

The 'SoU' must go on: Redefining the scope of the Bengal rule as an alternative to Article 76 of UNCLOS

Ángeles Jiménez García-Carriazo^{a,*}, Luis Miguel Rioja Gallo^b, Teresa Medialdea Cela^c, Luis Somoza Losada^c

^a University of Cádiz, Spain

^b Hydrographic Institute of the Navy (IHM), Cádiz, Spain

^c Geological Survey of Spain (IGME-CSIC), Madrid, Spain

ARTICLE INFO

Keywords:

Statement of Understanding
Bengal rule
UNCLOS
Extended continental shelf
CLCS

ABSTRACT

The Statement of Understanding (SoU) emerged as an alternative method for delineating the outer limits of the continental shelf. To prevent inequities for States whose sediment accumulation extends hundreds of kilometers seaward but whose foot of slope lies unusually close to their baselines, Sri Lanka championed this initiative. Although originally intended for the Bay of Bengal, the mechanism has since been invoked by other States that consider themselves to meet the relevant geological criteria. In this context, Myanmar, Sri Lanka, Kenya, and Spain (in relation to the Galicia region) have all relied on the SoU. The central issue, however, lies in its interpretation. The SoU is set out in only five paragraphs contained in Annex II of the Final Act of UNCLOS, providing States with a degree of discretion. Nevertheless, the Commission on the Limits of the Continental Shelf (CLCS) applies its own interpretative approach. This paper offers a legal and technical examination of the conditions required for applying the SoU method. It analyzes the legal framework governing its use, highlighting the challenges that arise in practice. A central focus is the interpretative role of the CLCS. Given the absence of clear standards and the intricacies of individual submissions, this study critically evaluates how the CLCS has addressed the uncertainties surrounding the SoU method. The analysis is grounded in a detailed review of State submissions and the practice of the CLCS, offering insights into the Commission's evolving interpretative approach and the implications for coastal States seeking to extend their continental shelf.

1. Introduction

During the first decades of the Commission on the Limits of the Continental Shelf (CLCS), coastal States have submitted the outer limits of their continental shelves based on the application of the formulae lines in Article 76(4) of the United Nations Convention on the Law of the Sea (UNCLOS) [1–3]. However, this is not the only possibility. The so-called Statement of Understanding Concerning a Specific Method to be Used in Establishing the Outer Edge of the Continental Margin (SoU) or Bengal rule [4,5] was incorporated into the Final Act of the Third United Nations Conference on the Law of the Sea as an alternative method in establishing the outer edge of the continental margin.

The SoU method serves as an exception for those States whose sediment accumulation extends hundreds of kilometers seaward but whose foot of slope is very close to the baselines. This alternative

recognizes the inequity that would result for States with special geographical features.

The invocation of this rule opens the door to new strategies, enabling coastal States to extend the continental shelf in areas that were not previously considered. On the other hand, it compels the CLCS to make determinations and interpret the rule without any clear guidance. So far, only five States have referred to the SoU in their submissions and four of them (as India reserved the right to make a new submission based on the SoU method) have calculated outer limits based on the SoU method: Sri Lanka - for whom the exception was originally conceived - and its neighbours in the Bay of Bengal (India and Myanmar); Kenya, which creatively invoked the rule despite not being located in that geographical area; and Spain, which applies both Article 76 and the SoU method for its extension in respect of the area of Galicia.

This paper aims to provide a comprehensive legal and technical

* Correspondence to: Avenida de la Universidad, Facultad de Derecho, Campus de Jerez, Universidad de Cadiz, Spain.

E-mail addresses: angeles.jimenez@uca.es (Á. Jiménez García-Carriazo), lriogal@fn.mde.es (L.M. Rioja Gallo), t.medialdea@igme.es (T. Medialdea Cela), l.somoza@igme.es (L. Somoza Losada).

<https://doi.org/10.1016/j.marpol.2025.106976>

Received 23 August 2025; Received in revised form 23 November 2025; Accepted 26 November 2025

Available online 2 December 2025

0308-597X/© 2025 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

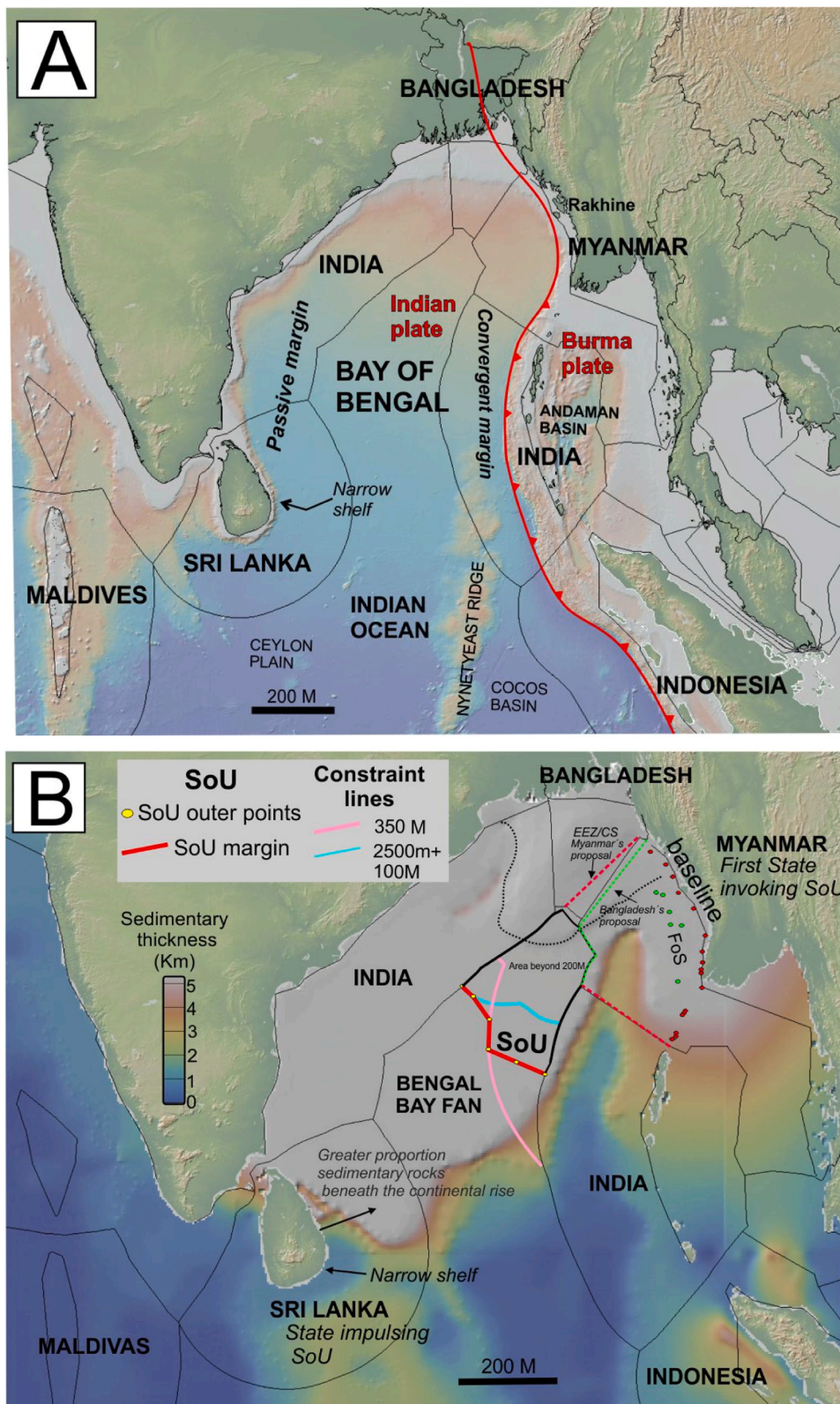


Fig. 1. A) Geological characteristics of the Bay of Bengal characterized by two types of margins i.e., a passive margin along the western side and a convergent margin on the eastern side. Bathymetry in the background from GeoMapApp 3.7.5 [13,14]. Exclusive economic zone maritime boundaries from World EEZ v12 [15] B) Submission of Myanmar according to the SoU in the Bay of Bengal. Global sediment thickness shown in the background [16].

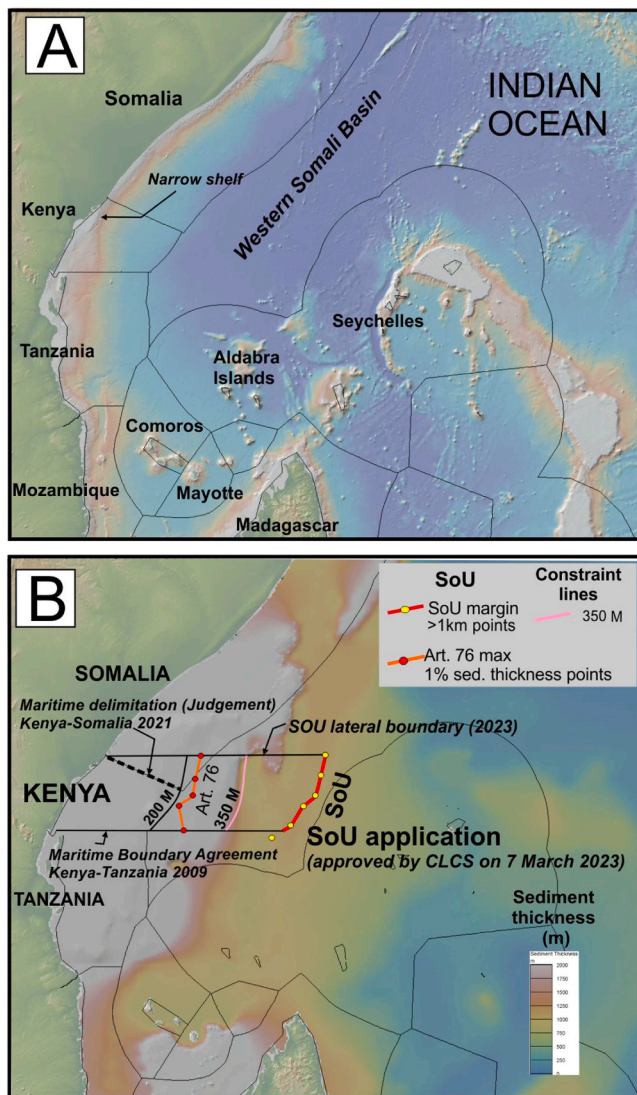


Fig. 2. A) Characteristics of the eastern passive African margin in the Indian Ocean. Bathymetry in the background from GeoMapApp 3.7.5 [13,14]. Exclusive economic zone maritime boundaries sourced from World EEZ v12 [15]; B) Submission of the Republic of Kenya to the CLCS according to the SoU. This was the first Submission applying the SoU beyond the Bay of Bengal. Global sediment thickness in the background [16].

analysis of the requirements for invoking the SoU method. It explores the legal framework that governs such invocations, emphasizing the challenges and nuances involved in their application. Of particular focus is the interpretation process carried out by the CLCS. Given the lack of clear guidelines and the complexity of each case, this paper critically examines how the CLCS navigates the ambiguity surrounding the SoU method, offering insights into its evolving approach and the implications for coastal States seeking to extend their continental shelf beyond 200 M.

