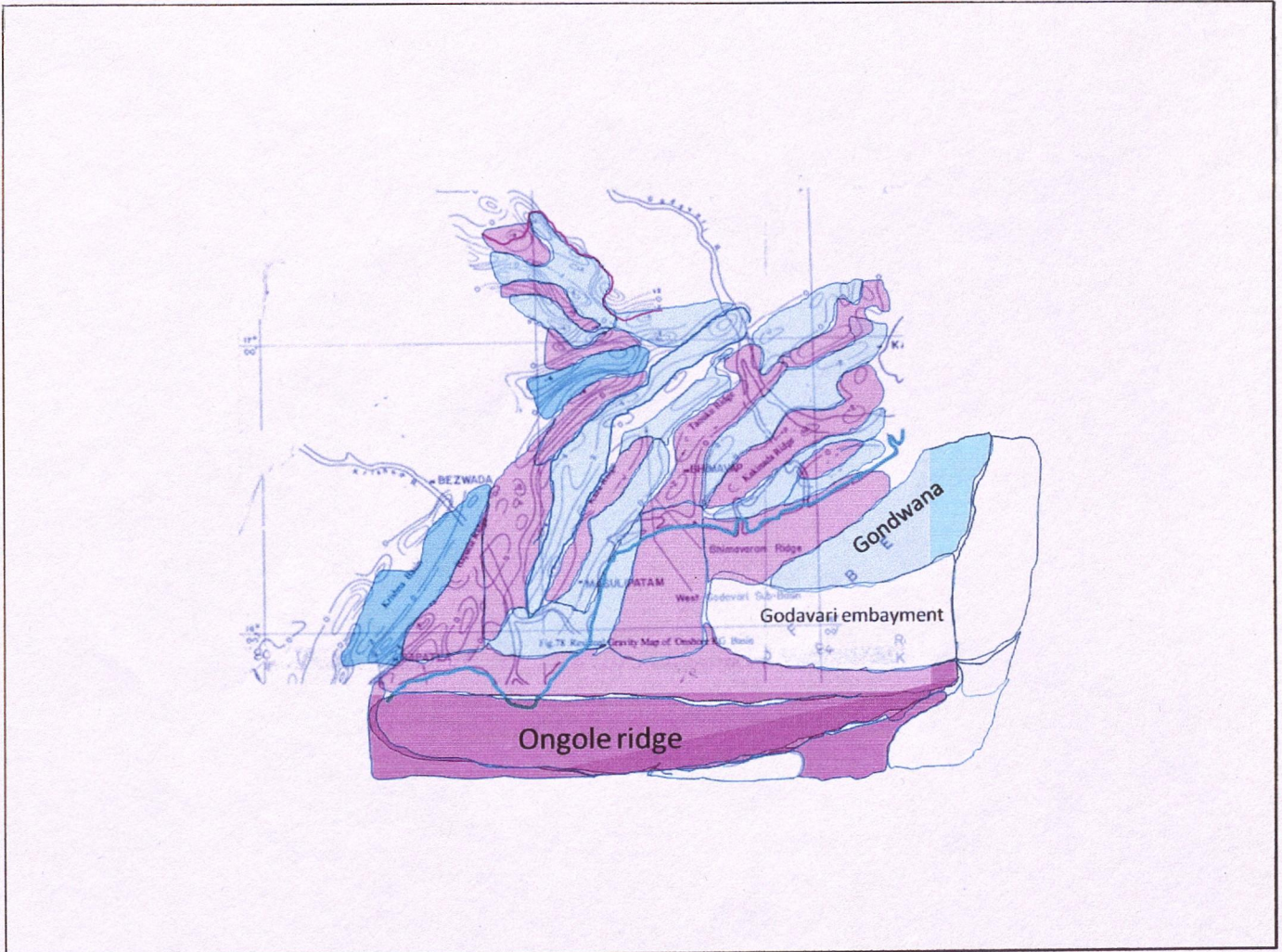


Slide 3:

The second graben mentioned above starts at 18 degrees latitude off the Andhra coast and proceeds south to wrap round the Eastern Ghats bloc to connect with the Godavari Gondwana graben on land. It is followed to the east and south by the oceanic crust, which enters the Masulipatam Bay. South of Masulipatam Bay, around latitude 15 degrees and longitude 82 degrees, there is anomalous negative free air gravity value. This is ascribed to a detached continental slab. Its relation to the mainland appears to be similar to that between Sri Lanka and the mainland. It is however covered by about 3 kms of water. It is bounded on the North by the Ongole ridge, which also appears to be continental. The strip between Masulipatam Bay and the Ongole ridge is occupied by a narrow arm of oceanic crust. We call this the Godavari embayment. The Godavari River empties into this embayment and thus produces an ideal situation for the mixing of continental and marine sediments. In fact it is within this region that substantial hydrocarbon reserves have been established.

