The tectonic history of the Bouvet triple junction and the Southwest Indian Ridge

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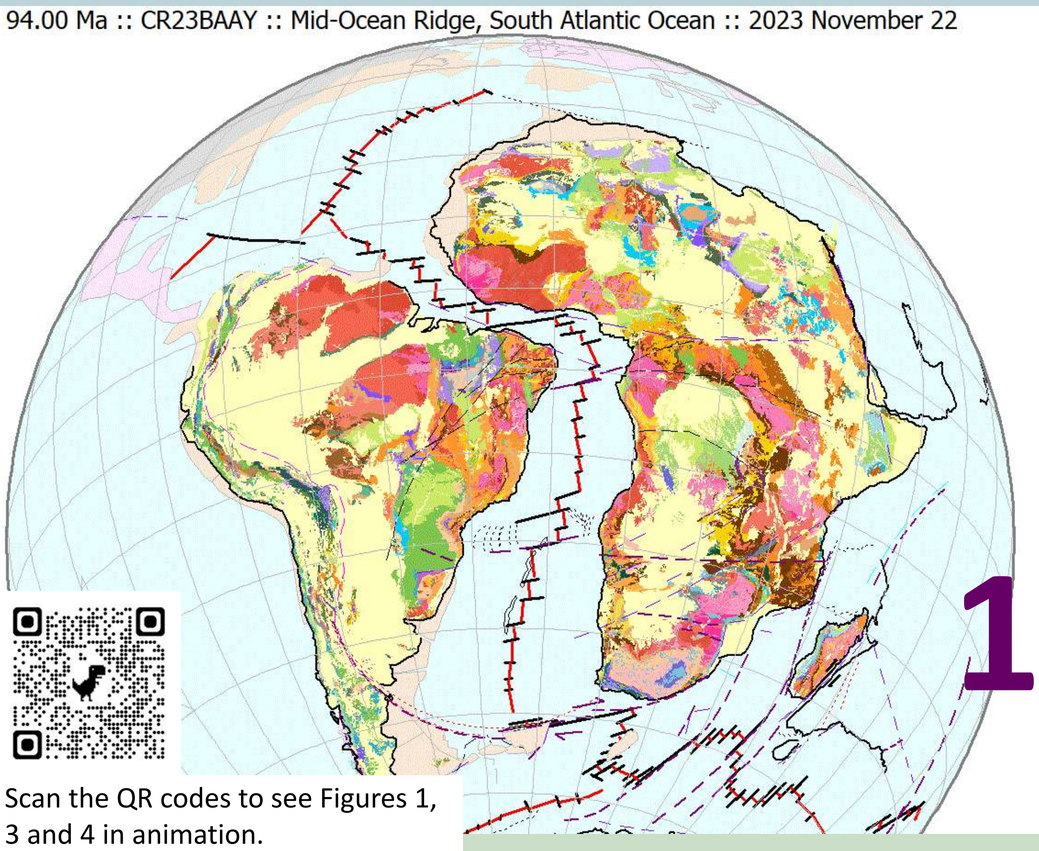


Scan the QR codes to see Figures 1, 3 and 4 in animation.

Figure 1.

1. At least two thirds of the Earth's lithosphere is oceanic and has been created in the last 200 Ma (i.e. it is young when compared to continental geology).

