Sediment Transport on the Continental Shelf of the SE Mediterranean Sea - Indirect Evidences

Abraham GOLIK

Israel Oceanographic and Limnological Research, National Institute of Oceanography
HAIFA (**Israel**)

More than 30 years ago, EMERY and NEEV (1960) proposed a model for sediment transport along the Israeli continental shelf. According to this model, which was based on the orientation of the Israeli coastline and the direction of the highest waves which may approach the Israeli coast (Az 275 - 292), longshore sand transport in the surf zone is directed northward from Rafah to Natanya, on the southern part of the Israeli coastline, whereas from Natanya northward the littoral drift is in a southward direction. As the source of sand is undoubtedly from the Nile, this model provided no explanation for the quartz sand found on the beaches north of Natanya. EMERY and NEEV therefore proposed an additional mechanism for sediment transport, namely the Mediterranean counterclockwise current, which carries sediment along the continental shelf from south to north and also feeds with sand the surf zone of the Israeli coastline. Recent findings may shed light on the validity of this part of the model.

In a study carried out by COLEMAN *et al.* (1981) off the eastern flank of the Nile Delta, bedforms such as sand ribbons and mega ripples were recorded by a side scan sonar. When a composite of these bedforms records was put together, their orientation indicated sand movement from southwest to northeast. Sediment distribution as well as current measurements supported this conclusion.

A side scan sonar survey carried out by GOLIK (1988) off Ashdod, Israel revealed the presence of small rocky mounds at a water depth of 90 to 105 m. These mounds (see figure) are 30 to 70 m in diameter, having a relief of 5-7 m, and are probably projections of a buried eolianite ridge. The records show a crescent shaped trench surrounding each of these mounds with the concave side of all of them facing to the northeast, parallel to the general orientation of the coastline. It is proposed that these crescent shaped trenches were formed as a result of bottom currents which exist in the area and cause sediment moment from the southwest to the northeast.

Between 1982 and 1990 nine surveys were conducted in the vicinity of the marine coal terminal off the Hadera power plant, aimed at monitoring the dynamics of coal particles which fall to the sea bottom during coal unloading (GOLIK and AVERBACH, 1985; GOLIK, 1986; GOLIK, *in prep.*). In all these surveys, the distribution of coal particles was that of a plume oriented northward, to a distance of at least 15 km, parallel to the coastline, at water depths greater than 13 m. South of the terminal, coal was very scarce. It is estimated that since the terminal started operation in 1981, some 10,000 tons of coal dropped to the sea bottom, yet underwater photographs, taken some 50 m from the unloading point, show that although coal is dispersed on the bottom, the seabed is not covered by a layer of coal as one would expect. The consistent presence of coal particles only north of the terminal, and the absence of a continuous coal layer under the unloading point, indicate that the net bottom currents' direction off Hadera is northward, and that they are strong enough to prevent coal accumulation there.

All the cases mentioned above, demonstrate that the general flow regime on the sea bed in the southeastern Mediterranean is oriented parallel to the coastline in a general northeast and northward direction. Recent current measurements which were conducted throughout the water column at several stations on the Israeli shelf by ROSENTRAUB (1990) also show that most of the time the currents flow northward. All these support the hypothesis of EMERY and NEEV concerning the sediment transport on the Israeli continental shelf.

REFERENCES

COLEMAN J.M., ROBERTS H.H., MURRAY S.P. and SALAMA M., 1981. - Morphology and dynamic sedimentology of the eastern Nile delta shelf. *Mar. Geol.*, 42 : 301-326.

EMERY R.O. and NEEV D., 1960. - Mediterranean beaches of Israel. *Israel Geol. Survey Bull.* 26 : 1-24.

GOLIK A., 1986. - Monitoring coal on the seabed in the vicinity of the coal terminal off Hadera. *IOLR report* H5/86 : 5 (in Hebrew).

GOLIK A., 1988. - Bathymetry and sub-bathymetry of the YAM 1 well on the edge of the continental shelf off Ashdod. *IOLR report* H/13 : 8.

GOLIK A. and AVERBACH S., 1985. - Monitoring coal on the seabed and on the beach in the vicinity of the coal terminal off Hadera. *IOLR report* H1/85:17 (in Hebrew).

ROSENTRAUB Z., 1990. - Investigation of currents on the Israeli continental shelf. *IOLR report* H18/90 : 18 (in Hebrew).