

GEOTECHNICAL PROPERTIES OF SHELF SEDIMENTS FROM AEGEAN SEA

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Abstract

The geotechnical properties of 14 selected sediment short piston cores, are investigated, from characteristic sedimentary environments from shelf sediments of Aegean sea. Sediment texture, mineralogy, calcium carbonate content, organic matter and the near bottom environment of deposition (bottom currents, near bottom suspended sediment, sedimentation rates) seem to have a significant effect on geotechnical properties of the surface shelf sediments from Aegean sea.

Resumé

Les propriétés géotechniques de 14 petites carottes, sélectionnées par des environnements sédimentaires caractéristiques du plateau continental de la Mer Egée sont examinées. Caractéristiques tels la texture sédimentaire, les éléments mineralogiques, la teneur en CaCO_3 (calcium carbonatifié) et en matériel organique et les conditions de l'environnement de la déposition (courant du fond, sédiments près du fond de la mer et vitesse de la sédimentation) semblent avoir une remarquable signification pour les propriétés géotechniques des sédiments du plateau continental de la Mer Egée.

Fourteen short piston cores were collected by the research vessels of Hydrographic service, from five representative provinces in the Aegean sea shelf.

Three cores were collected from Alexandroupolis bay located in the north-eastern part of the Aegean sea. River Evros, the biggest river in the Aegean area, discharges into the bay. Relatively high values of mean bulk density ($1.65-1.89\text{g}/\text{cm}^3$) and low values of water content (25-62%) and porosity (44-62%) observed in the surface sediments. Average vane shear strength were ranged from $41\text{g}/\text{cm}^2$ to $62\text{g}/\text{cm}^2$. The higher bulk densities and the lower water contents and shear strengths appear to be related with the low calcareous sandy silty and sandy muddy sediments, the minerals present in the coarser fraction (micas, quartz, feldspar), the strong near bottom currents ($\sim 40\text{cm}/\text{sec}$) and probably the relatively low organic matter. The lower mean bulk densities and the higher water contents, porosities and shear strengths are found to be associated with the muddy sediments, the weaker bottom currents ($\sim 25\text{cm}/\text{sec}$), the low CaCO_3 content and low organic matter. According to their plasticity characteristics these sediments are classified to the "inorganic clays of high plasticity".

Four cores were collected from Kavala bay a shallow marine embayment in the northern Aegean sea which flanked by the Nestos river delta plain to the eastern side. Mean bulk density of the surface sediments varies from $1.48\text{g}/\text{cm}^3$ to $1.57\text{g}/\text{cm}^3$, water contents from 61% to 79%, porosities from 64% to 69% and shear strengths from $34\text{g}/\text{cm}^2$ to $83\text{g}/\text{cm}^2$. The higher bulk densities, shear strengths and the lower water contents & porosities appear to be associated with the relatively coarser muddy and silty sediments towards the delta plain, the mineralogy of the coarser (quartz,

feldspar, micas) and the finer (>60% illite) fraction, the relatively weak near bottom currents (10-15cm/sec), the low CaCO₃ content (<10%), and the low organic matter. Based on their plasticity characteristics are classified to "the inorganic silts of high compressibility". The lower bulk densities, shear strengths and the higher water contents, porosities were found within the finer muddy sediments where weak near bottom currents (5-10cm/sec) prevail. These sediments are characterised as "inorganic clays of high plasticity".

The gulf of Petalion is shaped between Attiki and S. Evia island and is covered mainly from calcareous sand and silt (calcareous algae, corals). The two cores collected from this sedimentary environment, display high mean bulk densities (1.82g/cm³-1.93g/cm³) but very low water contents (27-35%) and porosities (43-50%). These values are related to the sediment texture and the low sedimentation rates (limited sediment input) in the gulf of Petalion.

A single core collected from south Evoikos gulf, a semi-enclosed shelf-sea, located north of the gulf of Petalion. The mean values of bulk density (1.53g/cm³), water content (80%), porosity (68%) and shear strength (25g/cm²) reflects the very fine bottom sediments (>60% clay), the high amounts of near bottom suspended sediment, the weak bottom currents (3-8cm/sec) and the low CaCO₃ content (<15%). The sediments in S. Evoikos are characterized as "inorganic clays of high plasticity".

The remained four cores were collected from Keratsini - Psitalia, a sludge area, in the innermost part of Saronikos gulf. The central sewage canal of Athens city out flows in the sampling area. The low mean bulk densities (1.25-1.44g/cm³), the high water contents (96-136%) and porosities (78-82%) and the variability in shear strengths (36-63g/cm²) is attributed to the very high organic matter, the low CaCO₃ content (<5%) and the relatively weak near bottom prevailing currents (5-15cm/sec).

Sedimentological processes related to the sediment texture, mineralogy CaCO₃ content organic matter, near bottom environment of deposition (bottom currents, near-bottom suspended sediment, appears to be responsible for much of the variation of geotechnical properties observed in the shelf sediments from Aegean sea.

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