

CLASSIFICATION OF MARINE SEDIMENTS AND THEIR DISTRIBUTION IN THE WORLD OCEANS

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Sedimentary deposits can be grouped according to several principles. Classification of sediments is essential in the sense that it should provide as a tool for understanding and interpretation of sediments. The ideal classification must include all the information of the sedimentary deposits to be classified and group them in such a way that it should convey some meaning to the observer. Consequently the name assigned in the classification should convey a great deal of information than simply an indication of its place in the classification scheme. Some sediment classifications are purely descriptive while others are interpretative. The identification of each type depends on both qualitative and quantitative factors such as size, composition and degree of staining or structure of the sediment particles.

Descriptive classification : Based on texture and color. Grey fine sand, brown silty sand, green mud and shelly sand etc. This type of descriptive scheme serves to define broad patterns of sediment distribution but is of little value in interpretation particularly in the deep sea, where many factors influence the nature of the sedimentary deposit. Consequently little can be gained from such a simplistic approach. Even so, textural aspects have remained a strong element in their definition and description. Composition has been a secondary feature and has been approached from both chemical and mineralogical view points.

Genetic terms have been used to describe sediment types and thereby assist in revealing processes, histories and sequences in sediment deposition.

DIFFERENT CLASSIFICATIONS

1) Emery

- Detrital
- Biological
- Authigenic
- Residual
- Relict

2) Kuenen

- Shelf sediments
- Deep sea sediments
- Hemipelagic and terrigenous sediments :
 - Blue, red, yellow, green, coral, calcareous and volcanic muds.
- Eupelagic sediments :
 - Calcareous oozes : Globigerine, pteropod and coccolith
 - Siliceous oozes : Radiolarian diatom oozes
- Red clay

3) Revelle

- Terrigenous deposits
- Organic muds, inorganic muds.
- Pelagic deposits

Inorganic deposits (red clay).
Organic deposits or oozes
Calcium carbonate oozes, Globigerina, pteropod and
coccolith.
Siliceous oozes
Radiolarian and Diatom.

4) Goldberg

Biogenous : CaCO₃ Opal, Apatite, Organic Matter.
Hydrogenous : Ferromanganese nodules, phosphorite, Barite,
Pyrite, Phillipsite, Aragonite, dolomite, Montmorillonite
Lithogenous : Quartz, Feldspar, Clay minerals, Micas, Augite,
Volcanic glass.
Cosmogenous : Cosmic spherules.

5) Shepard

Pelagic :
Brown clay lithogenous material having less than 30%
biogenous.

Authigenic deposits (consisting dominantly of minerals crystallised in sea water, such as phillipsite and Mn-nodules. Pyroclastic (derived from the ash of volcanic eruptions). Biogenous deposits (having more than 30% material derived from organisms). Foraminiferal oozes (having more than 30% calcareous biogenous, large foraminifera, usually called Globigerina ooze). Chalk (Nannoplankton) ooze. Diatom ooze (having more than 30% siliceous biogenous largely diatoms).

Radiolarian ooze : having more than 30% siliceous biogenous, largely radiolarians).

Coral reef debris (derived from slumping to the deep seafloor from coral reefs).

Coral sands.

Coral muds.

Terrigenous

Terrigenous muds (having more than 30% of silt and sand of definite terrigenous origin).

Turbidites (derived by turbidity currents from the lands or from submarine highs).

Slide deposits (carried to deep water by slumping). Glacial marine (having a considerable percent of allocthonous material derived from iceberg transportation).

INDIAN OCEAN : Indian Ocean is the smallest of the three major ocean basins, but is nevertheless geologically complex. The greatest thickness of sediments are found in the Bengal and Indus Fans and in the basins off the east coast of Africa. Physiography influences the sediment distribution in Indian Ocean. Southern part of the Central Indian Ocean Basin is virtually devoid of sediment because of its isolated position, and similar conditions are to be found on the western side of the Wharton Basin. Thick terrigenous sediments are accumulating on the Indus cone, the Bengal Fan, and the Zambezi Fan. Carbonate sediments are accumulating in the shallow areas along the Australian, African coasts and West coast of India, on the shallow ridges and plat forms and in the shallower parts of the Somali basin. Siliceous sediments

are found in significant amounts in the subpolar regions of the Crozet basin and in the equatorial regions of the deep basins. Elsewhere, deep-sea clays are accumulating except in the Central Wharton Basin and southern Mascarene Basin, where sedimentation appears to have been stopped.

PACIFIC OCEAN : In comparison with the North Atlantic, with its abundant supply of terrigenous sediment and vigorous bottom water circulation, the Central equatorial Pacific is a relatively quiet region starved of external sediment inputs. In contrast erosion products derived from land has a free access to the deep ocean of the northeast Pacific. Elsewhere, terrigenous debris is trapped in the major ocean trenches or, off California, in the deep basins of the continental borderland. Access for terrigenous debris to the equatorial Pacific is hindered by the middle America Trench and the southern California Borderland. Any material that does reach the region from Central America is prevented from being transported west wards by the East Pacific Rise. Biogenous material produced in the equatorial Pacific due to high productivity dominates the equatorial sedimentation pattern and results in a zone of thick sediment accumulation. Near the equator the sediments are highly calcareous but give way north and south to zones of siliceous sediment. Beyond the boundaries of the high productivity zone non-fossiliferous pelagic clays are accumulating. In the eastern part of region the zone of calcareous sediment accumulation extends north and south over the shallow regions of the East Pacific Rise and its associated ridges.

ATLANTIC OCEAN : In the Atlantic Ocean siliceous deposits are not prominent whereas terrigenous inputs are high compared to the other two oceans due to vigorous bottom water circulation. When no other influences are at work, and the currents are small pelagic sediments can accumulate. These will be partly biogenic and partly fine suspended terrigenous clays and authigenic minerals. Major part of the Atlantic ocean floor is covered with carbonate deposit.

Selected references for further reading :

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