2. The genesis and genius of the Statement of Understanding

During the negotiations at the Third Conference on the Law of the Sea, the Government of Sri Lanka pointed out that the application of the sediment-thickness formula in Article 76(4) UNCLOS to the southern part of the Bay of Bengal would lead to inequity, as more than half of the margin would be excluded.

Several major river systems - including the Ganges, Brahmaputra, Godavari, and Krishna - drain into the Bay of Bengal. Over millions of

years, the sediments carried by these rivers and their ancestors have accumulated to form a significant submarine structure known as the Bengal fan [6].

Sri Lanka considered the Bengal fan to represent the natural prolongation of continental sediments and extend significant distances into the high seas. Therefore, Sri Lanka argued that its approach did not entail encroaching on the ocean floor, but rather sought sovereign rights over specific components of the continental shelf [6,7].

In some specific areas, even though a very thick accumulation of sediments extends hundreds of kilometers seaward, the foot of the continental slope is very close to the baselines. In such cases, the formulae lines would lie close to the baselines, a circumstance that would put coastal States with continental shelves having those characteristics at a disadvantage [8].

To address this issue, the drafters, building on a Sri Lankan proposal, agreed on an exception that applies in cases where the 200-metre isobath occurs, on average, within 20 M from the baseline, and where the greater proportion of the sedimentary rocks forming the continental margin lies beneath the continental rise [8].

If both conditions are met, the coastal State may delineate the outer edge of its continental margin using a “modified sediment thickness formula:” by drawing straight lines, each no longer than 60 M, between fixed points defined by latitude and longitude, where the thickness of sedimentary rock is at least 1 kilometre.

The exception, which is not included in the main body of the Convention, was drafted to address the unique characteristics of the Bay of Bengal. This is explicitly referenced in Article 3(1)(a) of Annex II, where the Conference requests the CLCS to apply this rule when formulating its recommendations concerning the determination of the outer edge of the continental margins of States located in the southern part of the Bay of Bengal.

The Bengal rule thus seems to function as a third formula, alongside the two established methods that generate the Gardiner line (Article 76(4)(a)(i)) and the Hedberg line (Article 76(4)(a)(ii)) [9]. This has been reflected in the CLCS Scientific and Technical Guidelines [10]: “The Commission acknowledges that, for the coastal States located in the southern part of the Bay of Bengal, an exception to the provisions of paragraph 4 is provided for by the Statement of Understanding in Annex I of the Final Act of the Third United Nations Conference on the Law of the Sea.”

From a detailed reading of the SoU, a series of special characteristics can be identified as prerequisites for the use of the alternative method prescribed by the SoU: (1) the average distance at which the 200 m isobath occurs is not more than 20 M from the baselines; (2) the greater proportion (volume) of the sedimentary rock of the continental margin lies beneath the rise; (3) the mathematical average of the thickness of sedimentary rock along a line established at the maximum distance permissible in accordance with the provisions of paragraph 4(a)(i) and (ii) of Article 76 as representing the outer edge of the continental margin should be not less than 3.5 km; (4) by applying the Article 76 margin, more than half of the margin would be excluded ($B > A$); (5) and the establishment of the outer edge of the continental margin by straight lines not exceeding 60 M in length connecting fixed points, defined by latitude and longitude, at each of which the thickness of sedimentary rock is not less than 1 km (SoU margin).

3. Application of the SoU method within and beyond the Bay of Bengal

Several countries have now included the SoU method in their submissions: Myanmar, Sri Lanka, India, Kenya, and Spain with respect to the area of Galicia.

Although originally intended for Sri Lanka (and, by extension, its neighbour India, pursuant to paragraph 4 of the SoU – “where a State establishes the outer edge of its continental margin by this method, a neighbouring State may apply the same method on a common geological

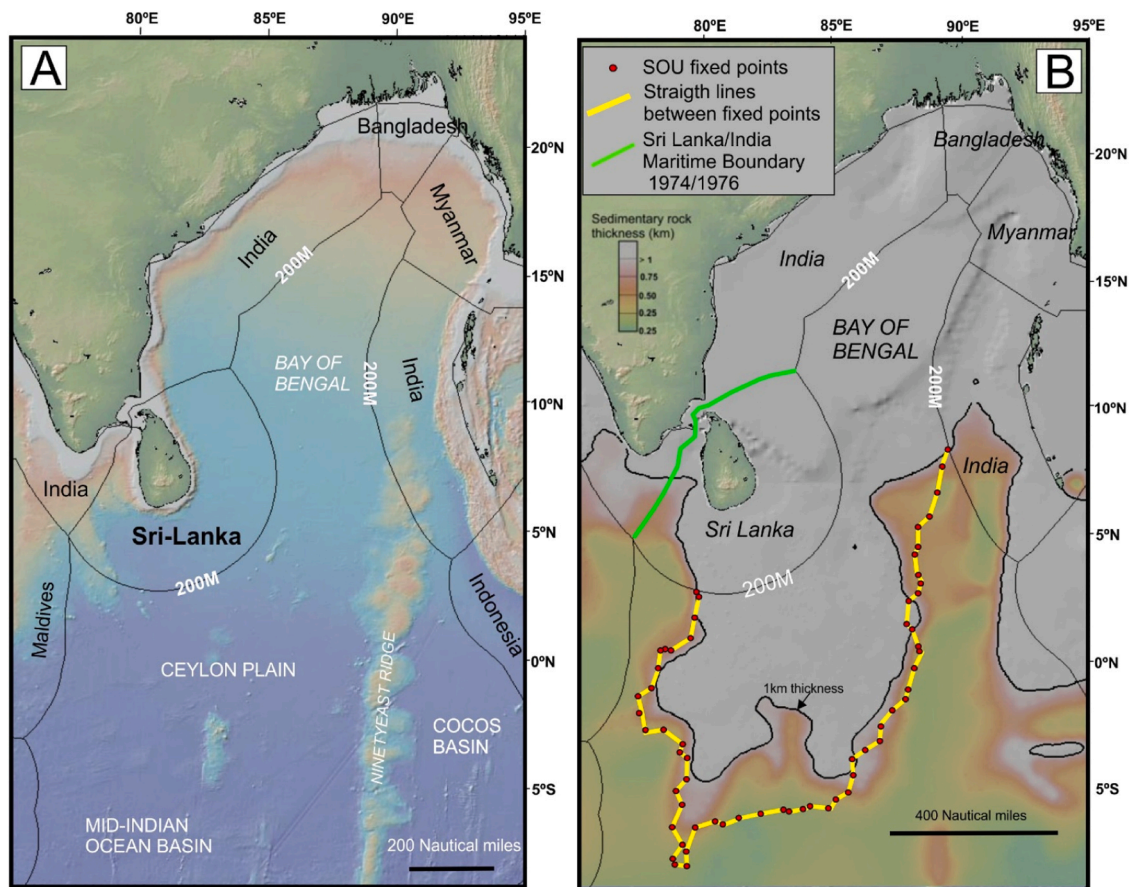


Fig. 3. A) Seafloor characteristics of the Sri Lanka located between the Bay of Bengal and the Mid-Indian Ocean. Bathymetry from GeoMapApp 3.7.5 [13,14]. B) Submission of the Republic of Sri Lanka to the CLCS according to the SoU. Global sediment thickness in the background marking the > 1 km thickness of sedimentary rocks [16].

feature”) [7], other States have interpreted the basis for invoking the SoU method not as a matter of geographical location, but rather as the ability to demonstrate the presence of the special characteristics and the inequity that would result from applying Article 76(4)(a)(i) [9].

In this regard, in 2009, the CLCS affirmed that the SoU applies to any area where the scientific criteria it sets forth are met, regardless of the geographic location of the State party [11].

Set out below are the submissions which refer to the SoU method, listed in chronological order of their presentation:

a. Myanmar: The Pioneer in Invoking the SoU

In its submission of 16 December 2008, the Republic of the Union of Myanmar claimed the extension of its continental shelf beyond 200 M in the Bay of Bengal, off Rakhine, and referred to as Rakhine Continental Shelf. The outer limits of Rakhine continental shelf were based on the provisions of Article 76 and the SoU, as both, one per cent sediment thickness formula and provision of Annex II of UNCLOS were used to delineate the outer limit of the extended Rakhine continental shelf [12].

Myanmar’s natural prolongation into the Bay of Bengal through the Rakhine continental margin is characterized by morphological, geological, and tectonic features. Morphologically, it includes the shelf, slope, and rise, extending to the deep ocean floor. Geologically and tectonically, the margin forms part of the westward-moving Burma plate and its accretionary complex, composed mainly of marine sedimentary rocks (Fig. 1A). This complex was formed by sediments from the subducting Indian plate, with the underlying abyssal plain shaped by the Bengal submarine fan system.

According to Myanmar, the submission was not subject to any

dispute with other States [12]. However, third States reacted and expressed their concerns in *notes verbales* [17–19]. The note from Bangladesh [20] asserted that there was an ongoing dispute, as the areas claimed by Myanmar constituted part of Bangladesh’s natural prolongation (Fig. 1B). This prevented the CLCS from beginning its consideration of the submission.

