Wide Continental Margins of the World:

A Survey of Marine Scientific Requirements Posed by the Implementation of Article 76 of the United Nations Convention on the Law of the Sea

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Introduction

The full implementation of article 76 of the United Nations Convention on the Law of the Sea (UNCLOS) poses one of the most significant scientific challenges in the fields of geodesy, geology, geophysics and hydrography during the next decade. These challenges stem from the collection, compilation, and processing of vast amounts of marine data to be presented to the Commission on the Limits of the Continental Shelf as evidence in support of continental shelf claims to national jurisdiction extended beyond 200 M.

This paper outlines the scientific challenges confronted by coastal States to implement the provisions contained in article 76 and their geographic scope. These tasks are compounded by the needs to develop the most accurate and economic scientific methodologies, and to ensure their rapid technology transfer to developing countries.

1. The continental shelf

The use of the term *continental shelf* as a designator of a marine geomorphologic feature appears to have been first made by H.R. Hill in his work *Realm of Nature* as early as 1887. However, it was until the International Committee on the Nomenclature of Ocean Bottom Features was created during the VIII Assembly of the International Union of Geodesy and Geophysics (IUGG) held at Oslo in 1948, that standardisation efforts were undertaken to define a brief, simple and unambiguous scientific nomenclature for marine geomorphologic features.

Agreement on final definitions was reached by the Committee at Monaco in 1952 (Wiseman and Ovey, 1953).

The definition and our scientific knowledge about continental margins has advanced and evolved in the context of plate tectonics over the last three decades (e.g., NRC, 1979; COSOD II, 1987; ODP, 1996). Similarly, the concept of the continental shelf in law has also undergone considerable but separate development. The legal status of the continental shelf is defined in international codified law by the 1958 Convention on the Continental Shelf and the United Nations Convention on the Law of the Sea (UNCLOS).

The 1958 Convention defines the outer limit of the legal continental shelf by reference to the 200 metre isobath and a criteria of exploitability. The outer limit of the legal continental shelf in UNCLOS, on the other hand, is determined by reference to a distance of 200 nautical miles (M); or to the outer edge of the geological continental margin wherever the margin extends beyond 200 M. There are States that currently use one or the other definition in their national legislation. There is, however, a general trend among coastal States to replace the provisions of the 1958 Convention by those contained in article 76 of UNCLOS. Figure 1 shows the distribution of continental shelf claims made by States to date.

2. **Article 76 of UNCLOS**

Figure 2 shows the outer limit of the continental shelf at a distance of 200 M as established in one of the provisions of article 76. When the continental margin extends beyond 200 M States must apply a complex formula where the outer limit must be located up to:

- a distance of 60 M from the foot of the continental slope (Figure 3); or
- a line where the ratio of sediment depth to its distance from the foot of the continental slope is 1/100 (Figure 4);

but no further than:

- a distance of 350 M from the baselines from which the territorial sea is measured (Figure 5); or
- 100 M from the 2,500 m isobath (Figure 6).

The implementation of the above rules presents scientific challenges in a number of marine disciplines: the determination of the foot of the continental slope falls in the realm of geomorphology; the determination of sediment thickness is a geophysical assignment; the determination of all distance rules, as well as positioning and geometric elements fall within the realm of geodesy; the determination of isobaths and all other ocean mapping tasks are routine in hydrography; and marine geology plays an essential role in the identification of many features.

3. **Propositional formulation of Article 76 of UNCLOS**

The provisions contained in article 76 can be expressed in symbolic form by means of a propositional formulation:

G	gradient rule	foot of the slope + 60 M
T	thickness rule	1% sediment thickness
D	distance rule	350 M
B	bathymetry rule	100 M from the 2,500 m isobath

g the limit given by **G** is larger than 200 M
t the limit given by **T** is larger than 200 M
d the limit given by **G** or **T** is lower than **D**
b the limit given by **G** or **T** is lower than **B**

