

In search of the Malaysian Extended Continental Shelf

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Abstract. Over the years, the sovereignty proclamation of Coastal States for their extended continental shelf has been a crucial matter. The declaration and extension of a continental shelf under the United Nations Convention on the Law of the Sea provide significant potential for many developing nations in economics, trades, resource exploitation, communication and security. Hence, the application of satellite altimeter, as one of the solutions for collecting bathymetry data to define the approximate limits of the continental shelf, is reviewed. This paper also discusses the possible significance or contribution of space-derived bathymetry, i.e. the seafloor topography, either independently or harmoniously with different datasets, to meet the element of the Article 76 of UNCLOS.

1. The importance of continental shelf

Over the years, the sovereignty proclamation of countries for their extended continental shelf has been a crucial matter. The declaration and extension of a continental shelf under the 1982 United Nations Convention on the Law of the Sea (hereinafter referred to as UNCLOS) for many developing nations provide significant potential for many developing nations in economics, trades, resource exploitations, communication and security.

A coastal or archipelagic State (hereinafter referred to as Coastal State) has sovereign rights and exclusive jurisdiction over its maritime zones for exploring and exploiting the natural resources in the marine environment which is determined in accordance with customary international law as reflected in the UNCLOS. The maritime zones recognised under UNCLOS, as illustrated in Figure 1, are measured seawards from the baseline, which includes the internal waters, the 12 nautical miles (NM) Territorial Sea, the 24 NM Contiguous Zone, the 200 NM Exclusive Economic Zone (EEZ), along with the continental shelf of 200-350 NM (where applicable), the High Seas and the Area [1].

As the highlighted maritime zones in this paper, the continental shelf is a crucial marine area which is regarded as an oasis in the ocean for plants and animals due to the abundance of sunlight, shallow waters, and nutrient-packed sediments that washes in from rivers, wave actions, and in some areas,



upwelling [2]. In addition to the vast amount of marine life, people have depended on the continental shelf for thousands of years to provide up to 90 percent of the fisheries production in the world and other resources such as natural gas, oil and mineral deposits. The natural resources of the continental shelf consist of minerals and other non-living resources of the seabed and subsoil together with living organisms belonging to sedentary species, i.e. organisms which, at the harvestable stage, are either immobile on or under the seabed or unable to move except in constant physical contact with the seabed or the subsoil [3]. A Coastal State is, among other things, entitled to explore and exploit the exclusive rights within the continental shelf area for its economic gain.

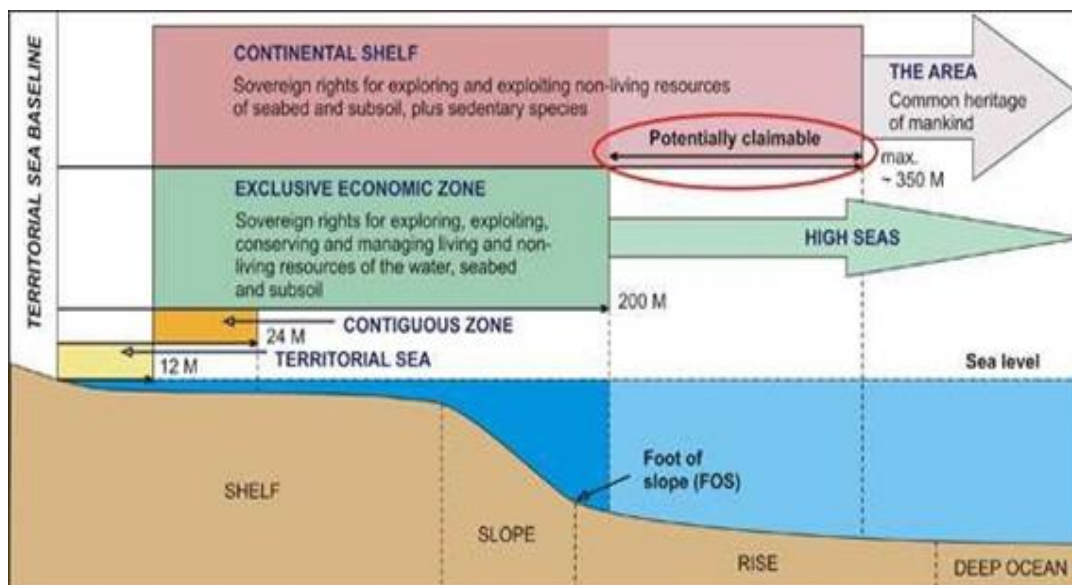


Figure 1. Marine Zones based on United Nations [3].