Following the judgment of the International Tribunal for the Law of the Sea (ITLOS) in the *Dispute concerning Delimitation of the Maritime Boundary between Bangladesh and Myanmar in the Bay of Bengal (Bangladesh v Myanmar)* [21], Myanmar amended its executive summary [22]. Bangladesh again objected [23], stating that the amended continental shelf claim did not reflect the ITLOS judgment, and as a result, the CLCS has not proceeded to consider Myanmar’s submission.

b. Kenya: Applying the ‘Bengal Rule’ Without Being in the Bay?

The Republic of Kenya is a coastal State in East Africa, located approximately 3000 M away from the Bay of Bengal. However, Kenya argued that the reference to States in the southern part of the Bay of Bengal in paragraph 5 of the SoU does not preclude the application of its general principles to other States, provided they can demonstrate the existence of geological and geomorphological characteristics similar to those of a continental margin in the southern Bay of Bengal, and that the application of Article 76 of UNCLOS causes inequity. On this basis, Kenya invoked the SoU in its submission of 6 May 2009 (Fig. 2) [24].

Sri Lanka claimed that this formula is reserved for the southern part of the Bay of Bengal, as reflected in paragraph 5 of the SoU [25]. Kenya responded that the application of the SoU should not be geographically limited [26–28]. It added that: “[T]here is no reference either in the

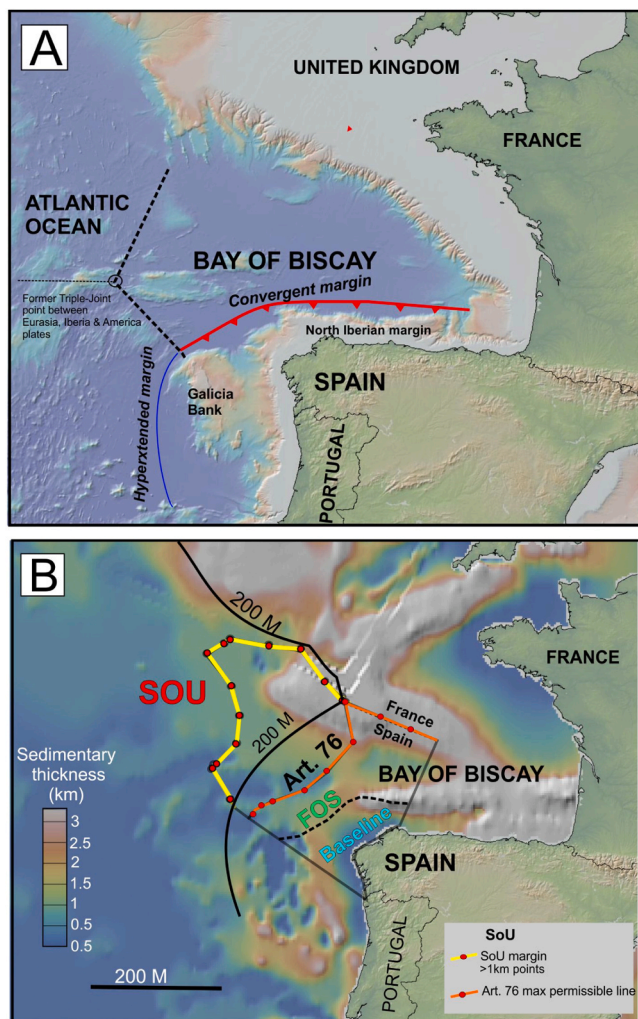


Fig. 4. A) Geological characteristics of the Galicia area, Northeastern Atlantic Ocean: a convergent margin developed along the Bay of Biscay and a hyperextended margin along the West Galicia Margin. Bathymetry in the background from GeoMapApp 3.7.5 [13,14]; B) Submission of Spain applying the SoU in the Bay of Biscay [36]. Global sediment thickness in the background [16].

Statement of Understanding or in any other part of the Convention as a whole to “...the principle State...” and that use of such terminology would not only negate the fundamental principle of equality of States under international law but would also amount to discrimination of States even under similar circumstances.”

The CLCS instructed the Subcommittee to consider the submission made by Kenya on a scientific and technical basis under the provisions of Article 76 and the SoU [29]. In its recommendations [30], having found that the five conditions were satisfied, the CLCS validated the outer limits based on the application of the SoU method. With this interpretation, the CLCS opened the door to the application of the rule beyond the Bay of Bengal.

c. Sri Lanka: The Primary Addressee of the “Bengal Rule”

In its submission of 8 May 2009 [31], the Democratic Socialist Republic of Sri Lanka submitted to the CLCS, in accordance with Article 76 (8) of UNCLOS, information regarding the limits of its continental shelf beyond 200 M from the baselines. This submission concerns the delineation of Sri Lanka’s outer continental shelf using the specific method set forth in the SoU, of which Sri Lanka was the primary intended beneficiary. Sri Lanka’s continental margin exhibits the distinctive geological

and morphological features outlined in the SoU (Fig. 3A). It is marked by a narrow continental shelf, a steep continental slope, and a broad continental rise. Notably, the Executive Summary omits reference to the polygon used by Sri Lanka for determining the application area of the SoU (Fig. 3B).

Sri Lanka’s submission overlaps with India, Myanmar, Maldives, and Bangladesh (Fig. 3B). In the submission, Sri Lanka stated that there were no pending disputes with its neighbours [31]. The CLCS appointed a subcommittee to consider Sri Lanka’s submission in October 2016 and several rounds of discussions between the Subcommittee and the Sri Lanka delegation took place.

Despite consultations held with India prior to the submission, in 2022 India issued a *note verbale* [32] that halted the consideration and qualification of Sri Lanka’s submission by the CLCS, on the grounds that it could prejudice India’s rights over parts of its continental shelf.

d. India: The Neighbouring State

On 11 May 2009, the Republic of India submitted its claim to extend its continental shelf to the CLCS. Unlike the other coastal States of the Bay of Bengal, India does not invoke the SoU method, but reserved the right to make a new submission based on the SoU method [33]: “Although the present submission is being made pursuant to article 76, paragraph 8 of the Convention, as a coastal state in the southern part of the Bay of Bengal and in pursuance of the provisions of paragraph 4 of the Statement of Understanding, India reserves the right to make a separate second partial submission of information and data to support the outer limits of the continental shelf in accordance with the provisions of the Statement at a later date, notwithstanding the provisions regarding the ten-year period.”

A submission of that kind had not been made at the time this was written.

On 3 April 2025, India transmitted to the CLCS two executive summaries in respect of the Western Offshore Region, and the Western Offshore Region as part of an amended partial submission. According to the submitting State [34], the executive summaries “have no bearing on the data and information provided in the 2009 partial submission pertaining the Eastern Offshore region comprising the Bay of Bengal and Western Andaman sectors.”

e. Spain in Respect of the Area of Galicia: The Last One to Join the Club

The Kingdom of Spain’s original submission of 11 May 2009 [35] did not anticipate the change in direction that would come 15 years later. When the Subcommittee began its consideration in 2019, the lack of consensus between the Spanish Delegation and the Subcommittee led to the submission being divided into two distinct margins: the West Galicia margin and the Bay of Biscay margin.

In the latter, specific features can be observed that are similar to those described by the SoU. In its amended executive summary dated 14 November 2024 (Fig. 4), Spain invokes the application of the SoU method to the Bay of Biscay margin [36]: “In establishing the outer edge of the continental shelf of the Bay of Biscay, Spain has applied the method specified in the SoU as provided in the Annex II of the Final Act of the Third United Nations Conference on the Law of the Sea. The application of the SoU is that of a general nature provided that the submitting State’s continental margin exhibits special characteristics and that the application of Article 76 occasions an inequity [...] In this regard, Spain is firmly of the view that the application of this specific method is consistent with the terms of the SoU, considering the particular and special characteristics of the continental margin of the Bay of Biscay [...] and recognizing the inequity that would arise in the event that Spain were required to apply the provisions of paragraph 4 of Article 76 under these circumstances.”

A new challenge for the CLCS has emerged, as one State has chosen to apply Article 76 along with the SoU method in a given submission. As of

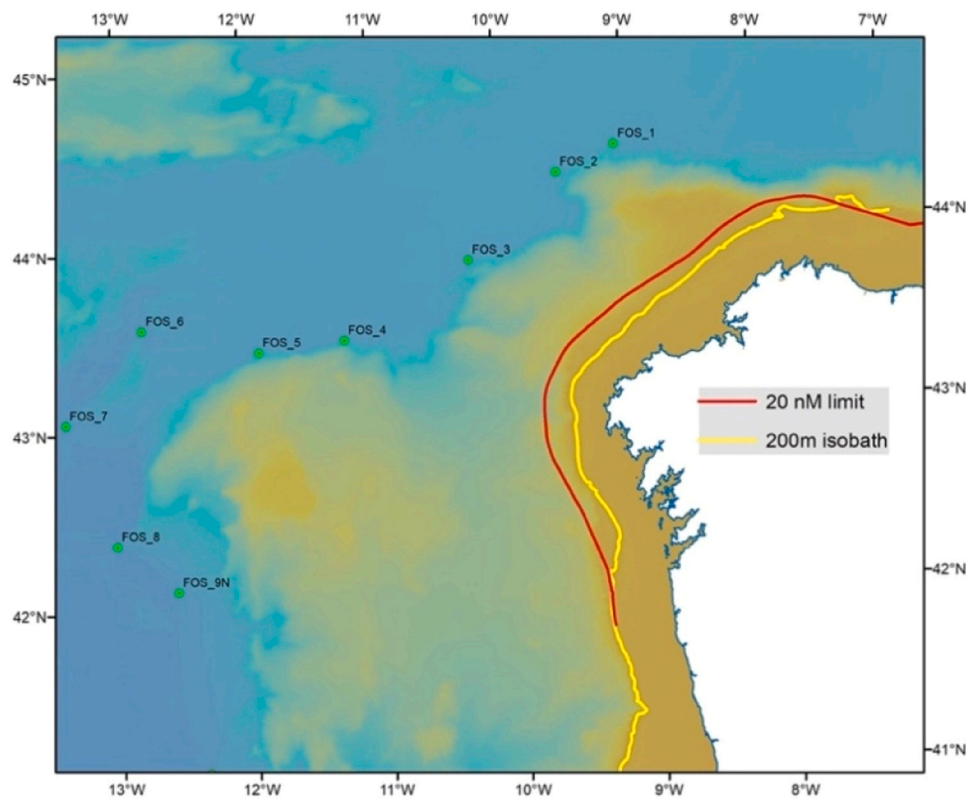


Fig. 5. Compliance with SoU Requirement 1, as presented by the Delegation of Spain in the area of Galicia. The map illustrates the 200 m isobath (yellow line) not extending beyond the 200 M (red line) from the baselines. The 200 m isobath was derived from multibeam bathymetry. This area was used to define the base of the SoU polygon.

the time of writing, the CLCS has not issued any recommendations on this matter.