Normal continental shelf claims: $(\neg g \wedge \neg t) \supset N$
Extended claims: $(g \vee t) \wedge (d \vee b) \equiv E$

where

$\neg$ negation
$\wedge$ conjunction
$\vee$ nonexclusive alternation or inclusive disjunction
$\supset$ material conditional
$\equiv$ material biconditional

4. **The Commission on the Limits of the Continental Shelf**

UNCLOS establishes a process for the registration of continental shelf claims beyond 200 M. This process involves an organisation created by the same Convention and named the Commission on the Limits of the Continental Shelf. Information on limits beyond 200 M shall be submitted by the coastal State to the Commission. The Commission, in turn, shall make recommendations on matters related to the establishment of the outer limits. The limits of the shelf established by a coastal State on the basis of these recommendations are final and binding.

The election of the Commission was held at UN Headquarters in April 1997. Candidates were nominated by States Parties to UNCLOS, and 21 members were elected for a period of five years. This election was carried out with a regional allocation of members: Africa (5); Asia(5); Latin America and the Caribbean (4); Eastern Europe (2); and Western Europe and others(5).

The Commission has produced three documents to date:

- *Rules of Procedure* which describe its organisation, structure and procedure.
- *Annexes I* and *II* to the Rules which describe its agreement with respect to matters of delimitation and confidentiality;
- *Modus Operandi* which describes its operational aspects interaction with submitting States and third parties; and
- *Scientific and Technical Guidelines* which describe the scientific and technical aspects of a submission on limits prepared by coastal States.

5. **Regions for Potential Research**

This study identifies a sample of potential research regions for continental shelf claims. Its purpose is to assess the geographic scope of the research that might be conducted to determine with certainty whether an extended continental shelf claim is feasible or not. Its objective is to highlight the need for international and regional scientific co-operation during the execution of feasibility and implementation studies carried out by States. Figure 7 shows a preliminary, ongoing, and non-exhaustive inventory of wide continental margin regions.

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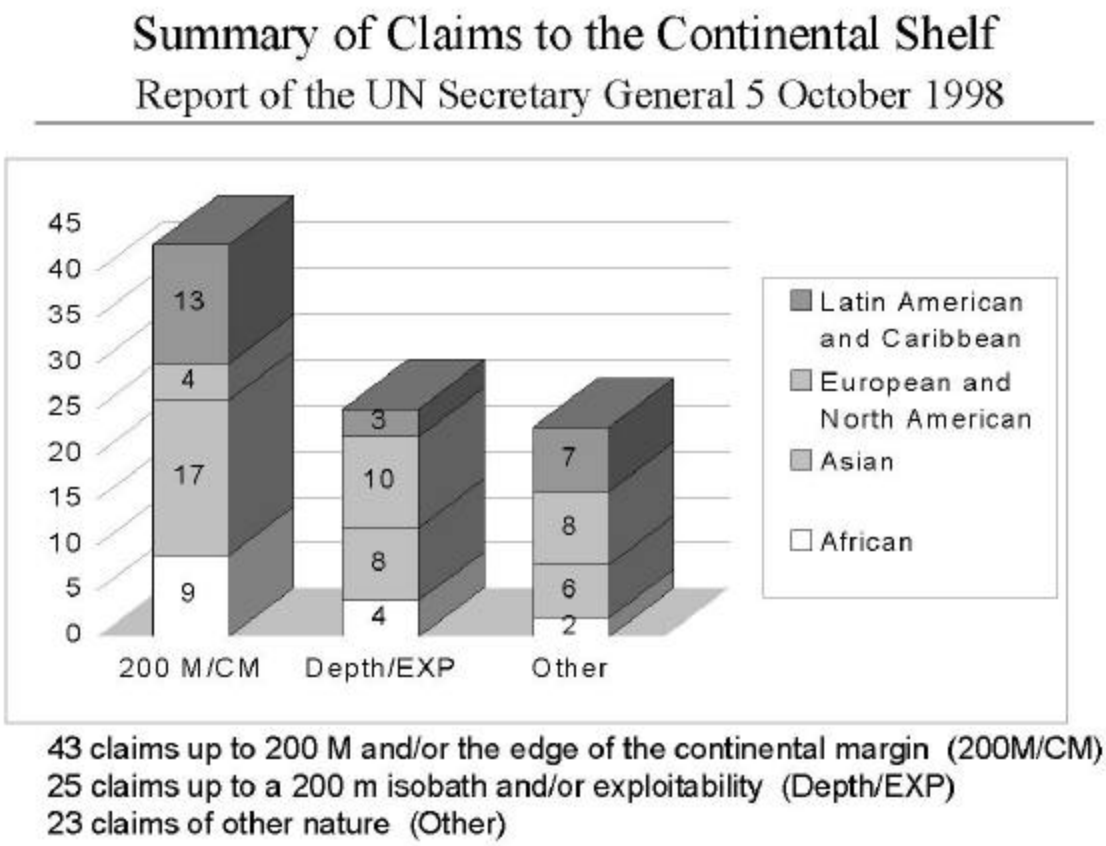

