Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.17125

Ridge domains --- an alternative division for the Oceanic crust other than tectonic plates

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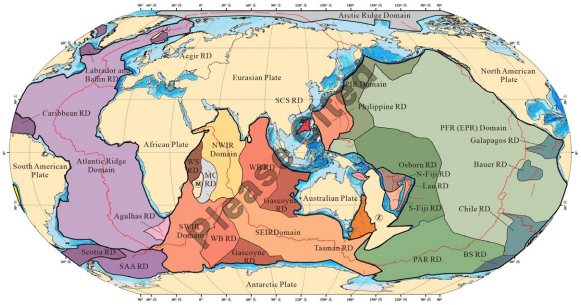

The plate tectonics theory has been widely accepted as the dominant model for describing the movement and interaction of Earth's lithospheric plates. Divergent, Convergent and transform boundaries are used to divide the crust into different plates. While it works well in the field of active continental margins, but it may cause difficulties when dealing with the passive continental margin, such as the continent-ocean boundary (COB). The oceanic crust and the continent on both sides are considered a single plate, for example, the African Plate or the South American Plate. Conversely, the conjugated oceanic crusts are artificially classified into different plates, such as the perfectly symmetric oceanic crust from Mid-Atlantic Ridge.

Although the plate tectonic theory facilitates the research on plate boundaries, such as mid-ocean ridges, subduction zones, and orogenic belts, it poses challenges when studying the evolution of oceanic crust. We propose an alternative model for dividing the crust, especially for the oceanic ones. Based on the seabed magnetic anomalies, as well as the bathymetry, gravity and seismic data, we choose the COB as a better candidate for the geological boundary. The mid-ocean ridges are no longer considered the first-order boundary, but the triple junction traces (TJT) are. The trenches are the only boundary inherited from the plate tectonic theory.

In the new model, continents are easily separated from the oceanic crust, with the borders of COB, or Trenches. The oceanic crust can be divided into four main ridge domains (RD) in the first order, including Pacific RD, Atlantic RD, Indian RD, and Arctic RD (Fig.1). The main ridge domains may consist of oceanic crust from several branches of ridges, which can further be classified into the second-order RDs. For the third-order classification, extinct spreading centers or ridge jumps are taken into account for the division (Fig.2).

The new model provides a straightforward visualization of the evolution history of oceanic crust and will tremendously benefit geodynamic research on Earth’s lithosphere.