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National and international standardization of geographical names: names collection, office treatment, national authorities, features beyond a single sovereignty and international cooperation

Undersea geographical names in the waters of Indonesia

Submitted by Indonesia**

Summary:

The submarine features of Indonesia have unique and complex characteristics. They are classified on the basis of their name, age, bathymetry, geological genetics and basin. The features – such as Hartono Trough, Nautilus Trough, Snellius Ridge, Hamilton Ridge, Weber Trough, Sinta Ridge, Paoli Ridge, Rama Ridge, Kuenen Ridge and Baruna Komba seamount – are usually named after the ships used, or persons involved, in conducting the surveys.

The Marine Geological Institute of Indonesia has organized the collection of data, the writing, determination and collection of new names and the processing of geographical names, including generic and specific elements, to obtain the names of underwater formations in each region. The research material covers all of the morphological features present in the seabed of Indonesia, identified and registered by their original name, accompanied by additional information concerning the formations. The marine morphology toponym programme was a multi -year activity that was carried out from 2006 to 2010.

Submarine features, in particular basins, are the predominant features in the regions of Aceh and North Sumatra, south-western Sumatra, southern Java, northern Bali and the waters of eastern Indonesia. They are formed by a complex tectonic process involving subduction of the oceanic Indo -Australian plate beneath the continental Eurasian plate. The seamount morphology is predominantly found in the Banda Sea and Flores Sea. The seamounts are series of underwater volcanoes that are indicative of active tectonism.

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INTRODUCTION

The total area territory of Indonesia is 8 million km2, the waters area reaches 5.8 million km^2 or equal to 2/3 of the total area of Indonesia, consist of Exclusive Economic Zone (ZEE) 2.7 million km^2 (Martha, 2007) number of islands 17,504 , coastline 94,623 km (Figure 1), the area of Indonesian waters has been recognized as the Insight of Nusantara by United Nation Convention of The Sea (UNCLOS, 1982).

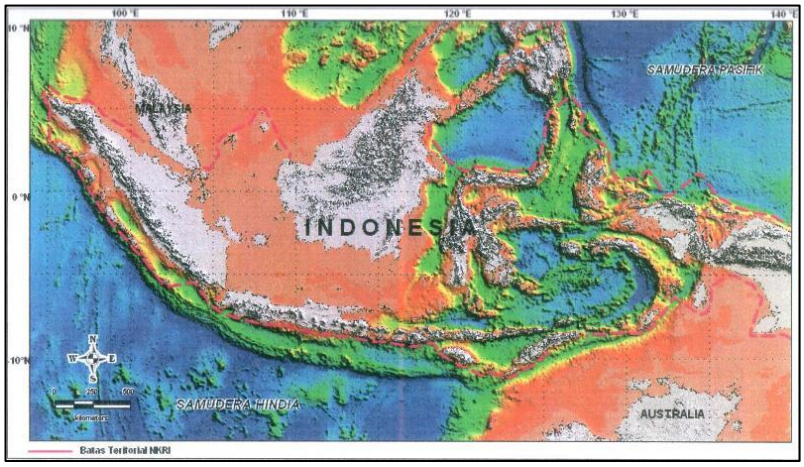

Figure 1. The region of Indonesian waters

The Marine Geological Institute (MGI) of Indonesia has organized data collection, writing, determining, gathering new names, and processing geographic names (including generic and specific elements) to obtain underwater formation names in each region (as previously mandated in Presidential Regulation of the Republic of Indonesia No. 112, 2006 regarding National Team of Standardisation of Geographical Names). The research materials include all of the morphology present in the seabed of Indonesia, identified and registered by the original name, accompanied by some additional information concerning the formations. This marine morphology toponym program was a multiyear activity, starting in 2006 and completed in 2010.

It is essential to collect the data from the types of Indonesian seabed morphology, especially when the map can be a reference of communication between nations. Includes information on the name, location, and position of an element of geography that can be linked with environmental disaster management efforts, the determination of maritime boundary, etc. This study becomes very important especially in the sovereignty of the state, the inventory of geography elements, energy and mineral resources potential about the geological processes that form it. The Submarine features in Indonesia are Basin, Trench, Ridge, Trough, Platform, Seamount, Shelf, Plateau, Arc, High, Abyssal Plain.