4. The interpretation of the SoU by the CLCS

As evidenced by the preceding discussion, the Bengal rule poses significant challenges. Despite its undeniable normative value, its interpretation is difficult for both States and the CLCS. Its five paragraphs offer grounds for optimism in some cases, while giving rise to legal uncertainty in others. To date, the CLCS is preparing interpretative guidance on each of the circumstances giving rise to the application of the SoU method, which will be published in a Technical Bulletin. It must be underscored, however, that such interpretations come from a technical, not a legal, body.

Requirement 1. The average distance at which the 200 m isobath occurs is not more than 20 M from the baselines

This requirement focuses on the special characteristics of a State’s continental margin; specifically, the presence of a narrow shelf where the 200 m isobaths, marking the boundary of the geological continental shelf, lies close to the coastline (Fig. 5).

At first glance, this appears to be a straightforward requirement that can be satisfied by submitting bathymetric data along with the coordinates of the baselines. Where there is a large degree of confidence in the accuracy of this information, the use of gridded bathymetric data may be deemed acceptable. However, if the average distance from the baseline to the 200 m isobath is close to 20 M, accurate multibeam bathymetry data will be necessary. 5 will address the interpretation of the “average distance” at which the 200-meter isobath is considered to be “not more” than 200 nautical miles from the baselines.

Requirement 2. The greater proportion of the sedimentary rock of the continental margin lies beneath the rise

This requirement concerns the geological special characteristics of a State’s continental margin; specifically, that a greater proportion of the sedimentary rock of the continental margin lies beneath the rise (Fig. 6).

In order to meet this requirement, the sediment volume of area A must be less than that of area B. Polygon A must encompass the baselines and the foot of the slope, as defined in Article 76 using the maximum change in gradient method. Conversely, polygon B must delineate the SoU outer margin, based on fixed points where sedimentary rock thickness exceeds 1 km and the points are no more than 60 M apart, in accordance with Requirement 5 of the SoU (Fig. 7). This requirement serves as a substitute for Article 76(4)(a) within the SoU framework. The volumetric comparison requires a precise delineation of the polygon within which the SoU is applied, particularly with respect to the positioning of its lateral extents. The lateral boundaries of these polygons are not clearly defined in the SoU and will be addressed in 5.

Ideally, a complete multichannel seismic lines dataset with sampling intervals of less than 20 M would be employed; however, such coverage is typically cost-prohibitive. As an alternative or in combination, a well-constrained sediment thickness grid derived from seismic data may be used in cases where the criteria for applying the SoU method are satisfied. Fixed points marking sediment thickness greater than 1 km for polygon B may be determined using single-channel seismic data and a time-depth conversion model. This approach was validated in the Commission’s recommendations for Kenya [30].

Requirement 3. The mathematical average of the thickness of sedimentary rock along a line established at the maximum distance permissible in accordance with the provisions of paragraph 4(a)(i) and (ii) of Article 76 as representing the entire outer edge of the continental margin should not be less than 3.5 km

The definition of this line, set at the maximum distance permissible under paragraphs 4(a)(i) and (ii) of Article 76, is a preliminary and

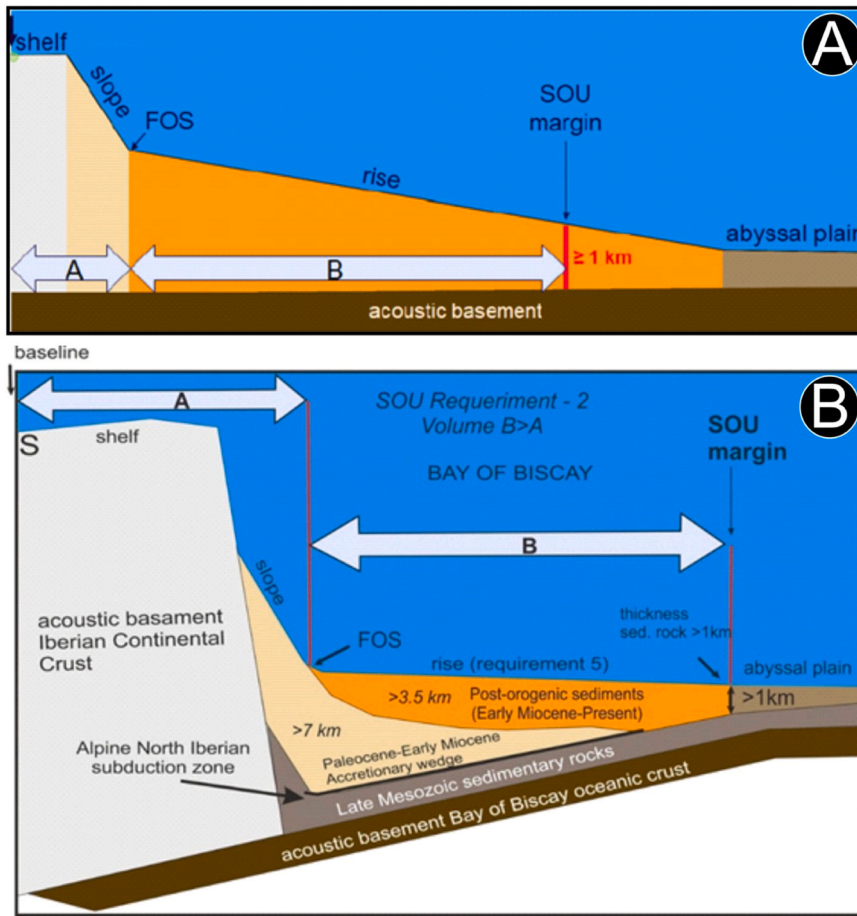


Fig. 6. Illustration of Requirement 2 for: A) Passive margins [30]; B) Convergent margins [36]. In the latter case, it is evident that the greater proportion of sedimentary rocks lies beneath point B, in accordance with Requirement 2.

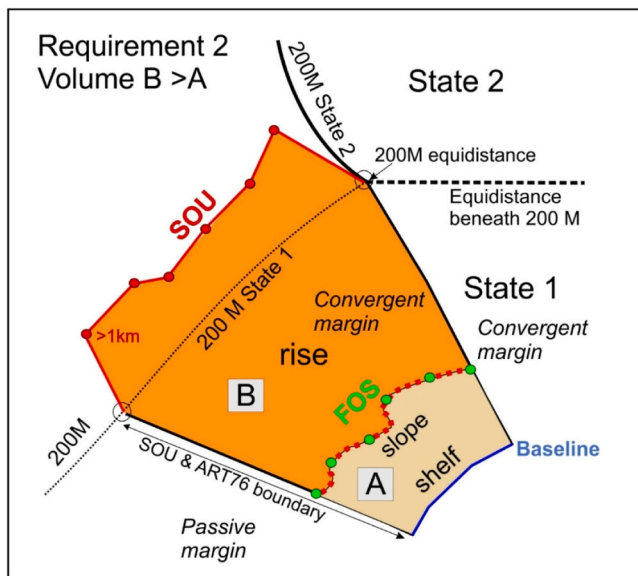


Fig. 7. Illustration of Requirement 2: The volume of polygon B (continental rise) must be greater than the volume of polygon A (shelf and slope). This requirement implies the definition of three lines: the baseline, the foot of the slope and the SoU margin. The delineation of the SoU margin (red thick line) requires defining the SoU outer edge fixed points according to Requirement 5—points where the thickness of sedimentary rocks exceeds 1 km and are connected by no more than 60 nautical miles (red points).

necessary step for satisfying Requirements 3 and 4 under the SoU method (Figs. 8 and 9). The Article 76 outer limit should result from an optimal combination of the formulae lines described in those paragraphs.

The Scientific and Technical Guidelines expressly prohibit the use of interpolated grids for establishing 1 % sedimentary thickness fixed points for the delineation of outer limits under Article 76 [10]. Therefore, the maximum permissible distance calculated in accordance with Article 76 for the application of Requirements 3 and 4 must adhere to the same rules established by the Scientific and Technical Guidelines—that is, interpolated grids cannot be used to calculate the 1 % sedimentary thickness fixed points (Fig. 9).

However, the calculation of the mathematical average sediment thickness along the Article 76 line can be derived by extracting equally spaced points (e.g., every 5 M or 0.85° to avoid dependence on latitude) from interpolated gridded thickness data. These data could be sourced from gridded thickness data from pre-stack depth migrated multi-channel seismic lines or from sediment thickness grids such as the 5-arc-minute GlobSed database [16]. If the mathematical average thickness along the Article 76 maximum permissible line is not less than 3.5 km, then Requirement 3 is considered fulfilled. No further uncertainties are involved, and the resulting average can be regarded as representative of the entire polygonal surface.

