A BETTER FIT FOR TASMAN SEA MAGNETICS AND REAPPRAISAL OF TASMAN SEA OPENING

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It has been proposed on morphological grounds that the S.E. margin of Australia is a 'collision coast' (Inman and Nordstrom, 1971) and, on the configuration of marine magnetics, that 'limited subduction may have taken place' along this margin (Hayes and Ringis, 1973).

There is a growing feeling among geologists, (Jones and Roots, 1974; and responses), that the published magnetic trends are difficult to reconcile with on-shore Australian geology and gross Tasman Sea tectonics.

However my examination of published magnetic data (Hayes and Ringis, 1973), and unpublished magnetic data collected in 1974, suggests that no major re-interpretation of the magnetic pattern is possible, and leads me to the conclusion that solution to the apparent misfit must lie at the interface between the areas of contention, i.e., *along the continental margin.*

That reconsideration is necessary can be seen from a study of the respective orientations of the magnetic pattern and Australia's Tasman Sea margin. The magnetic anomaly lineaments converge northerly at 10 degrees, while the M.O.R. and the Australian margin converge at 55 degrees, a misfit of 45 degrees (see also Ringis, this section).

More compelling however is that at least 15 m.y. of magnetic anomalies are obviously truncated along this margin, whereas along simple rifted margins the margin locates, and therefore parallels the first rift-filling ocean basalt. This basalt, being synchronous with initial rifting, forms an isochron parallel to the margin. No magnetic truncation is possible without some later process such as subduction. Acceptance of Hayes & Ringis data involves acceptance that some 15 m.y. production of Tasman Sea Floor has been subducted under northern New South Wales

The truncation of the magnetic pattern reduces to the south and may reach zero just south of Tasmania, in which case a 'pole of subduction' can be proposed at that location.

Subduction raises its own problems, in particular the absence of synchronous andesitic volcanic rocks overlying the proposed subduction zone. A sequence of basaltic volcanic rocks of acceptable age range (70 to 10 m.y.b.p.) is present along this margin, but on present data and current thinking these do not indicate or require subduction for their generation.

A consequence of subduction on this margin is that the movement involved must be reversed before the magnetics are used to arrive at the pre-drift configuration. Two steps are involved:

(1) The Tasman Sea floor must be rotated 45 degrees clockwise around a pole south of Tasmania, which will bring the M.O.R. nearly parallel to the Australian margin. This rotation may account for some hundreds of km of movement along the Alpine Fault, the southeastern plate boundary.

(2) The New Zealand Plateau must next be translated along F.Z. traces to close the Tasman Sea. This places New Zealand some 20° latitude further north than does any proposed pre-Tasman fit except that of Jones (1971).

References

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NEW DEEP WATER DATA: OTWAY BASIN

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Hematite Petroleum Pty. Ltd., have shot over 5000 kms. of seismic profiles in the Otway Basin. The Portland to King Island Seismic Survey (1972) and the Cape Nelson to Cape Otway Seismic Survey (1973) preceeded the most recent HO4 Seismic Survey (1974) (Fig. 1).

The detailed knowledge obtained from boreholes closer to shore namely those in the Port Campbell Embayment (particularly Flaxman's -1), and offshore wells Pecten-1a, Mussel-1, Nautilus-1, Prawn-1 and Whelk-1 has been incorporated into the geological interpretation of the geophysical data. The stratigraphic section broadly comprises:

Tertiary	*Port Campbell Limestone: Gellibrand* and *Narrawaturk* Marls: *Mepunga Formation* and *Wangerrip Group* sandstones.
Upper Cretaceous	*Sherbrook Group* — sandstones, siltstones, shales.
Lower Cretaceous	*Otway Group* — sandstones, mudstones.

Steeply dipping Palaeozoic rocks were encountered beneath the Otway Group at Ferguson's Hill-1.

The *Otway Group* at outcrop and in wells comprises poorly sorted argillaceous felspathic sandstones, incorporating a variety of clasts, lignitic beds and interbedded with mudstones, which have been structurally deformed into a series of fault blocks throughout the region. In the Port Campbell Embayment the Otway Group has been deeply eroded and structures truncated. The Lower Cretaceous Otway Group sediments are overlain unconformably by the Sherbrook Group of Upper Cretaceous age.

In the nearshore section of the seismic line HO 24 the unconformity separating the Sherbrook and Otway Groups is well defined. Farther offshore the recognition of that unconformity is difficult on HO 84B. It strongly reappears at the southern end where the Otway Group has thinned over a strong basement event, only the Otway Group velocities have been recognised in a recently interpreted sonobuoy probe (J. Denham personal communication).

The *Sherbrook Group* comprising about 900 metres of clastics in the Port Campbell area thickens to the west to