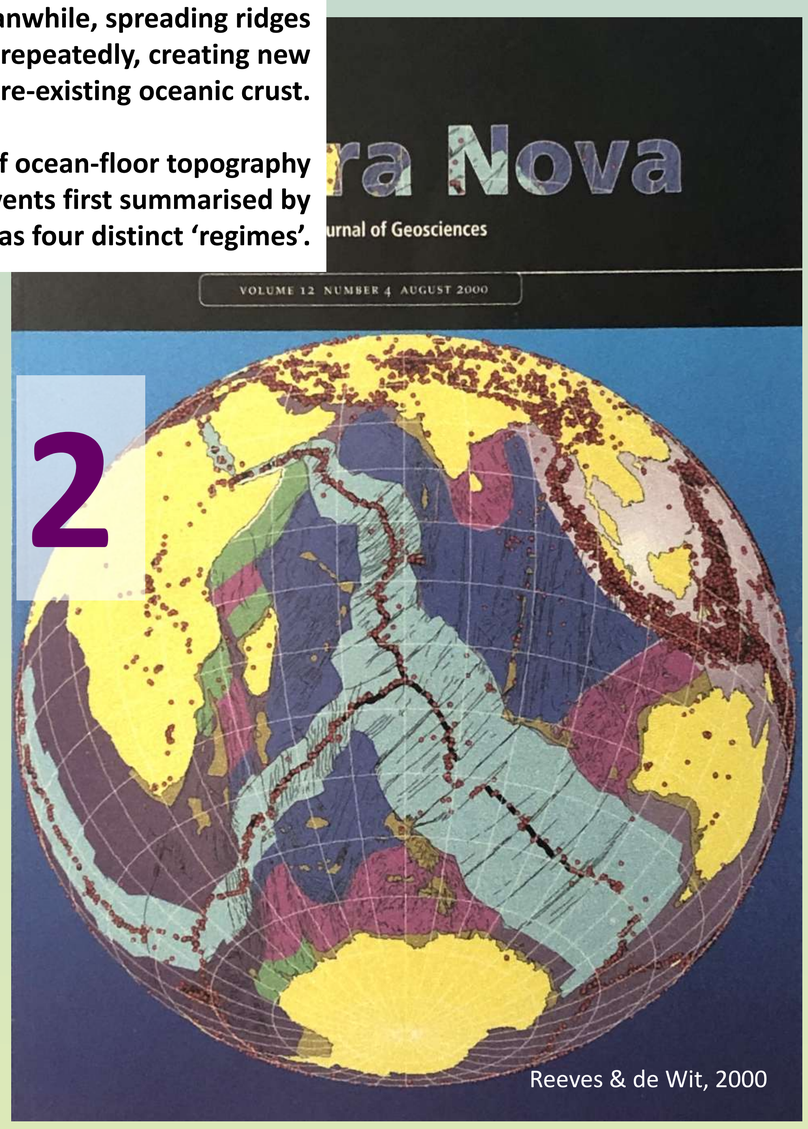
2. New oceanic crust is created at the mid-ocean ridges that are seismically active amid large areas of stable oceanic crust. Modelling mid-ocean ridges in paleo-reconstructions tells us where things were happening at times in the past.

3. **In the <u>Atlantic Ocean</u> the mid-ocean ridge has always been located centrally, midway between the conjugate continental margins, and may be so modelled within small margins of error.**

Figure 2.

4. In the <u>Indian Ocean</u>, meanwhile, spreading ridges have re-located or 'jumped' repeatedly, creating new conjugate margins in areas of pre-existing oceanic crust.

5. Careful interpretation of ocean-floor topography reveals a sequence of events first summarised by Reeves and de Wit (2000) as four distinct 'regimes'.