Requirement 4. More than half of the margin would be excluded thereby

In order to fulfill this requirement, three lines must be delineated: the baseline, the Article 76 line (as previously described under Requirement 3), and the SoU line. These lines are necessary to compute Areas A (the

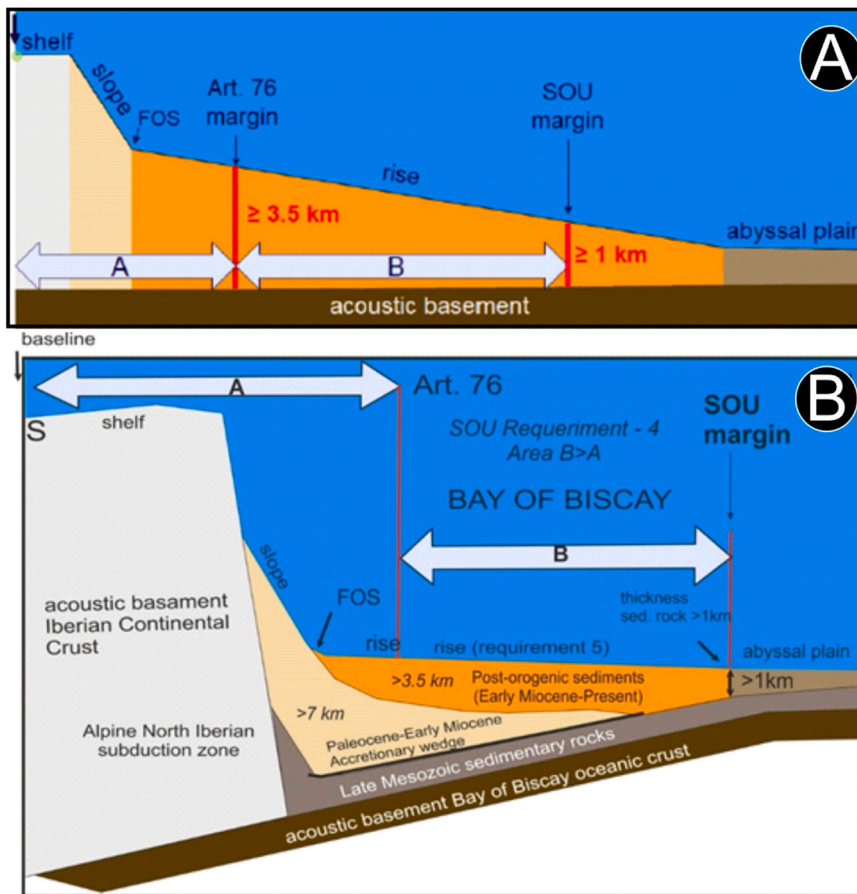


Fig. 8. Illustration of Requirement 3 (Article 76 maximum permissible line > 3.5 km) and 4 (Area B > Area A) for: Passive margins [30]; B): Convergent margins [36]. In both cases, the delineation of the line established at the maximum permissible distance in accordance with paragraphs 4(a)(i) and (ii) of Article 76 constitutes a key issue.

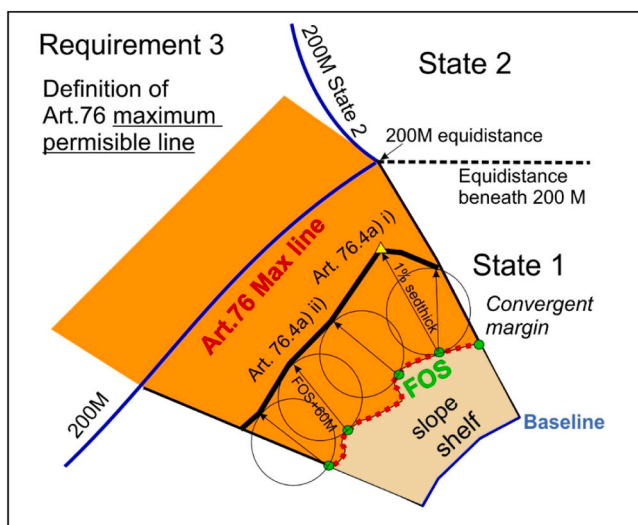


Fig. 9. The definition of the line established at the maximum distance permissible under paragraphs 4(a)(i) and (ii) of Article 76 must follow the rules set forth in the Scientific and Technical Guidelines, specifically prohibiting the use of interpolated grids for calculating 1 % sediment thickness fixed points.

Article 76 margin) and B (the area located between the Article 76 and SoU margins) (Fig. 10). All three lines must be defined within the lateral boundaries of the SoU polygon, which are geometrically constrained by

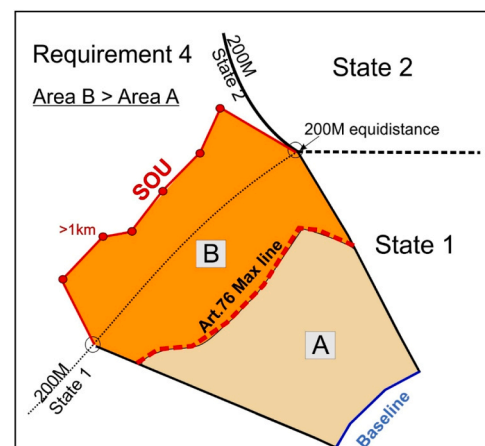


Fig. 10. Requirement 4: Delineation of two polygons using three lines: the baseline, the Article 76 maximum permissible line, and the SoU line. In order to fulfill this requirement, the area of polygon B must be greater than that of polygon A.

the lateral lines (as will be discussed in 5). Requirement 4 is considered satisfied when the area of the polygon B (the SoU margin) exceeds that of polygon A (the Article 76 margin). As stated in the SoU, this condition demonstrates that *more than half of the continental margin* (as defined by Article 76) *would be excluded* if the SoU were not applied (Fig. 10).

Requirement 5. Establish the outer edge of the continental margin by

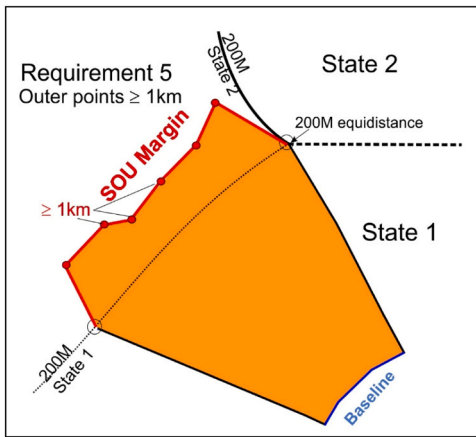


Fig. 11. The SoU margin delineated by outer fixed points located no more than 60 M apart, where the thickness of the sedimentary rocks is not less than 1 km.

straight lines not exceeding 60 M in length connecting fixed points, defined by latitude and longitude, at each of which the thickness of sedimentary rock is not less than 1 km

The CLCS understands that the application of the SoU does not exclude the application of other relevant provisions contained in Article 76. Accordingly, it draws lines connecting fixed points, defined by latitude and longitude, at each of which the thickness of sedimentary rock is not less than 1 km (Fig. 11).

5. Emerging uncertainties in the ongoing application of the SoU

The title of the SoU clearly establishes it as a specific method for determining the outer edge of the continental margin. It therefore

represents an alternative method to the standard application of Article 76 [5]. The SoU recognizes that, provided the relevant requirements are met, a State may—*notwithstanding the provisions of Article 76*— establish the outer edge of its continental margin by means of straight lines not exceeding 60 M in length. However, the interpretation and application of the SoU method are not without ambiguities. In fact, the practice of the CLCS itself continues to shape the applicable “rules” [37].

This is evident in its extension beyond the Bay of Bengal, as confirmed by the recommendations issued to Kenya. Does this mean that any country could invoke it? Logically, if a State appears to meet the relevant criteria at first glance and, following the report of the 19th meeting of SPLOS, it should, at the very least, consider making the attempt.

However, there remain a number of questions that still require answers before fully understanding the scope and application of the SoU. Only time (and the CLCS) will reveal how they will ultimately be applied.

5.1. Applying Article 76 and the SoU in a given submission

The Spanish case has raised questions regarding the simultaneous application of Article 76 and the SoU method within a given submission (Fig. 12). In cases where both the SoU method and the Article 76 provisions are applied within the same submission, the demarcation line separating the two approaches must be thoroughly justified. This justification should be grounded in the distinct physiographic and geological characteristics of the margin.

In Spain’s case the two distinct methodologies were presented within the same submission. The Bay of Biscay is recognized as a geologically distinctive margin. For now, this approach appears to have been accepted, as the consideration of the submission is still ongoing.

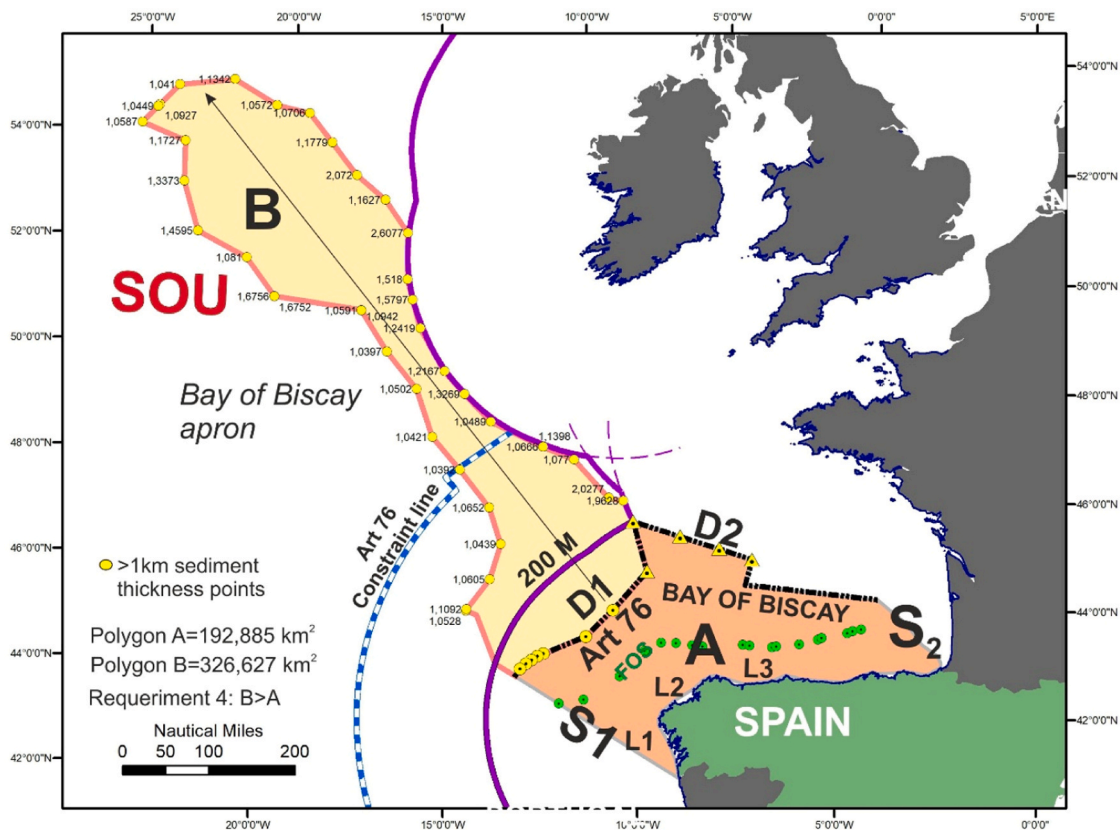


Fig. 12. Application of the SoU to the Bay of Biscay. S1 and S2 are the lateral boundaries. D1 and D2 are the fronts of the SoU margin.