To the west of the continental slab mentioned above, one can observe another arm of the oceanic crust, this time coming up from the south. This arm is bounded on the north by the Ongole Ridge. We call this the Krishna Embayment. It is meeting point of mouth of the Krishna River and the arm of the ocean.

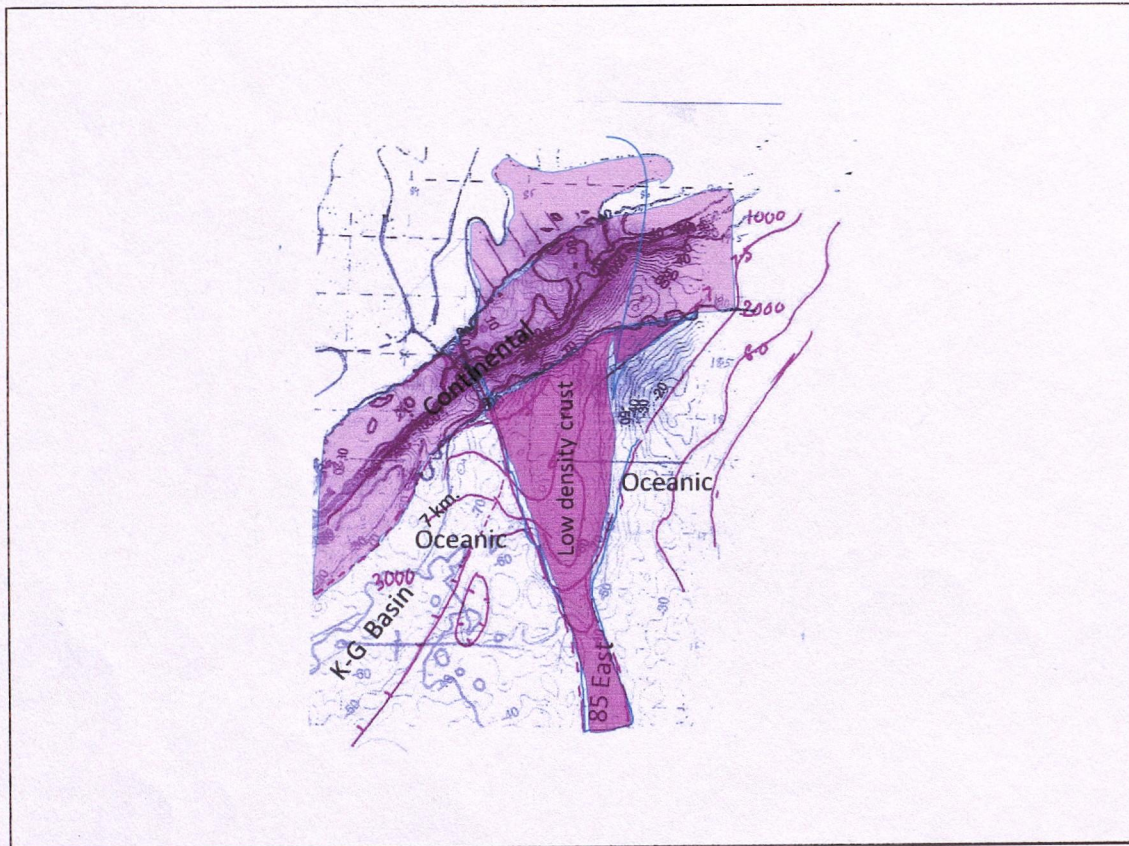
Slide 4



Slide 4:

The region between the continental slab mentioned above and the mainland consists largely of the onshore KG basin. Like the Cauvery basin down south it is a stretched piece of the mainland crust and is broken up into linear blocks. Principal among these are the Bapatla ridge, the Kaza ridge, the Tanuku ridge and the Kakinada ridge. The shelf is also largely occupied by a ridge. The depressions between them are filled with Gondwana sediments, overlain by mesozoic and tertiary sediments.

Slide 5



Slide 5:

The ^{deep} sea Gondwana graben terminates at about 18 degrees latitude. Up to this latitude the COB lies immediately to the east of this graben. Attempts have been made by several authors to fit the 2000 m. bathymetry of India and that of Antarctica. According to the late Dr. A.B. Dasgupta and others, the fit is good. The COB north of latitude is therefore shown as the 2000 m. bathymetry in the slide.

In the Mahanadi basin area, south of the 2000m. bathymetry, one observes a strong negative gravity anomaly striking NS. This connects directly with the 85 degree ridge of the Bay of Bengal. It is due to a low density crust, suggestive of continental origin. The corresponding seismic picture shows this as a crustal block plunging south from the Orissa coast, again connecting with the 85 degree ridge. The correspondence between the gravity and seismic pictures is striking. Regional considerations rule out the possibility of continental crust in the 85 degree ridge and its northern extension.