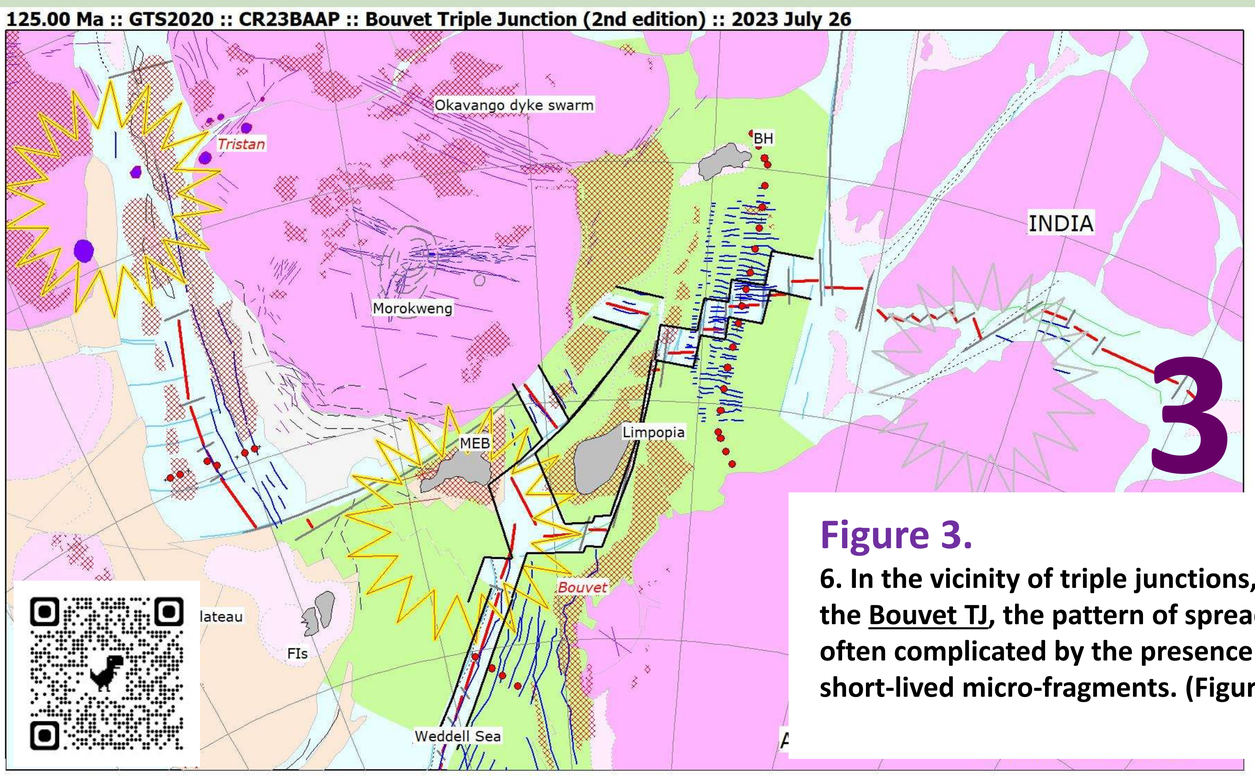
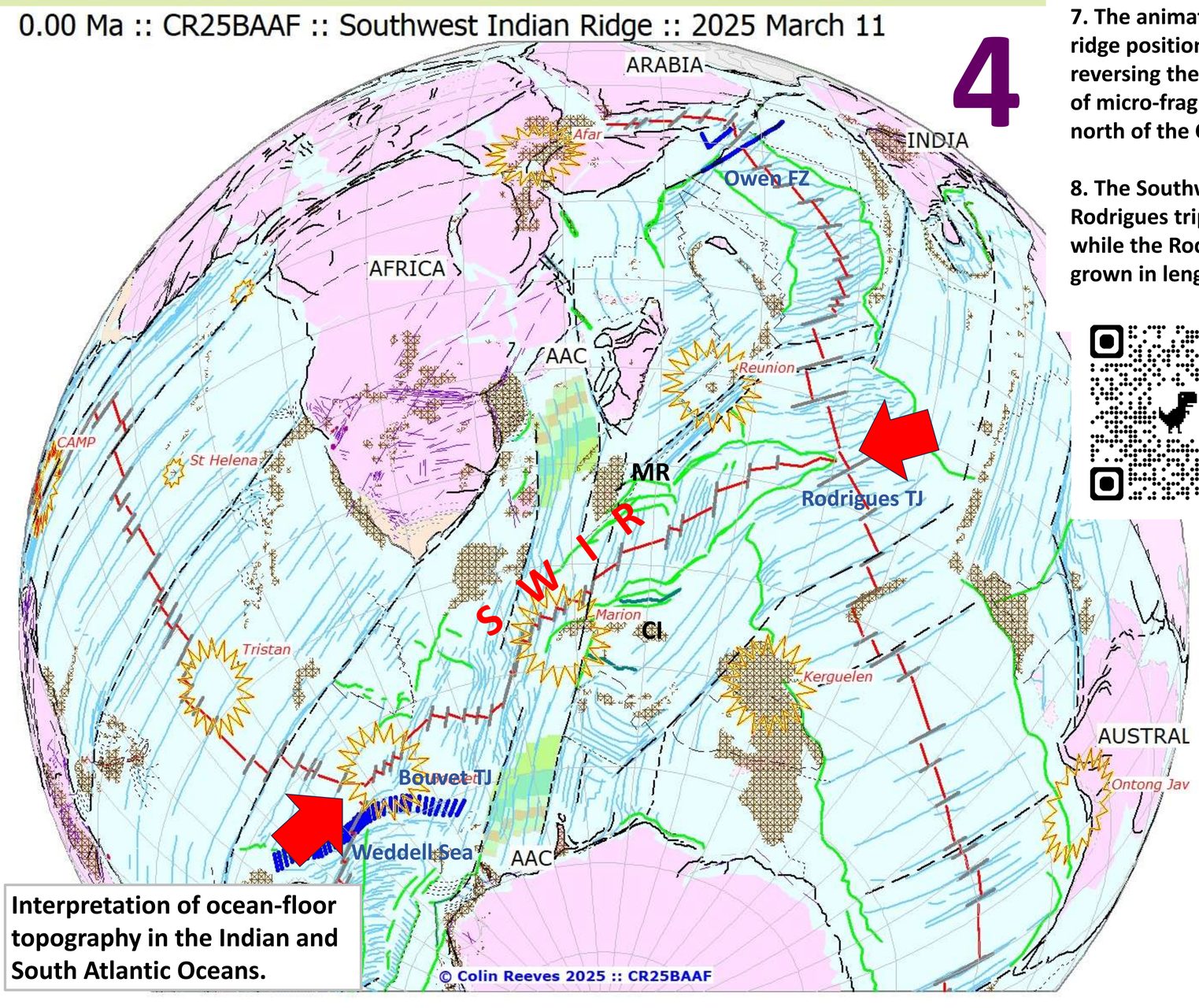