Basin

The several concepts of the basin, the basin is a very large depression on the surface of the lithosphere that occurs in the oceans, another definition of the basin is a low area in a part of the earth of tectonic origin as the place of sediment deposition (Tomascik., 1997)

Trench

Trench is a form of depression in the seabed that is very deep and asymmetric, narrow and elongated shape, characterized by a flat bottom shape and a steep margin (International Hydrographic Organization, 2001)

Ridge

According to the dictionary of the terms Marine Geology Online has two meanings, namely the part of the earth's surface that protrudes and extends to its narrow and sharp peak and its steep sides, can be separate or part of the Ridge

Trough

The trough is a narrow, long and very deep and asymmetrical basin on the seabed with a relatively steep margin. The Trough is also defined as a long depression of the seafloor that has a flat ocean floor; the sides are steep and generally more shallow than the Trench (International Hydrographic Organization, 2001)

Platform

The platform is a plain or submarine surface that slopes from the coast to the sea (United States Board on Geographic Names, 2005)

Seamount

It is a collection of separate heights with a height of more than 1000 m above the sea floor, characterized by a cone shape. Seamount is scattered throughout the ocean floor, sometimes random but more often in linear rows and active volcanic. A form of lifting with a height of more than 1000 m and having a certain broad peak (International Hydrographic Organization, 2001)

Shelf

It is a zone adjacent to the continental crust or zone that surrounds an island, extending from tidal lines to the ocean to a certain depth where the slope of the zone rises again (United States Board on Geographic Names, 2005)

Plateau

Plateau is a formation with a certain area, is a relatively flat peak that suddenly becomes steep on one or more of one side (United States Board on Geographic Names, 2005)

Arc

It is an arch and has a large dimension on a regional scale (Dictionary of the terms Marine Geology Online)

High

High is an area on the seafloor that is higher in elevation than the depth of the surrounding area (adapted from high plain, Glossary of Geology, 1982)

Abyssal Plain

It is an extension, flat, with a sloping slope or near to the area level at abyssal depth (International Hydrographic Organization, 2001)

Indonesia as an archipelagic country, where its geographical position lies between the Indo-Australian plate, the Pacific Plate, and the Eurasian Plate. This setting has made the country unique and specific in term of morphology, bathymetry, and geography. The Indonesian marine morphology is complex, consisting of various types of morphology including basin, trench, trough, ridge, high, arc, and seamount. The defined features are classified based on name, age, bathymetry, geological genetics, and basin. The names of those features are usually based on the human or cruise names during which the survey was taken, such as Hartono Trough, Nautilus Trough, Snellius Ridge, Hamilton Ridge, Weber Trough, Sinta Ridge, Paoli, Rama, Kuenen Ridge, Baruna Komba seamount, etc.

The problem of underwater morphology data collection process in Indonesia is wide area coverage of 8 million km^2. The waters area reaches 5.8 million km2 or equal to 2/3 of the total area of Indonesia. The coordinate locations are not uniform, the same naming in two different regions, the shape/dimension/boundary of the marine features are not clearly seen from the satellite image data, limited literature and incomplete documentation of details of previous research, especially notes on expeditions of Indonesia waters by institutions of domestic and foreign agencies

METHODOLOGY

The study was based mainly on an abundant collection of marine publications, and reports resulting from various surveys in Indonesian waters since Dutch colonialization. The study also included delineation of morphological

boundaries based on modern bathymetric and geographic data and data digitization. The results obtained are a complete inventory of the 34 seafloor morphologies, including 27 basins and 7 seamounts.

The undersea feature naming was carried out mostly on distinct seabed morphologies as seen on their profile from bathymetry map, no formal name has been given, or the features are not listed on the map of the Indonesian submarine feature. Naming was carried out by considering documentations in the publications and reports that mentioning seafloor geomorphology and map of submarine features. This method can be done as long as the data source has been verified and recognized scientifically as referred by succeeding scientists.