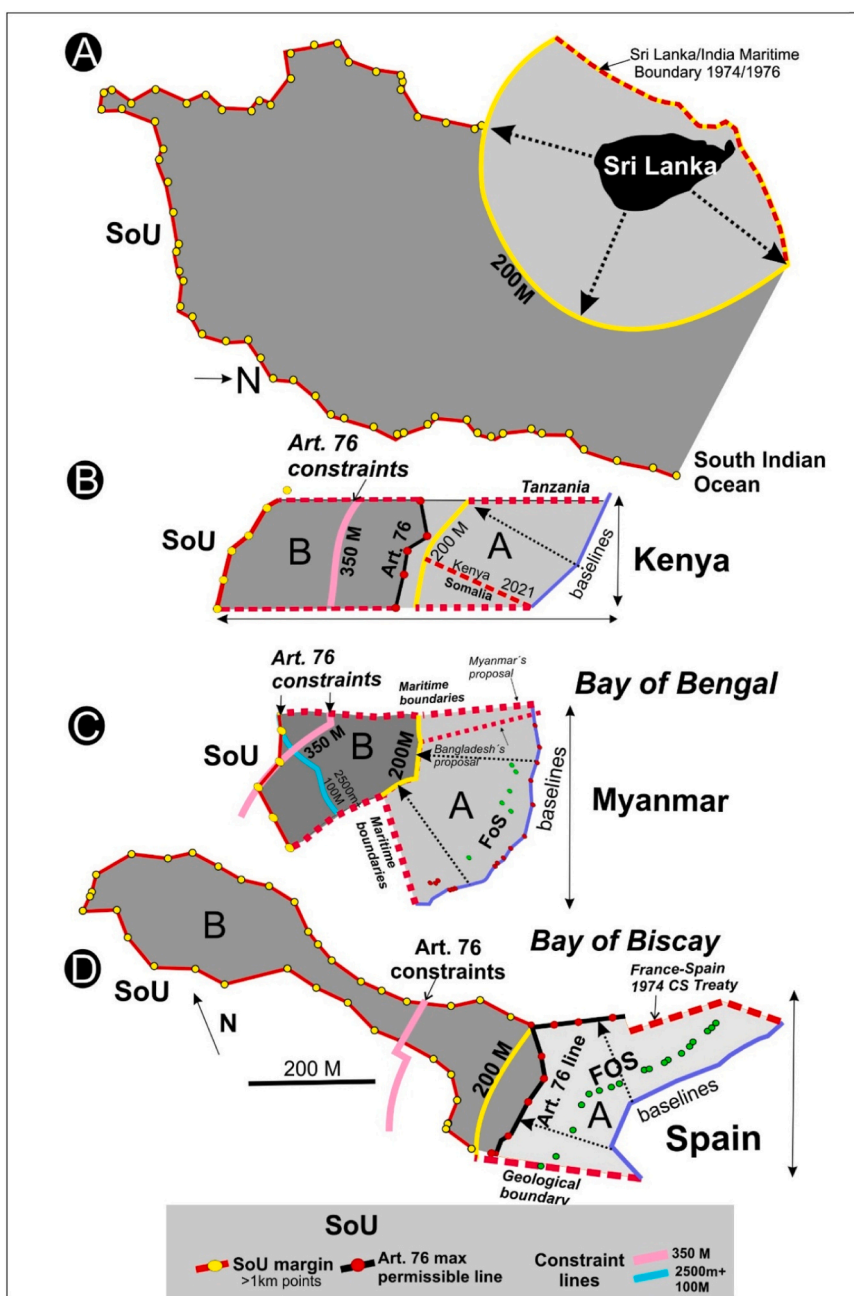


Fig. 13. Comparison of the geometry and size of the SoU polygons applied by the different coastal States across varying morphological coastline settings: A) Sri Lanka (Bay of Bengal-Mid-Indian Ocean); B) Kenya (East African continental margin); C) Myanmar (Bay of Bengal), and D) Spain (Bay of Biscay). Sri Lanka’s submission did not include reference to the polygon in its the Executive Summary. All SoU margins are presented at same scale and orientation (landward to the right) to facilitate direct comparison. While the Article 76 constraint lines do not apply to the calculation of the A/B polygon ratio necessary for SoU requirement 4, they are introduced at a subsequent stage of the process.

5.2. Extents of the SoU applications

Regarding the lateral extent of the SoU, it is clear that the method requires a well-defined area within which its criteria can be evaluated. The lateral boundaries of the SoU domain must be explicitly identified and documented, as they directly influence area-based calculations.

To date, four coastal States have followed this method to establish their outer continental margin: Myanmar, Sri Lanka, Kenya, and Spain in respect to the area of Galicia (Fig. 13). A common factor among these cases is the inequity in applying Article 76 of the Convention to their continental margins. Specifically, the Article 76 outer limit is noticeably more recessed compared to the limits established through the SoU

method. This difference is particularly pronounced in the case of Spain, where the Article 76 limit lies significantly landward of the 200 M boundary (Figs. 12 and 13D). This inequity originates from the special characteristics of these States’ continental margin, characterized by narrow shelves. In particular, the average distance at which the 200 m isobath occurs does not exceed 20 M, a feature common to all four cases presented to the CLCS (Fig. 13).

Several different lateral boundaries have been employed in the previously presented applications of the SoU method (Fig. 13). Kenya’s proposal used the full extent of its continental margin, disregarding the established maritime boundaries with neighboring States, Tanzania and Somalia (Fig. 13B). In cases of concave coastlines, such as the Bay of

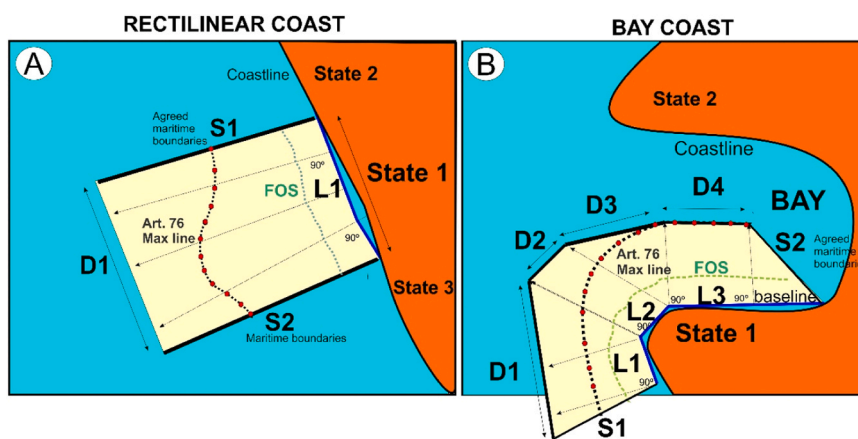


Fig. 16. Lateral boundaries and configuration of SoU polygons as influenced by coastal morphology. A) Rectilinear coastline example: Kenya, Indian Ocean (refer to Fig. 2); B) Bay-type coastline examples: Bay of Bengal and Bay of Biscay (refer to Figs. 1 and 4).

To date, the only submission evaluated by the CLCS involving a rectilinear coast is that of Kenya, along the East African margin (Fig. 16A). In this instance, the CLCS applied a rectangular configuration to define the SoU polygon, consisting of two lateral boundaries (S1 and S2), an onshore boundary (L1) parallel to the baselines, and an offshore boundary (D1) extending seaward (Fig. 16A). The lateral limits were drawn along two east–west trending lines. The southern boundary (S2) coincided with the existing maritime boundary agreed with Tanzania, while the northern boundary (S1) was established along an east–west line that did not account for the provisional equidistance line derived through geometric methods from base points on the Kenyan and Somali coasts (Fig. 2).

The ICJ’s judgment revised the provisional equidistance line between Kenya and Somalia [38]. However, the recommendations adopted by the Subcommission on 8 November 2022—and later endorsed by the full Commission on 7 March 2023 in its Recommendations—maintained a east-west line (S1) as the northern lateral limit of the SoU polygon. This choice failed to reflect the ICJ’s adjusted delimitation and directly impacted the construction of polygons A and B used for meeting Requirements 2 and 4 of Article 76.

As a general rule, for rectilinear coasts, the lateral boundaries (S1 and S2) should be delineated at right angles to the general orientation of the coastline, as defined by the baselines (indicated by blue lines in Fig. 16A). Where maritime boundary agreements for the exclusive economic zone or the continental shelf within or beyond 200 nautical miles exist, these agreed boundaries should be adopted as the lateral limits. Applying this rule consistently helps to avoid overlaps between the SoU application polygon and established maritime delimitation lines.

In the case of bay-type coasts, we propose that the same general principle should be applied, while taking into account the distinct coastal morphology. Accordingly, the SoU polygon in such settings would consist of multiple sub-polygons, each constructed at right angles to the local trend of the coastline. These segments are delineated with reference to the baselines (blue lines L1 to L3 in Fig. 16B). The overall lateral boundaries of the composite polygon (S1 and S2) correspond to the outermost edges of the sub-polygons and, as with rectilinear coasts, may be defined by provisional equidistance lines, agreed maritime boundaries, or relevant geological features.

Importantly, for bay-type coasts, the offshore fronts of the sub-polygons (D1 to D4 in Fig. 16B) are aligned parallel to the baselines and the FOS line. As such, they cannot be treated as lateral boundaries. This distinction is particularly significant when applying the Article 76 maximum permissible line, since these offshore fronts—being perpendicular to the FOS line—represent the shortest distance for calculating Article 76 formula points (e.g., D4 in Fig. 16B). The implications of this

configuration for the application of Article 76 will be examined in detail in the following section.

5.5. The rules for determination of the Article 76 “maximum permissible line”

One of the main uncertainties in the context of the SoU is the concept of the Article 76 “maximum permissible line.” How is it constructed? It is intriguing that, in order to apply the requirements of the SoU method, calculations must be made based on Article 76 of UNCLOS. This raises questions about the coherence of using Article 76 as a basis for determining the boundaries of the SoU, as it seems to involve a somewhat paradoxical application of both methodologies within the same framework.