Figure 1. Summary of continental shelf claims.

Figure 2. Outer limit of the continental shelf at a distance of 200 nautical miles.

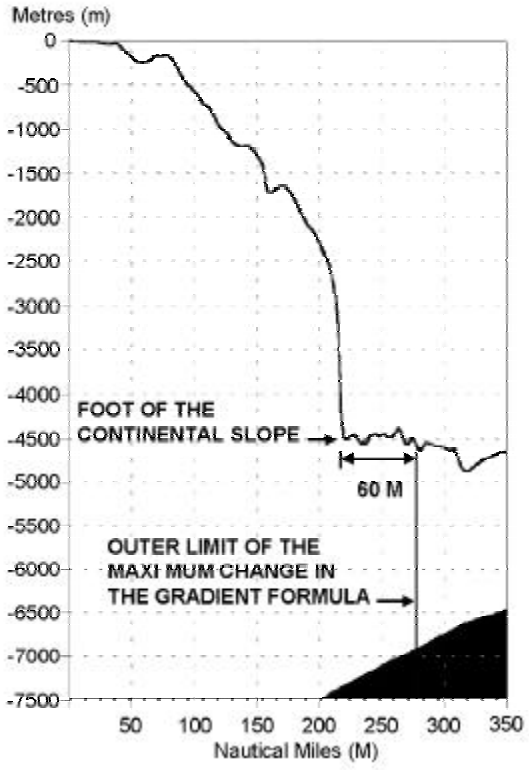

Figure 3. Foot of the slope formula

