

Paper Number: 1162

## **Queue tectonics, roundabout tectonics, and the opening and closing of narrow ocean basins**

Johansson, Å.<sup>1</sup>

<sup>1</sup> Department of Geosciences, Swedish Museum of Natural History, Stockholm, Sweden. [ake.johansson@nrm.se](mailto:ake.johansson@nrm.se).

---

Plate tectonics naturally involve the formation and widening of ocean basins as well as their subsequent closure and disappearance. Especially for narrower oceanic basins, this process typically occur by introversion, in which the bounding continents return to more or less the same positions as prior to ocean opening. This is often envisaged in terms of a classical Wilson cycle where the original continent rifts and the two parts drift apart in opposite directions, followed by a reversal in plate motion, leading to subduction, ocean closure and final continent-continent collision.

However, such reversals of plate movement may be hard to justify from a geodynamic point of view, and may not always be in accord with the overall movement of continental plates when going from one supercontinent configuration to another. An alternative view of looking at this process may be called “queue tectonics”. Just as sometimes a gap may be opened in a line of slowly moving cars, as one car moves ahead of the other, and subsequently be closed again (hopefully not by a full collision) as the car behind catches up, a large continent that moves ahead may be stretched, perhaps along a pre-existing suture or other line of weakness roughly perpendicular to the direction of movement, so that a narrow ocean basin opens. This basin may widen due to ocean floor spreading, but eventually close again in more or less the same relative position, as the continent lagging behind catches up with the forerunner. Examples of oceans opened and closed in this manner would be the Mozambique and Adamastor oceans during the Neoproterozoic transition from a Rodinia to a Gondwana configuration (1).

Another process by which narrow ocean basins may open and close may be called “roundabout tectonics”. As large continental landmasses move by rotational movement, such as during the transition from Rodinia to Gondwana, not only may gaps open perpendicular to their movement direction, but also in longitudinal direction as different parts of the continent move at different speed, in a way akin to the openings between cars in separate lanes moving around a roundabout. Possible examples of such longitudinal ocean basins, where the movement between the neighbouring continents is dominantly transtensional and later transpressional, would be the ones along the Damara orogen between the Congo and Kalahari cratons, and the Eastern Ghats orogen between India and Antarctica.

### *References:*

[1] Johansson Å (2014) Precambrian Research 244: 226-235

