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Volcanic margins in Law of the Sea context

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Under the United Nations Convention on the Law of the Sea (UNCLOS) sovereign rights of some 151 coastal States cover approximately 60 million sqkm or around 20 % of the world ocean within the 200 nautical mile (M) limit.

But there is probably an addition of > 15 million sqkm for an extended continental shelf. Article 76 of the Convention refers to *"continental shelf"* as a juridical - and not a geomorphological - term which applies to an area of the seabed, beyond the territorial sea, falling under the sovereign rights of the coastal State for the purpose of exploring it and exploiting its natural resources. The natural resources consist of mineral and other non-living resources of the seabed and subsoil, together with living organisms belonging to sedentary species. The definition of the continental shelf contained in article 76 of the Convention takes into consideration two possibilities:

- In the first case, the breadth of this zone is limited to a distance of 200 M from the baselines from which the breadth of the territorial sea is measured. This occurs where the outer edge of the continental margin does not extend beyond 200 M.
- In the second case, the outer edge of the continental margin extends beyond 200 M from the baselines. In this instance, the coastal State may delineate its continental shelf to a breadth greater than 200 M, in accordance with the criteria specified in article 76. The breadth of this zone shall not exceed 350 M, or in the alternative, extend beyond 100 M from the 2,500 metre isobath. In this case, the coastal State must pass the Appurtenance Test - the shelf must be the natural prolongation of the land territory of the State to the outer edge of the continental margin.

The volcanic rifted margins of the Atlantic, Arctic, Indic and Southern Hemisphere provide by far the greatest contribution to the worldwide area of the extended continental shelf.

Foot of the slope: The foot of the continental slope (FOS) is an essential feature that serves as the entitlement to the extended continental shelf and the delineation of its outer limits.
According to Article 76, paragraph 4 (i) and (ii) it is the reference baseline from which the breadth of the limits specified by formula rules are measured.

* *(i) a line delineated in accordance with paragraph 7 by reference to the outermost fixed points at each of which the thickness of sedimentary rocks is at least 1 % of the shortest distance from such a point to the foot of the slope; or*

**(ii) a line delineated in accordance with paragraph 7 by reference to fixed points not more than 60 nautical miles from the foot of the continental slope*

Paragraph 4 (b) provides a dual regime for the determination of the foot of the continental slope:

> *"In the case of absence of evidence to the contrary, the foot of the continental slope shall be determined as the point of maximum change in the gradient at its base."*

The "Evidence to the Contrary" provision: The provision "evidence to the contrary" in article 76, paragraph 4(b) is interpreted by the Commission on the Limits of the Continental Shelf (CLCS) in their Scientific and Technical Guideline (Publication CLCS/ 11) as a provision designed to allow coastal States to use the best geological evidence available to them to locate the foot of the slope at its base when the geomorphological evidence given by the maximum change in the gradient does not or can not locate reliably the FOS.

For the purpose of identifying the region defined as the base of the slope, the CLCS defines the continental slope as the outer portion of the continental margin that extends from the shelf edge to the upper part of the rise. The base of the FOS is a region where the lower part of the slope merges into the top of the continental rise.

For the purpose of identifying the region of the FOS it is advisable to consider also Article 76, paragraph 1:

> *"The continental shelf of a coastal State comprises the sea-bed and subsoil of the submarine areas that extend beyond its territorial seas throughout the natural prolongation of its land territory to the outer edge of the continental margin, or to a distance of 200 nautical miles from the baselines from which the breadth of the territorial sea is measured where the outer edge of the continental margin does not extend up to that distance."*

and Article 76, paragraph 3

> *"The continental margin comprises the submerged prolongation of the land mass of the coastal State, and consists of the sea-bed and subsoil of the shelf, the slope and the rise. It does not include the deep ocean floor with its oceanic ridges or the subsoil thereof."*

South Atlantic volcanic margins: The margins of the South Atlantic are mostly mature, sediment-rich, volcanic rifted margins, showing often a very complex slope and rise geomorphology (e.g. canyon, drift, giant mud waves, piercing bodies). In such complex geomorphologic environment a reliable FOS determination by geomorphological evidence is difficult. Therefore, the use of the *"evidence to the contrary"* approach appears advisable to argue for a FOS position other than that defined by the *"maximum change in gradient at its base"*.

On the basis of new multichannel seismic and magnetic data from South Atlantic volcanic rifted margins (Argentina, Uruguay, Namibia) an application of a proxy of the FOS and its determination is discussed. Some methodological recommendations are made for the determination of the FOS for the case that the "evidence to the contrary" provision is invoked.