Since the foot of the slope (FOS) + 60 M points, calculated in accordance with Article 76, paragraph 4(a)(ii), are typically derived from a retreated margin located close to the coast (as is characteristic of a SoU-type margin), and the 1 % fixed may also lie beyond the 200 M, the distance required to connect these two types of Article 76 formula points normally exceeds the 60 M permitted under Article 76, paragraph 7. Furthermore, intermediate 1 % formula points, generated from regional sediment thickness grids, cannot be used to bridge the gap between 1 % sediment thickness points and those derived from the foot of the slope (Fig. 17).

Therefore, the selection of fixed points for the Article 76 maximum permissible line based on an isopach map is not considered an acceptable practice. The interpolation inherent in contouring introduces an additional source of uncertainty and is not explicitly permitted under Article 76, paragraph 4(a)(i), as clarified in paragraph 8(5) of the Scientific and Technical Guidelines (Fig. 17A-B).

The morphology of the coastline plays a critical role in calculating the Article 76 maximum permissible line, particularly in relation to SoU Requirements 3 and 4 (Figs. 9 and 10). In cases where the coastline is predominantly rectilinear, such as that of Kenya, the delineation of the Article 76 maximum permissible line is constrained by the lateral boundaries, as this line typically extends from point S1 to point S2 (Fig. 16). This configuration limits the ability to follow the natural curvature of the continental margin. In contrast, for bay-type coastlines, the Article 76 maximum permissible line may be drawn in accordance with the curvature of the coast, allowing it to reach the lateral boundary at point S2. This distinction underscores the importance of coastal morphology in the practical application of Article 76 methodologies.

The logic of the CLCS in this regard is the same as that applied when using the constraint lines of Article 76 in the SoU method. According to the CLCS, the SoU method simply substitutes Article 76(4) of UNCLOS, although this is not explicitly stated anywhere. In other words, it serves

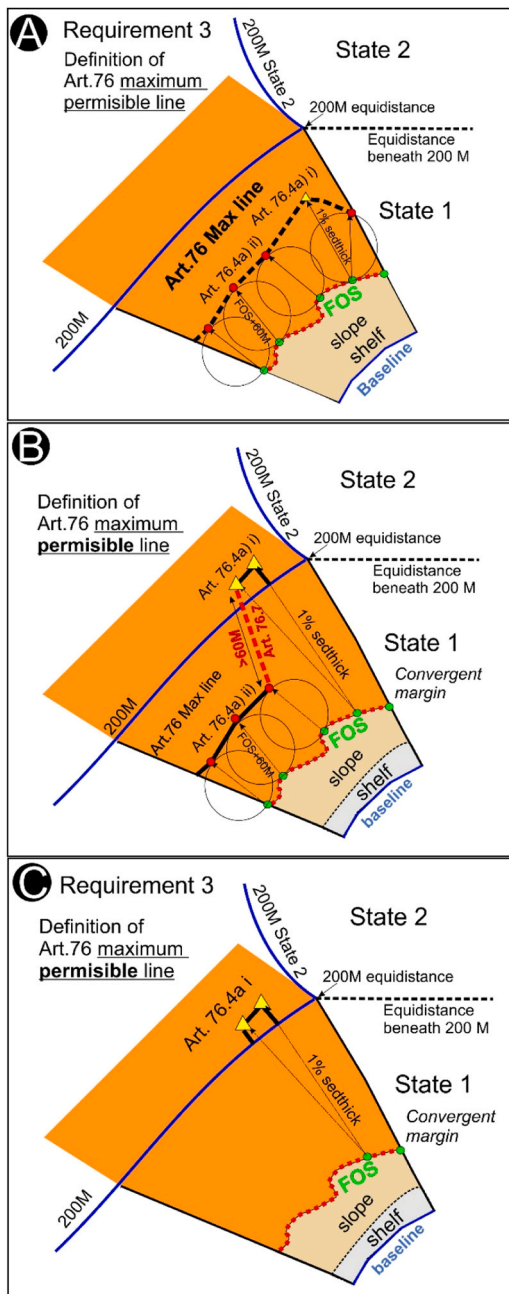


Fig. 17. A) The construction of the Article 76 maximum permissible line in the context of the SoU must follow the same rules outlined in UNCLOS Article 76 and the Scientific and Technical Guidelines; B) The distance between Hedberg and Gardiner formula fixed points should be less than 60 M according to Article 76(7); C) The use of isopach maps to select 1 % sedimentary thickness fixed points for this line is not considered acceptable, as the interpolation inherent in contouring introduces uncertainty and is not explicitly permitted under Article 76.

only as an alternative way to establish the outer edge of the continental margin; to determine the final outer limits of the continental shelf, all other relevant provisions of Article 76 must still be applied. This approach has been followed, for instance, in the case of Kenya.

5.6. The “mathematical average” and the different approaches for calculating sedimentary thickness along the Article 76 maximum line permissible

A similar concern arises in relation to the interpretation of the

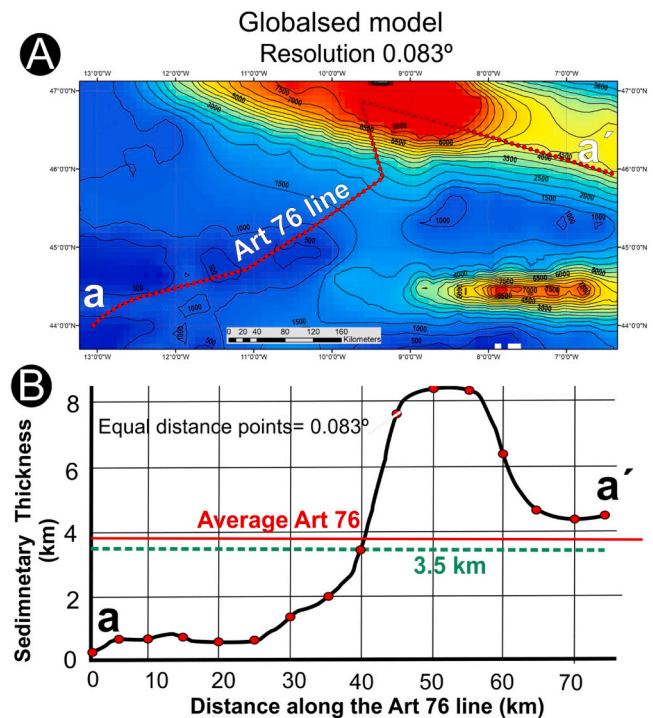


Fig. 18. Methodology for calculating the mathematical average of sedimentary thickness along the Article 76 line in the Bay of Biscay. Above: equidistant points computed at 0.083° intervals along the Article 76-line path, projected onto the GlobSed version 3 [16], with a sediment thickness value assigned to each point. Below: The resulting mathematical average of sedimentary thickness (red line), which exceeds the 3.5 km threshold, thereby fulfilling Requirement 3 in the Bay of Biscay.

Table 1

Estimates of various mathematical averages of sedimentary thickness along the interpolated profile of the Article 76 line, and their corresponding 95 % confidence intervals (CI).

Type of Mean	Estimated Mean (m)	Lower 95 % CI (m)	Upper 95 % CI (m)
Arithmetic mean	3612.08	3035.39	4201.95
Integral mean	3602.27	3548.15	3697.64
Winsorized mean	3615.60	3038.72	4205.52

mathematical average of sedimentary thickness along the Article 76 line. According to the Commission, sediment thickness should be mapped at equal spacing along the line, ensuring that the computed average is representative of the entire polygonal area.

In the case of Spain, equidistant points were computed at 0.083° intervals along the Article 76-line path. This spacing corresponds to the spatial resolution of the global sediment thickness dataset used—GlobSed version 3 [16]. Each point was then projected onto the GlobSed model, assigned a corresponding sediment thickness value, and compiled into an ordered dataset for further analysis (Fig. 18).

However, there are, at least, three different statistical approaches to calculating the mathematical average of sedimentary thickness along a profile, each grounded in a different rationale:

- **Arithmetic mean:** This is the conventional average, obtained by summing all sediment thickness values and dividing by the total number of points. While straightforward and widely applied, it can be significantly affected by outliers or skewed distributions.

- Integral mean (using the trapezoidal rule): This approach involves integrating the area under the sediment thickness profile curve using the trapezoidal rule, then dividing the total area by the length of the profile. It offers a robust estimate for continuous profiles and provides a more accurate representation of effective cumulative thickness.
- Winsorized mean: This is a robust method designed to reduce the influence of extreme values. It limits (trims) the lowest and highest values (typically at the 10th and 90th percentiles) and replaces them with the corresponding threshold values. This minimizes the impact of outliers without excluding them from the dataset.

The results obtained using each of these methods for calculating the average sedimentary thickness are presented in Table 1.

Among all the estimators evaluated, the integral mean proved to be the most robust and accurate for several reasons: a) its 95 % CI is significantly narrower (150 m) compared to the much wider intervals (~1200 m) associated with the other means (Table 1); b) it exhibits reduced sensitivity to outliers and zones of high uncertainty, as it effectively integrates sediment thickness over the entire profile length; and c) it better reflects the geospatial reality by incorporating both the values and their spatial distribution along the Article 76 line path.

Therefore, the use of the integral mean not only meets numerical rigour but also ensures statistical robustness and geospatial consistency. In this case, the lower bound of the 95 % CI remains positive, satisfying the minimum value requirement.

The SoU Requirement 3 interprets the term “mathematical average” as a minimum value of 3.5 km that must be met to fulfill this requirement, without considering any additional uncertainty values or premises. The uncertainty value largely depends on the nature of source data (seismic) and the type of oceanic crust involved (volcanic intrusions, ridges), both for global datasets and for multichannel seismic-derived data grids.

6. Conclusions

The previous explanation highlights that the SoU is a very useful tool for some States, enabling them to extend their continental shelf through an alternative approach to Article 76 of UNCLOS, a possibility they may not have otherwise considered. However, the five paragraphs in question contain ambiguities and unclear terms that require further clarification to ensure uniform application. But who interprets them?