Figure 3.

6. In the vicinity of triple junctions, such as the <u>Bouvet TJ</u>, the pattern of spreading is often complicated by the presence of small, short-lived micro-fragments. (Figure 3)



Interpretation of ocean-floor topography in the Indian and South Atlantic Oceans.

Figure 4.

7. The animation (see QR code) demonstrates graphically the sequence of ridge positions recorded in the Indian Ocean, determined by systematically reversing the growth of the fracture zones and interpreting local movements of micro-fragments – such as the Madagascar Rise (MR) and a small fragment north of the Crozet Islands (CI) – in the vicinity of the <u>Rodrigues triple junction</u>.

8. The Southwest Indian Ridge (SWIR) joins the Bouvet triple junction to the Rodrigues triple junction. The Bouvet TJ has been stable since about 125 Ma while the Rodrigues TJ has only been stable since about 40 Ma. The SWIR has grown in length from 1500 at 125 Ma to 6500 km at the present day.

Notes:

9. Amid so much complexity, the mid-ocean ridge in the narrow Africa-Antarctica Corridor (AAC) has remained central and stable. Does this result from its location midway between the Marion and Bouvet plume heads for much of its evolution?

10. The plate rotation model achieves (a) smooth growth of the ocean between South America and Antarctica consistent with the FZs in the Weddell Sea and (b) a conservative strike-slip motion between India and Arabia on the Owen FZ (89-65 Ma). These constraints close the two main plate circuits in the model.

More examples of the plate tectonics of Gondwana: <u>www.reeves.nl/gondwana</u>