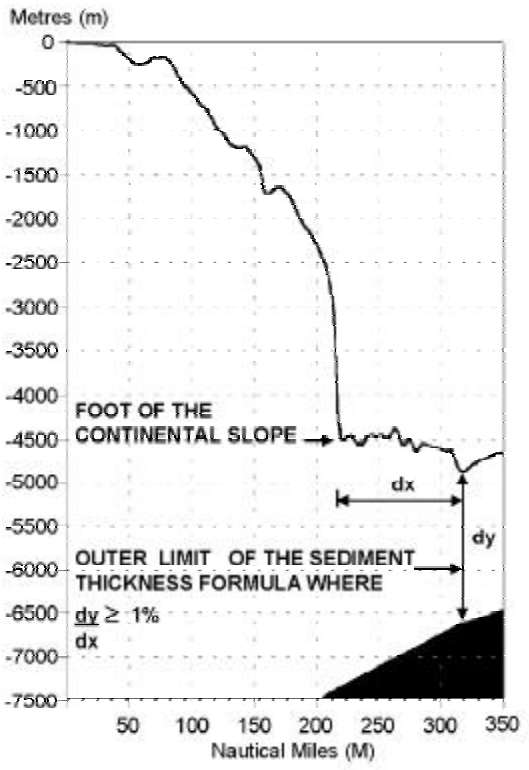

Figure 4. Sediment thickness formula

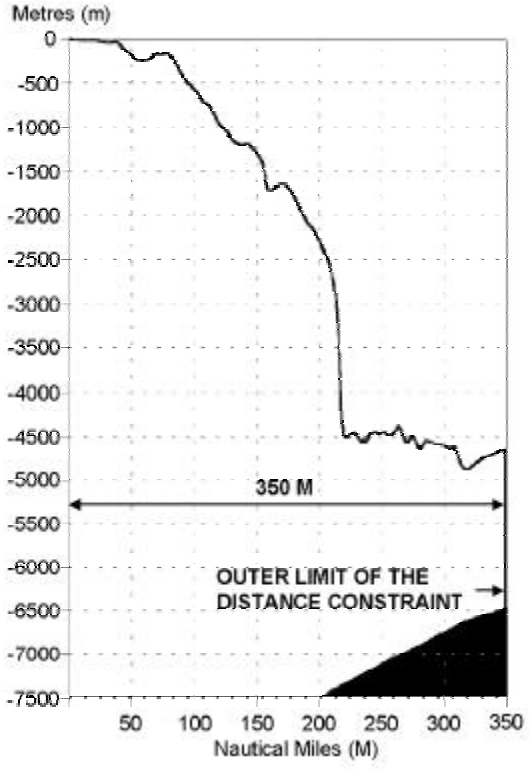

Figure 5. Distance constraint

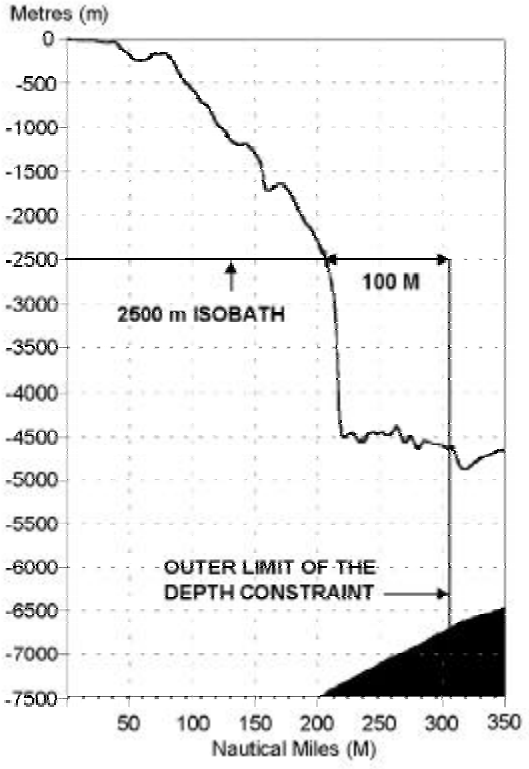

Figure 6. Depth constraint