As we know, the CLCS cannot legislate, so the interpretation of the SoU cannot be entrusted to it. While the Commission may provide technical guidance, such as through the Scientific and Technical Guidelines, these would have solely an advisory value. The only bodies with legal competence to interpret the Convention are the international courts and tribunals established under Part XV of UNCLOS.

Nevertheless, the evolving practice of the CLCS has helped to clarify aspects of the SoU framework. For instance, the Commission has acknowledged that the SoU method merely substitutes paragraph 4 of Article 76 of UNCLOS. In other words, it serves exclusively as an alternative mechanism for determining the outer edge of the continental margin; to establish the final outer limits of the continental shelf, all other relevant provisions of Article 76 must still be observed.

This paper addresses some of the uncertainties arising from practice. As we have seen, the justification provided by the CLCS is not always the simplest or most efficient. It may be time for the Meeting of States Parties to address this issue, particularly as more States gradually begin to apply the SoU, and SoU far, SoU good!

CRediT authorship contribution statement

Ángeles Jiménez García-Carriazo: Writing – original draft, Conceptualization, Writing – review & editing. Luis Miguel Rioja Gallo: Methodology, Software, Writing – review & editing. Teresa Medialdea Cela:

Methodology, Writing – review & editing; Luis Somoza Losada: Conceptualization, Methodology, Software, Writing – original draft, Writing – review & editing

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used ChatGPT in order to polish the language After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the published article.

Funding

This work was supported by the Spanish Ministry of Science, Innovation and Universities under grant ‘Recursos marinos, sostenibilidad y territorio. Implicaciones para España de la evolución de los regímenes jurídicos de la pesca y la plataforma continental ampliada’ (RECMAR). PID2023-150405OB-I00, Agencia Estatal de Investigación /10.13039/50110001103 /FEDER, UE.

Data availability

Data will be made available on request.

References

- [1] United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3.
- [2] S. Suarez, *The Outer Limits of the Continental Shelf: Legal Aspects*, Springer, Berlin, 2008.
- [3] A. de Marffy, La fixation des dernières limites maritimes: Le rôle de la Commission des limites du plateau continental, in: *La mer et son droit: Mélanges offerts à Laurent Lucchini et Jean-Pierre Quéneudec*, A. Pedone, Paris, 2003, pp. 399–419.
- [4] Decision taken at the 141st meeting of the plenary, 29 August 1980, in: *Official Records of the Third United Nations Conference on the Law of the Sea*, vol. XIV, A/CONF.62/SR.141.
- [5] L. Parson, *Annex II to the final act*, in: A. Proelms (Ed.), *United Nations Convention on the Law of the Sea: A Commentary*, Verlag C.H.Beck, Munich, 2017, pp. 600–603.
- [6] K.L.P.D. Lekamge. D.M.S.H. Dissanayake, “A Grapple for Standing out Rather Fitting in: Sri Lankan Claim to the Commission on the Limits of the Continental Shelf”, General Sir John Kotelawala Defence University Sri Lanka, (<http://ir.kdu.ac.lk/bitstream/handle/345/1747/032.pdf?sequence=1&isAllowed=y>) accessed 17 November 2025.
- [7] M.C.W. Pinto, Article 76 of the UN Convention on the Law of the Sea and the Bay of Bengal Exception, *Asian J. Int Law* 3 (2013) 215–235, <https://doi.org/10.1017/S2044251313000192>.
- [8] United Nations Division for Ocean Affairs and the Law of the Sea, *Training Manual for the Delineation of the Outer Limits of the Continental Shelf beyond 200 Nautical Miles and for Preparation of Submissions to the Commission on the Limits of the Continental Shelf* (UN 2006).
- [9] S.W. De Herdt, In the name of equality: the ‘Bengal Rule’, *IJMLC* 36 (2021) 294–310, <https://doi.org/10.1163/15718085-bja10046>.
- [10] Commission on the Limits of the Continental Shelf, *Scientific and Technical Guidelines of the Commission on the Limits of the Continental Shelf* (13 May 1999) CLCS/11, 8.1.12.
- [11] Report of the Nineteenth Meeting of States Parties to the United Nations Convention on the Law of the Sea (22–26 June 2009) (SPLoS/203) para 79.
- [12] Myanmar, Executive Summary, Continental Shelf Submission (16 December 2008), (https://www.un.org/depts/los/clcs_new/submissions_files/mmr08/mmr_es.pdf), accessed 17 November 2025.
- [13] GeoMapApp 3.7.5, (www.geomapp.org), Accessed 17 November 2025.
- [14] W. Ryan, S. Carbotte, J. Coplan, S.O. Hara, A. Melkonian, R. Arko, R.A. Weissel, V. Ferrini, A. Goodwillie, F. Nitsche, J. Bonczkowski, R. Zemsky, Global Multi-Resolution Topography (GMRT) synthesis data set, *Geochem. Geophys. Geosyst* 10 (2009) Q03014, <https://doi.org/10.1029/2008GC002332>.
- [15] Marine Regions, “World EEZ v12”, (<https://www.marinerregions.org/>), Accessed 17 November 2025.
- [16] E.O. Straume, C. Gaina, S. Medvedev, K. Hochmuth, K. Gohl, J.M. Whittaker, et al., *GlobSed: Updated total sediment thickness in the world’s oceans*, *Geochem. Geophys. Geosyst* 20 (2019), <https://doi.org/10.1029/2018GC008115>.
- [17] Sri Lanka, Note verbale transmitted to the UN Secretary-General (2 March 2009), L/UJN/20(xii).
- [18] India Note verbale dated 26 March 2009 transmitted to the UN Secretary-General, No.NY/PM/443/2/2009.
- [19] Kenya Note verbale transmitted to the UN Secretary-General (30 April 2009), MFA. INT.8.15A/XXXI.

- [20] Bangladesh Note verbale transmitted to the UN Secretary-General (23 July 2009), No. PMBNY-UNCLOS/2009.
- [21] ITLOS, Maritime Boundary between Bangladesh and Myanmar (Bangladesh v Myanmar) (ITLOS, Judgment, 14 March 2012) Case No 16.
- [22] Myanmar, Executive Summary, Continental Shelf Submission (30 July 2015) https://www.un.org/depts/los/clcs_new/submissions_files/mmr08/Myanmar_Amended_Ex_Summary.pdf Accessed 17 November 2025.
- [23] Bangladesh Note verbale transmitted to the UN Secretary-General (22 October 2015), No. PMBNY/CLCS/2015.
- [24] Kenya, Executive Summary, Submission on the Continental Shelf beyond 200 nautical miles to the Commission on the Limits of the Continental Shelf (6 May 2009) (https://www.un.org/depts/los/clcs_new/submissions_files/ken35_09/ken2009_executivesummary.pdf) accessed 17 November 2025.
- [25] Sri Lanka, Note verbale transmitted to the UN Secretary-General (22 July 2009), SRL-NOT-002-22.07.2009.
- [26] Kenya Note verbale transmitted to the UN Secretary-General (29 October 2013), MFA.TCA 12/34 VOL.XI/(101).
- [27] A. Jiménez García-Carriazo, Submissions to the commission on the limits of the continental shelf: Practice and controversies, *Mar. Aff.* 18 (1) (2022) 1–11, <https://doi.org/10.1080/09733159.2022.2080376>.
- [28] F. Armas Pfirter, Submissions on the Outer Limit of the Continental Shelf: Practice to Date and Some Issues of Debate, in: D. Vidas (Ed.), *Law, Technology and Science for Oceans in Globalisation: IUU Fishing, Oil Pollution, Bioprospecting, Outer Continental Shelf*, Brill, Leiden, 2010, pp. 477–498.
- [29] Commission on the Limits of the Continental Shelf, 'Progress of work in the Commission on the Limits of the Continental Shelf', CLCS/90, (<https://documents-dds-ny.un.org/doc/UNDOC/GEN/N15/297/39/PDF/N1529739.pdf?OpenElement>) accessed 17 November 2025.
- [30] Commission on the Limits of the Continental Shelf, Summary of the Recommendations in regard to the submission made by the Republic of Kenya (7 March 2023) (https://www.un.org/depts/los/clcs_new/submissions_files/ken35_09/20230307ComSumRecKen.pdf), accessed 17 November 2025.
- [31] Sri Lanka, Executive Summary of the Submission made by Sri Lanka in accordance with the Statement of Understanding adopted by the Third United Nations Conference of the Law of the Sea, on 29 August 1980, contained in Annex II to the Final Act of the Conference, and under paragraph 8 of Article 76 of the United Nations Convention on the Law of the Sea, and Article 3 of Annex II of the Convention. (https://www.un.org/depts/los/clcs_new/submissions_files/lka43_09/lka2009executivesummary.pdf) accessed 17 November 2025.
- [32] India Note verbale transmitted to the UN Secretary-General (25 October 2022), No. 55/DPR/PMI/NY-2022.
- [33] India, Executive Summary of the Partial Submission to the Commission on the Limits of the Continental Shelf (11 May 2009), (https://www.un.org/depts/los/clcs_new/submissions_files/ind48_09/ind2009executive_summary.pdf) accessed 17 November 2025.
- [34] India Note verbale transmitted to the UN Secretary-General (8 April 2025), CLCS.48.2009.LOS.Add.1.
- [35] Spain, Executive Summary of the Partial Submission on the limits of the Spanish Continental Shelf pursuant to Article 76 and Annex II of the United Nations Convention on the Law of the Sea in respect of the area of Galicia (11 May 2009) (https://www.un.org/depts/los/clcs_new/submissions_files/esp47_09/esp_2009_summary_english.pdf) accessed 17 November 2025.
- [36] Spain, Amended Executive Summary of the Partial Submission on the limits of the Spanish Continental Shelf pursuant to Article 76 and Annex II of the United Nations Convention on the Law of the Sea in respect of the area of Galicia (14 November 2024) (https://www.un.org/depts/los/clcs_new/submissions_files/esp47_09/Spain_Amended_Executive_Summary_English.pdf) accessed 17 November 2025.
- [37] A. Serdy, Annex II: commission on the limits of the continental shelf, in: A. Proels (Ed.), *United Nations Convention on the Law of the Sea: A Commentary*, Verlag C. H. Beck, Munich, 2017, pp. 2067–2114.
- [38] Maritime Delimitation in the Indian Ocean (Somalia v. Kenya), Judgment, I.C.J. Reports 2021, p. 206.