Elements of Marine Geology

June 6, 2010



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Delft Institute of Earth Observation and Space Systems

Delft University of Technology

Bathymetry of the Earth an overview





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Topography of the seafloor features 1





Topography of the seafloor features 2



THE EDGE OF THE CONTINENT



June

A typical ocean bottom section typical sound speed values





Stratification of sediments



Recent sediments: stratification parallel to the seabed

Older sediments: deformation



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Geo-acoustic modelling of the seafloor P- and S- waves



A geo-acoustic model of the seafloor comprises the following parameters

- compressional (P-) wave speed
- shear (S-) speed
- compressional wave attenuation
- shear wave attenuation
- density

as a function of depth.

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Sediments

unconsolidated rock and mineral particles

• Clastic sediment (loose rock fragment and mineral grains)



- Chemical sediment (precipitation of dissolved matter)
- Biogenic sediment (fossil remains of organisms)

Rocks

naturally formed, coherent aggregate of minerals

- Igneous rocks, formed by cooling and consolidation of magma (examples: granite, basalt)
- Sedimentary rocks, formed by cementation of sediment
 - clastic (examples: sandstone, siltstone, conglomerate)
 - chemical (evaporites)
 - biogenic (limestone, consisting mainly of the mineral calcite)
- Metamorphic rock (high temperature, high pressure)





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Geo-acoustic parameters of sediments **Shepard diagram**



Geo-acoustic parameters of sediments

grain size, porosity, density, sound speed



Geo-acoustic parameters of rocks

		Compressional speed [m/s]	Shear speed [m/s]	Density [g/cm ³]
Igneous rocks	Granite	6000	3500	2.65
	Basalt	4800	2500	2.5
Sedimentary	Sandstone	4700	2700	2.5
rocks				
	Siltstone	3800	2150	2.4
	Mudstone	2200	1000	2.2
	Limestone	6000	3000	2.65