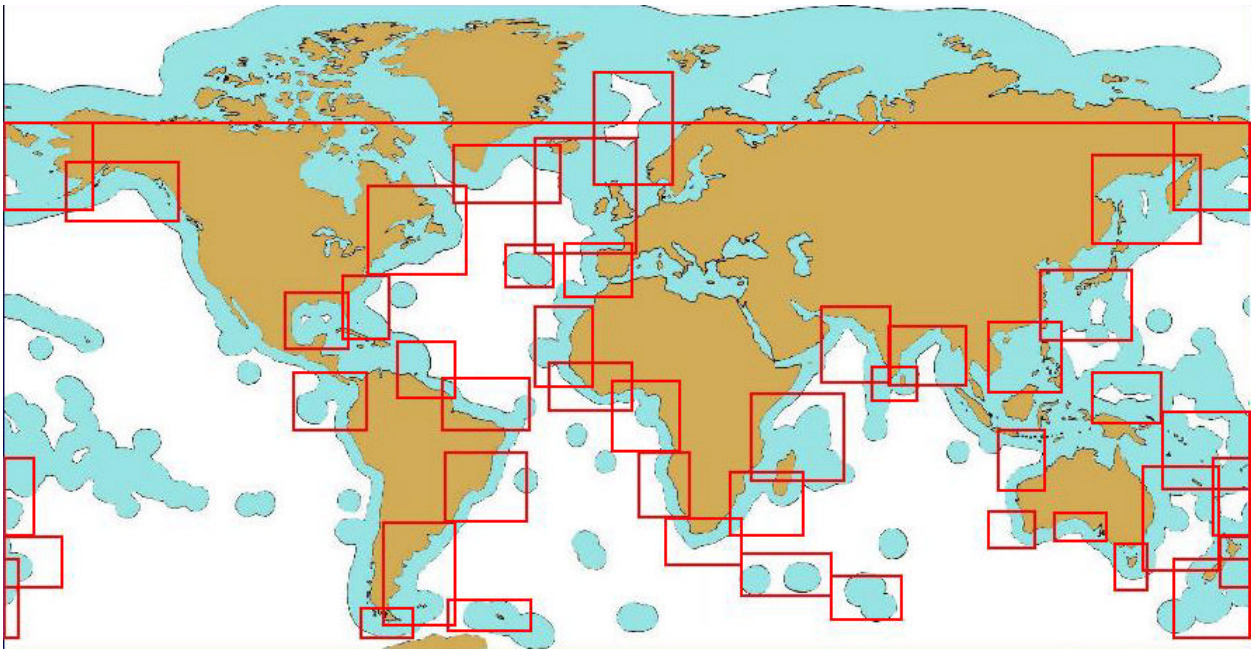

Figure 7. Potential research regions for extended continental shelf submissions.

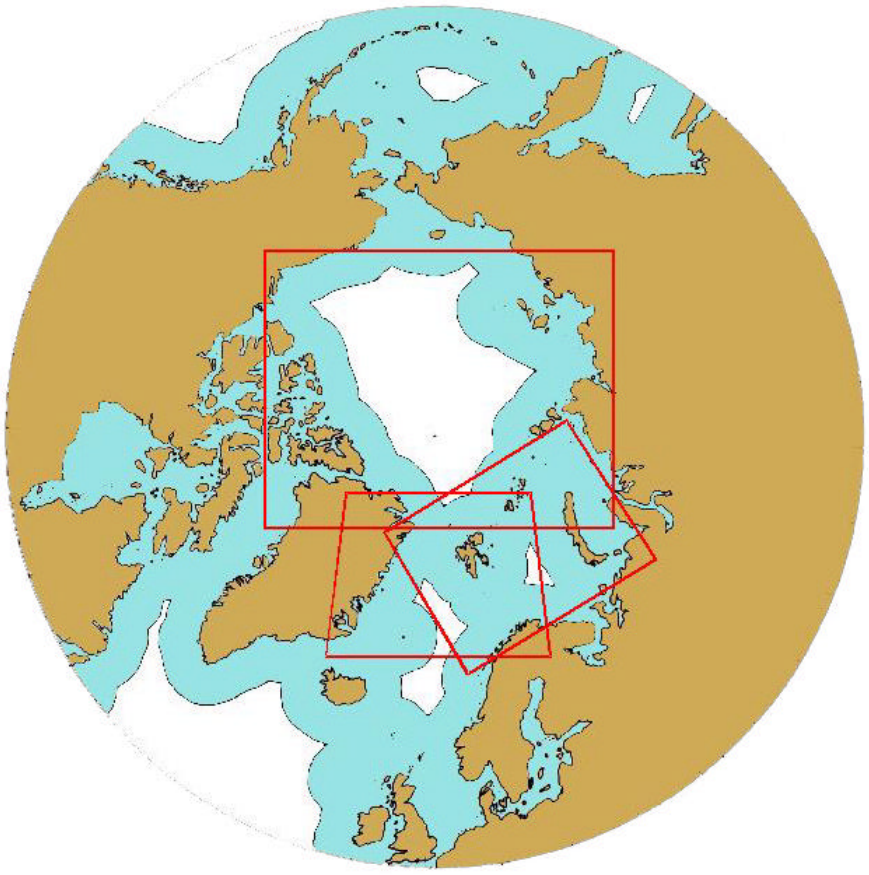

Figure 8. Potential research regions for extended continental shelf submissions.