RECENT SEDIMENTATION RATES IN THE AEGEAN SEA

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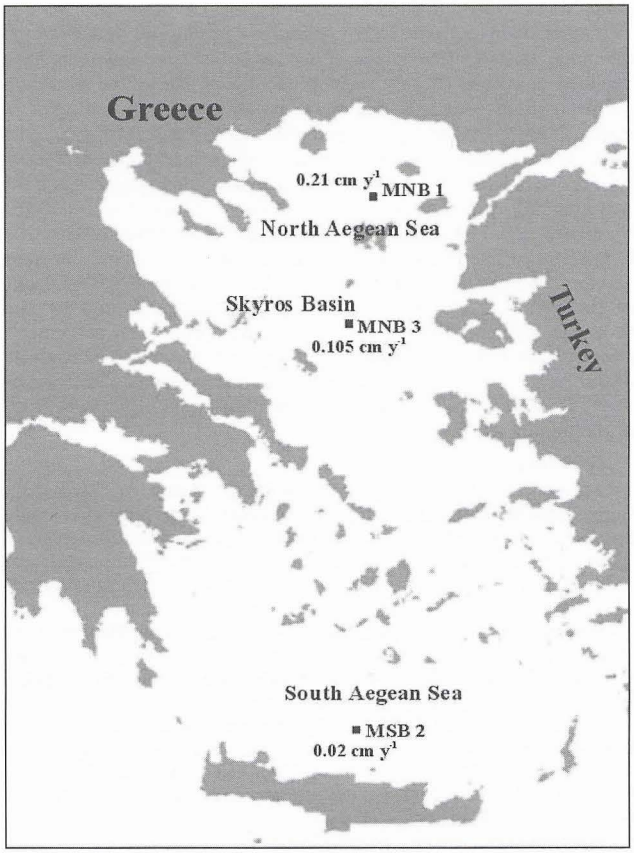
Abstract
Sedimentation rates were determined in three deep basins of the Aegean Sea, using the ^{210}Pb method. In the North Aegean basin the sedimentation rate was the highest (0,21 cm y^{-1}); in the Central Aegean Sea, the Skyros basin, the sedimentation rate was found lower than the previous one (0,105 cm y^{-1}); the lowest sedimentation rate was calculated in the South Aegean basin (0,02 cm y^{-1}), where the main sources of particles are the biological processes in the water column and the atmospheric fall-out.

Keywords: sedimentation rates, ^{210}Pb, Aegean Sea.

Sediment accumulation rates were determined in three basins of the Aegean Sea in the framework of the MTP-II-MATER project. The cores that were analyzed for ^{210}Pb were collected from the North Aegean basin (MNB-1), the Skyros basin in the Central Aegean Sea (MNB-3) and the South Aegean basin (MSB-2) (Fig.1). According to Lykousis *et al.* (2002) there appears to be a N-S gradient in the biogeochemical processes in the Aegean Sea. Moreover, in the North Aegean mass fluxes in the water column are characterized strongly by the lithogenic constituent, due to the river discharge from the northern mainland of Greece. In contrast, the South Aegean fluxes appear to depend more upon the biogenic component and less on the lithogenic fall-out [1].



Sediment cores (∅ 6cm and about 50cm long) were sub sampled from a box corer, during the August 1997 cruise of the R/V *Aegaeo*. For the total dissolution of the dry sediments the analytical method described by Sanchez-Cabeza *et al.* [2] was followed. ^{210}Po isotopes were deposited on silver discs and counted in both sides on a total alpha-counter (Ortec EG&C) [3]. Sedimentation rates were calculated assuming secular equilibrium between ^{210}Po and ^{210}Pb.

For the determination of the biomixing zone and the calculation of the sedimentation rates the Biodiffusive Model was used [3, 4, 5] according to which the biological process is given by the advection - diffusion equation. The accumulation rate (S) is calculated in the zone below the mixed layer whereas the mixing coefficient (D_B) is calculated within the mixing layer of the sediment core. It must be noted that the rates calculated this way are the apparent one. Supported ^{210}Pb concentrations were determined from the deeper parts of the cores where the total ^{210}Pb concentrations were constant with depth.

Core MNB-1 was collected from a depth of 1287 m in the deep basin of the North Aegean Sea. The vertical profile of the unsupported ^{210}Pb activity showed a significant decrease below the 10-11 cm layer of the sediment core. Surface ^{210}Pb activity was 34.5 dpm g^{-1}. The upper 4-4,5 cm of the core seemed to be mixed. The apparent accumulation rate calculated according to the Biodiffusive model was found to be 0,21 cm y^{-1} and the mixing coefficient about 4.2 cm^2 y^{-1}.

Core MNB-3 was taken from the Skyros basin (820 m) in the Central Aegean Sea. The vertical profile of the unsupported ^{210}Pb showed an almost theoretical exponential decrease until the 18 cm depth, with a surface concentration of 40 dpm g^{-1}. The sedimentation rate was found 0.105 cm y^{-1}, whereas, no mixing was observed in the surface layer of the sediment core.

MSB-2 core was collected from a depth of about 1600 m, in the South Aegean deep basin. Surface ^{210}Pb total activity was 13,9 dpm g^{-1}, lower enough than in surface sediments of the North Aegean Sea. Below the first 0,5cm of the sediment core, ^{210}Pb activities decreased very sharply. According to the Biodiffusive model, the apparent sedimentation rate was found to be 0,02 cm y^{-1} and the mixing coefficient 0,022 cm^2 y^{-1}.

Concluding, the most important finding of this work is the quantification in a way of the previously demonstrated difference between the three basins of the Aegean Sea as far as the sediment supply is concerned.

References

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