PALYNOLOGICAL EVIDENCE FOR CLIMATIC CHANGE DURING THE LATE QUATERNARY

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Abstract
Pollen analysis was carried out on three cores collected from the Marmara Sea. Pollen assemblages display slightly different composition in the eastern and western parts of the Marmara Sea. *Artemisia* exists in the cores KL 97 and DM18 but does not occur in core DM 13. In addition, *Picea* points to woodland vegetation more like the present moister mountain forest in the Southern Black Sea where it occurs on the north slopes of the mountains. Cores DM18 and DM 13 from the Central basin, show different stratigraphic distributions of major pollen species.The pollen records of the sediment cores include several types of vegetation, from step to semi-desert taxa, to those of upland broad -leaved deciduous and coniferous forests. *Quercus* is the most common tree pollen all of cores, reflecting the eastern Mediterranean warm-dry summers and mild-wet winters. Total AP and NAP percentages, and changing abundance of individual tree and herb taxa allowed us to distinguish four different zones in studied cores.
Keywords : Deep Sea Basins, Sea Of Marmara, Sapropel.

The intracontinental Marmara Sea is a unique waterway situated between the Black and Mediterranean Seas to which it is connected by the Turkish Strait System (TSS: Bosphorus and Dardanelles) The Marmara Sea includes various types of several depositional environments such as shelves, slopes, deep basins and ridges. The shelf area is subject to accumulation of mainly coarse-grained siliciclastic terrigenous sediments with biogenic sediment contribution, particularly in the southern part where it widens and receives large riverine input [1-4]. The sediment deposits of this small basin provide excellent records for determining the water exchanges between the twomarine realms during the Late Quaternary in relation to the paleoceanographic evolution of the region. Previous investigations indicate the occurrence of sapropelic layers [5-6].

Pollen analysis was carried out on three cores collected from the Marmara Sea.The gravity cores DM 13, DM 18 and KL 97 were collected during the cruises of R/V Sismik1 and R/V Meteor, respectively. The core DM 13 and DM 18 were collected from the western ridge of the Marmara Sea at a water depth of 710 m, with sediment recoveries of 300 cm and 420 cm, respectively. KL 97 was collected from the Eastern Basin of the Marmara Sea at a water depth of 1094 m and it has a length of 540 cm. The sediment samples for pollen analysis ($\sim$1 cm ^{3}fresh material) were treated using standard methods [7-9]. This method includes HCl, HF, and KOH digestion, before staining with safranine and mounting with glycerine jelly. After HCl digestion, *Lycopodium* spores were added to obtain estimates of palynomorph concentration per cm^3. The pollen percentages are based on total pollen, excluding spores. Ages of the pollen zones were obtained by AMS and ^{14}C dated methods.

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Core DM 13 was collected from the western ridge of the Marmara Sea at a water depth of 710 m, with a recovery of 3 m. The oldest sediments are found in core DM 13. two units are identified in core DM13 highest total pollen count between 80 and 100 cm, which reaches about 900 grains cm^{-1}, is coeval with the sapropelic layer in this core. Pollen zone D at the base of the core (from 200 to 290 cm) is characterized by a high value of AP (arboreal pollen), ranging between 80 and 90 % of total pollen, and consequently, the percentage AP is low. *Quercus* is the dominant arboreal pollen type, followed by irregularly increasing amounts of *Pinus* and *Juniperus*. Chenopodiaceae is the most abundant in nonarboreal pollen. In Zone C,between the 120-190 cm, the arboreal pollen sum increases against non-arboreal pollen (up to 91%). The percentage of *Quercus* does not vary but *Pinus* increases. Chenopodiaceae dominates the NAP (non-arboreal pollen), but decreases at the base of the zone C. In Zone B (120-60 cm), the pollen sum increases and corresponds to a sapropelic layer. *Quercus*, *Pinus* and *Juniperus* increase and reach maximum values whereas the Chenopodiaceae start to decrease. In Zone A, the distributions of the most abundant AP species, such as *Quercus* and *Pinus*, do not show significant fluctuations.

In core DM 18, the highest pollen count is between 245 and 355 cm, reaching about 800 grains cm^{-1} and corresponding to the sapropelic layer. Zone C between 400 and 245 cm contains high arboreal pollen sums. *Pinus* and *Abies* increase and reach their maximum values whereas *Artemisia* decreases. In Zone B, between 245 and 90 cm, *Quercus* increases whereas *Pinus* and *Abies* decrease. Zone A is characterized by the lowest value of total pollen.

Core KL 97 from the deep eastern basin shows high variable sedimentation rates. The total pollen sum displays the highest value at around 260 cm, corresponding to the sapropelic layer. Zone D, located between 400 and 500 cm, consists of high values of AP. *Artemisia* reaches a maximum value in zone C. Between the intervals 140 and 280 cm in zone B, *Quercus* pollen fluctuation in this core. Pollen distributions do not fluctuate significantly in zone A.

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