In general, the features to be named is as follows:

The submarine features are from the seabed, a relief and can be measured, morphology in whole or in part within the territory (twelve nautical miles) and Exclusive Economic Zone. Submarine features that are outside the territorial boundary, its name follows the international name, Names within territorial boundaries must be recognized by other countries.

In the process, the naming of elemental elements of the seabed implements principles such as short and simple names, geographical location, research vessels during expeditions, names of living persons and figures, etc. In the compilation of primary data, all data and information that has been collected and then archived and documented in the form of documents and files, digital maps and images.

The basic map of Submarine features of Indonesia generated from the Digital Elevation Model (DEM) data produced by the National Oceanic and Atmospheric Administration (NOAA). The submarine features intrepreted and delinated from of the DEM data on the projection of latitude and longitude WGS-84.

RESULT AND DISCUSSION

The result of this study is information about morphological elements of seabed found in Indonesia waters, which will be very useful for the sovereignty of Indonesian territory and the interest of navigation. All the information contained in this report is also expected to be very useful for the study of the geology of Indonesian waters, which will be applied to study the potential of geological disasters and the potential of energy and mineral resources. With the complete atlas and fundamental data, information about the morphological elements in Indonesian waters will be widely known both among the scientific community or the general public.

The list of the delineated morphology, then compiled by displaying attributes in the form of descriptions of morphological numbers, waters locations, morphological forms, the coordinates of the outermost points in the north, east, south and west, the coordinates of the midpoints, the maximum and minimum depths, In 2007, there were 6 names of seamounts removed from the inventory list, because the sixth peak of the seamounts was already above sea level. So the number of seamounts changed to 7 names. Thus the total number of morphological names is reduced to be 93 names.

This study was a part of government's activities in the naming of natural geological elements, includes Basin, Trench, Ridge, Trough, Platform, Seamount, Shelf, Plateau, Arc, High, Abyssal Plain (Table 1). The entire morphology of the undersea that was successfully delineated and completed consists of eleven kinds of undersea features, the whole inventory is as much as 126 morphology. On this inventory, there are new additions and revision, including subdivision from previous morphology. (team of submarine features names of Indonesia Waters, 2010).

Table 1. Toponym inventory of submarine features in Indonesian waters

Type of Morphology	2006	2007	2008	2009	2010
Basin	42	42	55	54	55
Trench	3	3	3	3	3
Trough	7	7	19	22	22
High	1	1	2	2	2
Ridge	18	18	19	19	20
Plateau	3	3	2	2	2
Platform	6	6	7	7	7
Shelf	3	3	3	3	3
Arc	2	2	4	4	4
Abyssal Plain	1	1	1	1	1
Seamount	13	7	7	7	7
Total	**99**	**93**	**122**	**124**	**126**