The Continental Shelf (Article 76 Part VI of the 1982 UNCLOS) is defined as “the natural prolongation of the land territory to the outer edge continental margin, or 200 NM from the coastal state’s baseline, whichever is greater”. Therefore, a State’s continental shelf may exceed 200 NM until the natural prolongation (the land mass of the coastal State) ends (see Figure 2). However, it may never exceed 350 NM from the baseline; or it may never exceed 100 nautical miles beyond the 2,500 meter isobaths (the line connecting the depth of 2,500 meters). It is noted that the continental shelf of a coastal State comprises the seabed and subsoil of the submarine areas: the slope and the rise; it does not include the deep ocean floor with its oceanic ridges or the subsoil thereof.

The declaration and extension of a Continental Shelf under UNCLOS for many developing nations provide a significant economic potential. In order for a Coastal State to exercise its sovereign rights over a particular seabed area, it has to define the outer limits of the extended continental shelf (ECS). A submission containing the outer limits of its continental shelf has to be deposited to the Commission on the Limits of the Continental Shelf (CLCS, hereinafter referred to as the Commission) through the Secretary-General of the United Nations in order to carry out the rights. The final and binding outer limits of the ECS should then be established in accordance with the Commission’s recommendations.

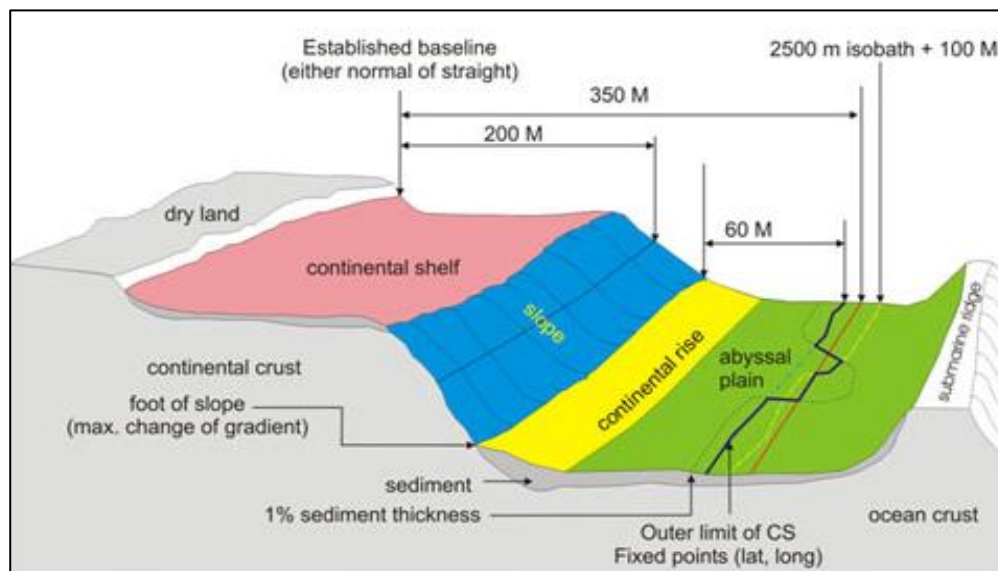


Figure 2. The Continental Shelf defined by UNCLOS [4].

2. The continental shelf submission's impact to Malaysia

In general, all Coastal States have the ability to define the outer limits of their territorial waters around the margins of the South China Sea without reference to opposite States. The People's Republic of China and the Socialist Republic of Vietnam have wide-ranging claims over the South China Sea, which are largely undefined, while the other countries, i.e. the Republic of Philippines, Malaysia, Brunei and Indonesia, have claimed their contiguous sea zones and continental shelf areas.

The main factor that motivates the Coastal States to submit their claims for ECS is the exclusive sovereign rights to explore and exploit the resources in the area. Being claimed as "the second Persian Gulf", South China Sea yields about 11 billion barrels of oil and 190 trillion cubic feet of natural gas in an unexplored area [5, 6]. Due to economic factors and conflicting resources in the South China Sea, the circumstances initiated a dispute involving complicated issues relating to UNCLOS, which does not offer clear guidelines in this situation [7, 8]. As a result, certain quandaries are faced, such as [7]:

- i. Highly emotional territorial claims in a region of rising nationalism.
- ii. Risks of accidental conflict that could escalate.
- iii. Risks to freedom of navigation in EEZs.
- iv. Disputes over the interpretation and applicability of international law, notably the UNCLOS.

On May 6, 2009, Malaysia lodged its joint submission with the Socialist Republic of Vietnam to the Commission, in accordance with Article 76, paragraph 8, of UNCLOS, regarding information on the limits of the continental shelf beyond 200 NM from the baselines, of which the breadth of the territorial sea measures in respect of the southern part of the South China Sea. Conforming to the 1979 New Map of Malaysia (*Peta Baru Malaysia*), Malaysia has the potential to extend its continental shelf beyond 200 NM (but not exceeding 350 NM from the breadth of the territorial sea) for the maritime area in Sarawak and West Sabah.

