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The enigmatic Hastings Block - history of emplacement and subsequent deformation

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The Hastings Block is a ~ 3000 km² fault-bounded block consisting of mainly Devonian to Carboniferous arc-derived sedimentary and volcanic rocks, and an Early Permian sedimentary cover sequence. It is located, out of place, outboard of the Tablelands Complex, a subduction complex and north of the Tamworth Belt of the southern New England Orogen [1].

The Hastings Block was translated with rotation between the Yarras and Parrabel fault systems, from a position along strike of the Tamworth Belt, in the Late Carboniferous. Subsequently, the Nambucca and Hastings Blocks, and southern Tamworth Belt, were deformed by the Hunter - Bowen Orogeny. However, they have distinctly different deformation histories reflecting the near field (Nambucca Block), mid field (Hastings Block) and far field (Tamworth Belt) accommodation of the southward movement of the Coffs Harbour Orocline.

The Northern Hastings Block (NHB) consists of Carboniferous to Early Permian sequences. It is dominated by the open, gently plunging NW- trending Parrabel Dome. Four episodes of cleavage and fold development and extensive post-dome faulting occurred during the Hunter - Bowen Orogeny [2]. The earliest E-W trending cleavage S₁ of the Permian sequences of the southern Nambucca Block were subsequently re-orientated as a result of the NHB acting as a massif during shortening related to southward translation of the Coffs Harbour Orocline.

Worm analysis of gravity/magnetic data reveals a possible fault boundary between the dome-dominated NHB and east-younging SHB. It is defined by a series of faults some of which underwent movement over extended periods and were in part active into the Late Triassic. Many record late sinistral-strike-slip movement. After dome formation in the NHB there was extensive faulting in boundary zone between the NHB and SHB. It represents an accommodation zone between the domal, rigid NHB and the east-dipping panel of rocks in the northern SHB. Limited Triassic movement on some faults in the Hastings Block took place reflecting continued accommodation of the block during the Hunter-Bowen Orogeny prior to Triassic granite intrusion that stitched the block to the subduction rocks to the west.

The Southern Hastings Block (SHB) consists of generally east-dipping and facing, Devonian to Late Carboniferous sequences which have been affected by two episodes of folding (F_1 N-S, F_2 NW-SE) and faulting (N-S, NE-SW, NW-SE).

References:

[1] Roberts J et al. (1995) *Aust J of Earth Sciences* 42: 609-634.

[2] Yan J (2015) In: PhD (unpubl.), University of New South Wales, Sydney.