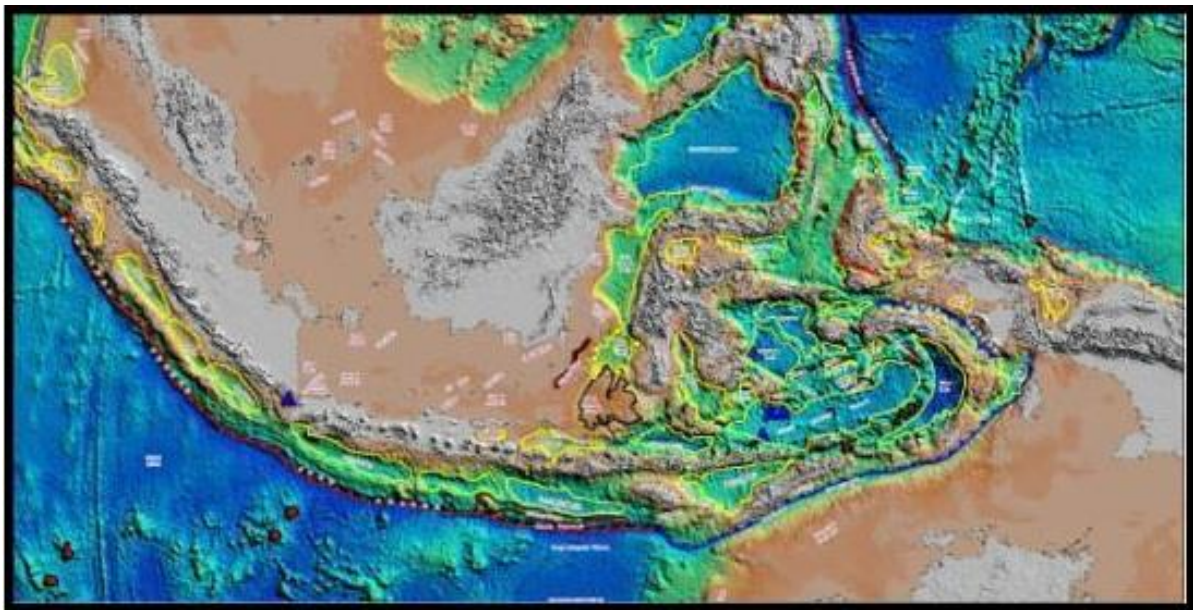

Figure 2. Toponymic Map of submarine features of Indonesian waters (background image: Satellite SRTM 30)

The basin is divided into three definitions (Koesoemadinata, 2006, Presentation, unpublished) these are sedimentary basins, structural basins, and physiographic basins. This study is emphasized in the discussion of the quarterly or tertiary physiographic basins whose morphological form is still visible.

Other morphologies such as troughs, ridges, etc. in general submarine features in eastern Indonesia is irregular, narrow and elongated. The naming of several names of quarter-aged basins still adopts the naming of Tertiary-aged sedimentary basins which are indicated to contain oil and gas such as Bengkulu basin, Bali basin, Lombok basin, etc. which are thought to be part of petroleum systems such as reservoir and hydrocarbon catcher.

Submarine features, especially basin is dominant in the regions of Aceh and North Sumatra, along south-western of Sumatra, southern Java, North Bali, and in Eastern Indonesia waters. They are formed by a complex tectonic process involving subduction of the Indo-Australian oceanic plate beneath the Eurasian continental plates. Seven morphology of seamount is dominantly found in the Banda and Flores Seas. These seamounts are a series of underwater volcanoes that reflect active tectonism.

Banda Sea

The Banda sea has an area of 470,000 km^2 and is bordered by the Sula archipelago, the island of Banda arc outside Buru and Seram to Alor island, consisting of several basins and troughs (Tjia, 1966) connected by cells that have a depth of above 3000 m such as north banda basin has a basic relief with a average depth of 4700 m is indicated by a steep side (Figure 3)

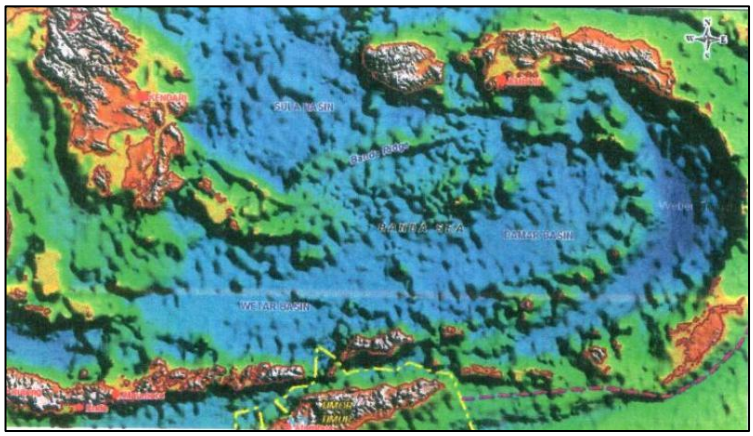

Figure 3. The boundary of Banda Sea

Banda basin

Geologically, the Banda basin was previously called the South Banda basin, a new name formulated by *Prasetyo* (1989) to show its unique tectonic development compared to Banda ridge in the Banda Sea region and the Sula basin formerly called North Banda. Banda basin more than 770 km (longest) in the Banda sea extends from the eastern Flores basin to Banda Api island; the basin is limited by in the northwest by the mainland of south Sulawesi and further east by Tukang Besi pluto