However, as soon as the executive summary of the submission is made public on the Commission's website, other neighbouring States had a chance to respond. The People's Republic of China and the Republic of Philippines submitted a protest note through its Notes of Verbale to the UN in response to the joint submission. The main reason for the People's Republic of China's protest to the joint submission is, as it covered the Spratly Islands in the South China Sea, of which its sovereignty is disputed by several surrounding States since ages ago. In the light of the fact, the Commission decided to defer further consideration of the submission until such time as the submission is next in line for consideration [9]. Despite the protests, issues and disputes from neighbouring States, Malaysia

continues its Malaysian Continental Shelf Project (MSCP) to determine our extended Continental Shelf and gather as much data as possible to defend the claim.

3. Advancement of satellite altimeter technology

Since the Seasat mission in 1978, global marine gravity anomalies of different accuracies and spatial resolutions have been derived from satellite altimeter missions [10]. By using the gravimetric geodesy concept, this space technique provides an economic tool to investigate the first view of the ocean floor structures in many remote areas of the earth where shipborne techniques are not feasible. Moreover, altimetry data have provided the Geoscience community a revolutionary and dramatically improving view of the global marine gravity field and geoid [11]. The main principle of satellite altimeter is to measure the instantaneous shape of the ocean at the nadir with good precision [12]. A pulse-limited radar is used to measure the altitude of the satellite above the closest sea surface point which, to a first approximation, is a measure of geoid height, or gravitational potential, as shown in Figure 3.

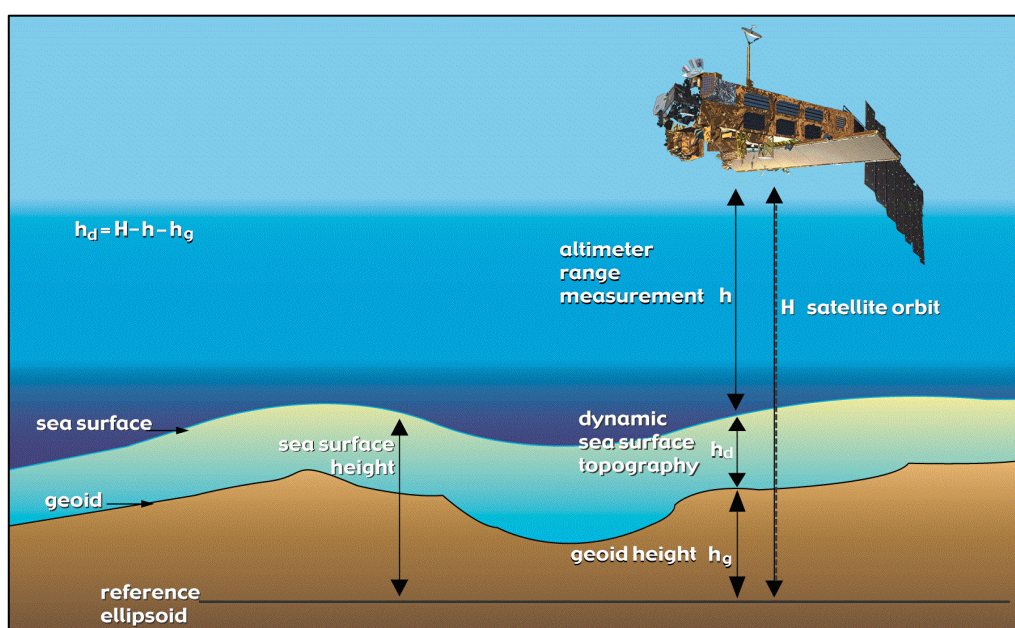


Figure 3. Principle of Satellite Altimeter (courtesy from European Space Agency).

4. Locating the Malaysia's continental shelf

Locating the continental shelf is a crucial component for a Coastal State's effort to lay claim to its juridical Continental Shelf under Article 76 of the UNCLOS. The Article 76 defines the 2500 m isobaths as "a line connecting the depth of 2,500 metres", but does not specify the surface that depth is measured from 2500 m isobaths fringe continents and islands, and lie on the flanks of mid-ocean ridges [13].