Banda ridge system

The Banda ridge system is a geomorphological element of the seabed in the Banda Sea and is located at the center of the Banda Sea region (Figure 4). The Banda ridge extends towards the northeast of Tukang Besi Plato, separating two basins with a depth of more than 5000 m, the Sula basin located on the ridge to the north and the Banda basin to the south. The underwater formations that cover the Banda ridge are Palapa Ridge, Palapa Trough, Rama Trough, Rama Ridge, Lucipara Basin, Lucipara Ridge, Sinta Ridge, Pisang Basin, Pisang Ridge, Citra Ridge, and Hamilton Ridge. These formations were named by geologists when carrying out Sinta's expedition with the ship Kana Keoki and Rama 12 expedition with Thomas Washington R.V 1983. Sinta ridge marks the boundary between the north of Banda ridge system and the Sula Basin. The Hamilton ridge is located in the southwest of the Banda ridge system. Hamilton is a geologist who worked in Indonesia for several years and published the Indonesian territory in 1979.

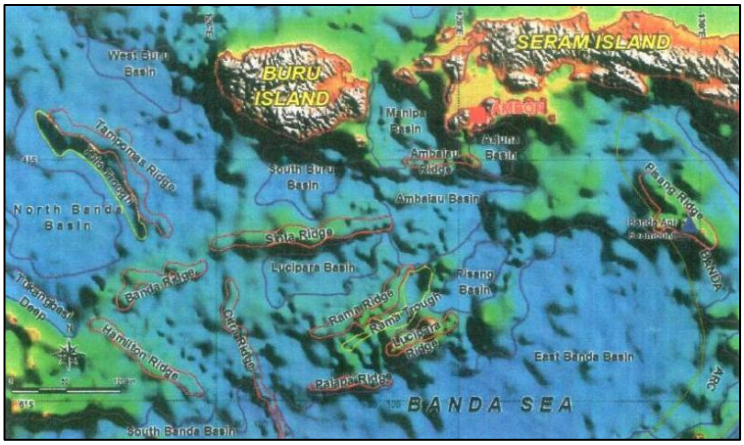

Figure 4. The system of Banda Ridge

Seamount in Banda sea

Seamouth is spread along the Banda Sea, concentrated with the tendency of Banda Arc in Eastern Indonesia, the cause is the collision between the Australian continental plate with the Banda Arc system (figure 5). When the Bandamin I and II expeditions on the northern of Lomblen island, seamount appeared in the bathymetry survey and named Abang Komba, Ibu Komba, and Baruna Komba called the Komba ridge (Sarmili, L., 2004, figures 6.7 and 8)

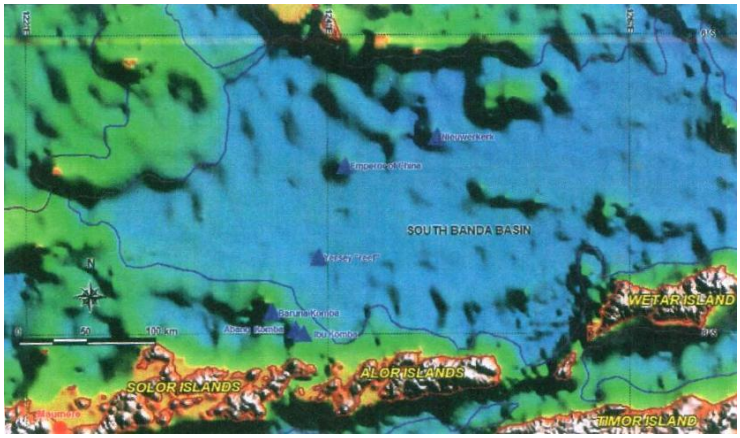

Figure 5. Seamount of the Banda Sea

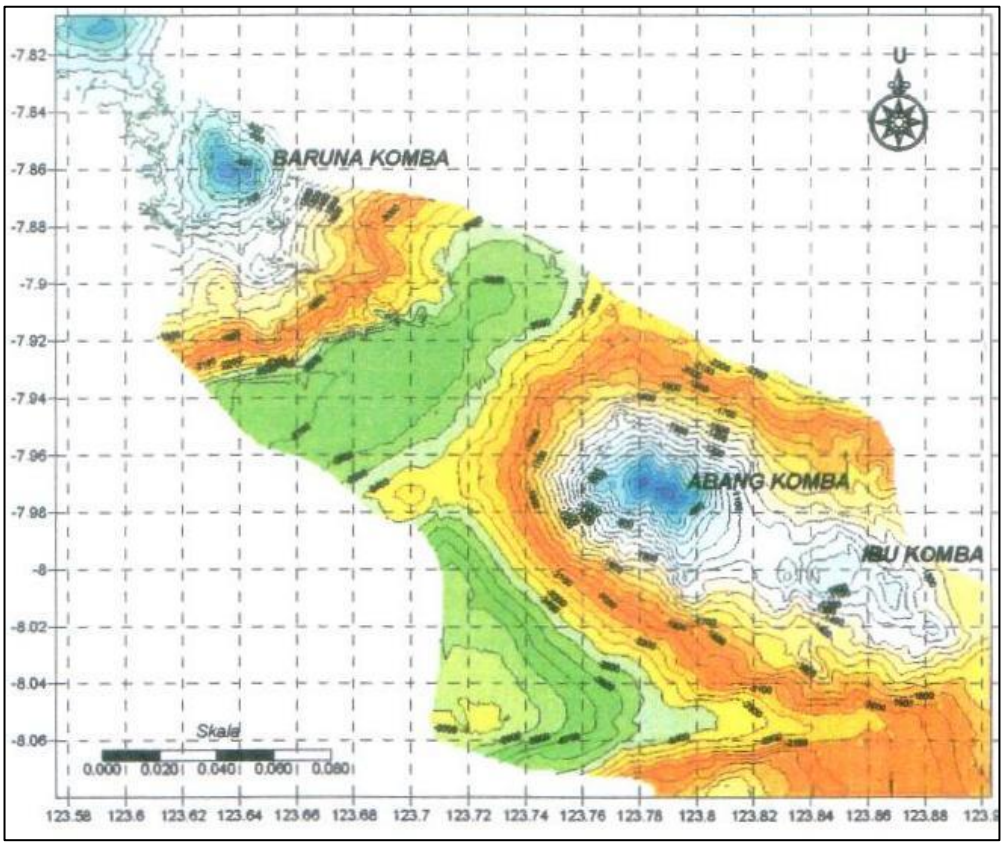

Figure 6. Bathymetric Map of Komba Ridge

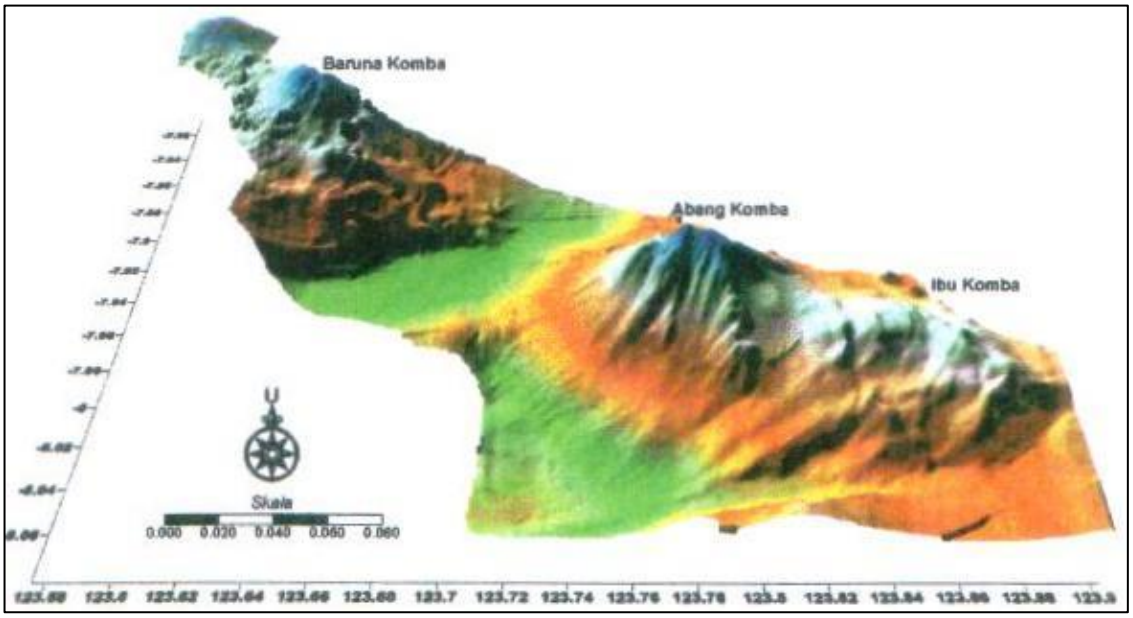

Figure 7. Morphology of Komba Ridge

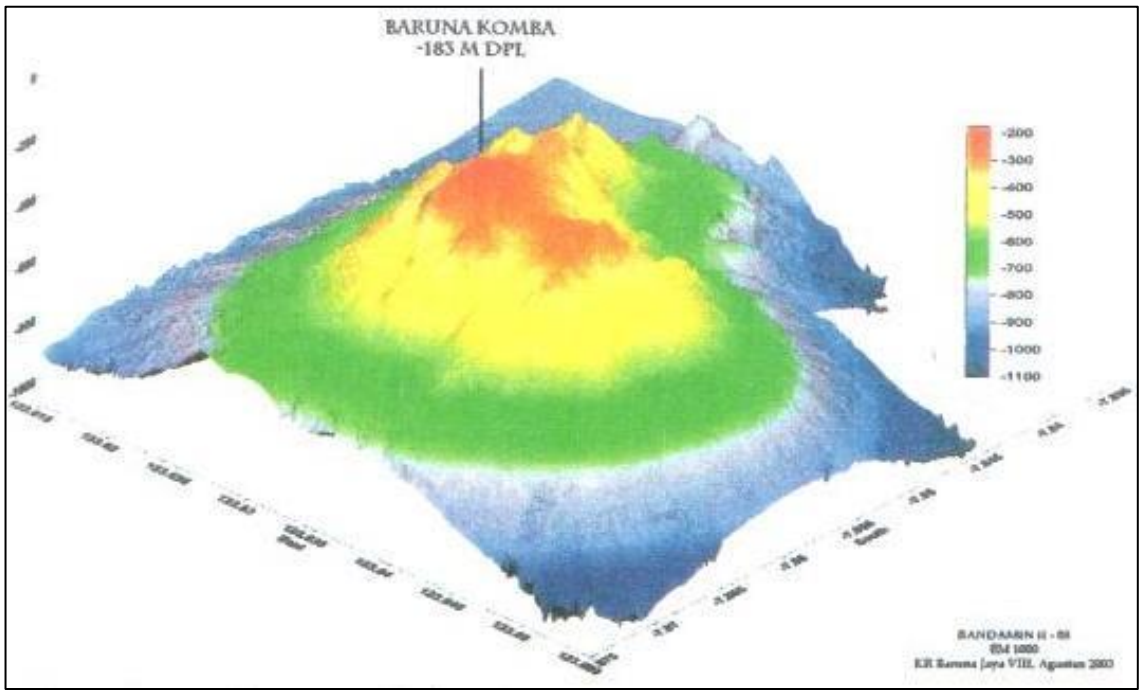

Figure 8. Morphology of Komba Seamount

CONCLUSION

Tectonic setting significantly affects the submarine features of Indonesian waters. The results of data collection, most of the geographical names used were referring to geographical position, such as east Banda and south Banda basin located at Banda sea. In addition, the names of submarine features also refer to the name of the person who has contributed to the research such as Hamilton Ridge, Hartono and Weber trough, the name of the expedition or cruise, such as Snellius Ridge.

This study has been taken on the submarine features of Indonesia waters up to 2010 are 55 basins, 3 trenches, 22 troughs, 2 highs, 20 ridges, 2 plateaus, 7 platforms, 3 shelves, 4 arcs, 1 abyssal plain and 7 seamounts, total submarine features in Indonesia waters were 126. Although the compiling of the submarine features map in Indonesia waters has been done, in the future there is no possibility of additional and revised data compiled. As marine geological research and surveys will continue, it is possible to find a new morphologies, or morphological data of the seabed from previously uncompiled publication, and possibly correction by considering various geological aspects

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