The primary step to derive data from satellite altimeter is obtaining the marine geoid for the recovery of marine gravity anomalies. The basic observations are the altimeter tracks which can be used to derive the sea surface height, the marine geoid, and the deflections of the vertical. The equation from Inverse Stokes or Vening-Meinesz can be applied to derive the marine gravity anomalies [14, 15, 16]. The gravity anomalies, then, can be used to determine the bathymetry of the seafloor. The variations of gravity anomaly are highly correlated with the seafloor topography [17, 18, 19, 20]. Figure 4 shows the graphical flow from the radar altimeter data used for the determination of the relevant parameters to determine the bathymetry, i.e. Marine Geoid, Gravity Anomalies and the final product, Bathymetry.

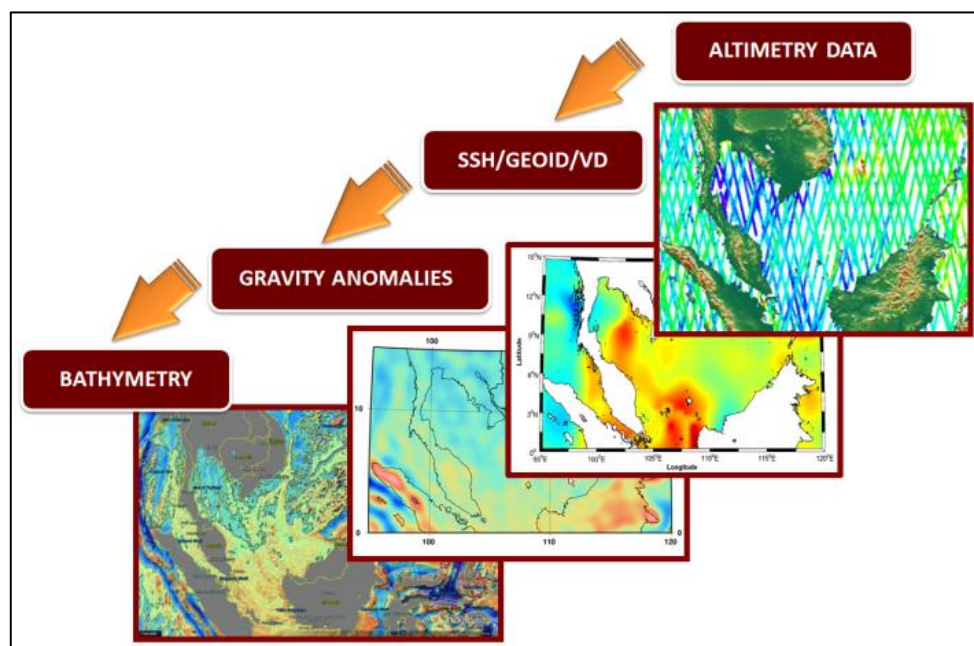


Figure 4. Information flow from the altimetry data, Marine Geoid, Gravity Anomalies and the final product, Bathymetry.

5. Summary

With technological advancements throughout the years, the demands from the worldwide population grew and there emerged a problem. Over-exploitation of the maritime resources is immensely felt towards the middle of the 20th century and many nations started feeling the need to ensure protection of their marine resources and maritime zones. Existing space-derived bathymetry can clearly be used for conducting a “desktop study” in the early stages of determining whether a Coastal State has a juridical Continental Shelf that is worth claiming, and for developing a plan of action in the likely area to be included and what data may be needed to substantiate it [21].

Furthermore, the data could be used as supportive evidence to strengthen our argument at the United Nation level. The data used in the early planning stages are not necessarily included with that submitted to the Commission, but the findings from the stage will determine the role of altimeter. Table 1 comprise the modified list of the mapping tasks required to substantiate the delineation of a Continental Shelf under Article 76 (UNCLOS) and the applicability of altimeter to each of the tasks [13].

Moreover, the space-derived bathymetry data are able to be employed as additional and/or validation of existing shipborne bathymetry data. In essence, recent advances in altimeter should be constantly reviewed to balance the paucity of seabed data in interpretation and determination of the extended continental shelf for Coastal States. To sum up, the cost-effective technique from the technology of satellite altimeter is capable to be a solution for mapping globally uniform bathymetry.

Table 1. The modified mapping tasks for establishing a juridical Continental Shelf and the applicability of altimeter [13].

Tasks	Applicability of Altimetry
Map baselines (shoreline points)	None
Map 2500 m depth contour	Applies and meets the standard
Map the base of the slope	Applies
Map the foot of the slope or prove it does not exist	Possibly
Optional -decide whether to use the morphological Foot of the Slope or “evidence to the contrary”	Possibly
Map sediment thickness seawards of the foot of the slope	Possibly
Determine whether isolated elevations are “natural prolongations”	Possibly
Resolve the “ridge exception”	Possibly
Create lines at distances of 60, 100, 200 and 350 nm	Not needed
Prepare a submission including “charts, maps and diagrams”	Could be used

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