RECENT EVOLUTION OF THE ARACHTHOS RIVER ESTUARY (NW GREECE)

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Abstract

Data derived from historical charts, seismic profiling and sediment core analysis have indicated three migration phases for the Arachthos River mouth since 17th century and up to 1930s. Thereafter, three evolutionary stages in the geomorphology of the modern estuary occurred: rapid development of an extended deltaic lobe in front of the river mouth until 1960; deceleration of the subaerial progradation of the deltaic lobe during 1960-1987; and domination of significant erosion of the deltaic deposits from 1987 to 2000, causing shoreline retreat.

Keywords: Shoreline Evolution, Deltas, Seismics

Study area The Arachthos River discharges into the Amvrakikos Gulf (NW Greece) which is the biggest semi-closed coastal biotope (protected by the RAMSAR convention) in the Greek territory. The river is 110 km long and the cathcment basin covers an area of about 1900 km^2. The average annual freshwater and suspended sediment inputs into the Amvrakikos Gulf are about 2.2×10^9 m^3 and 7×10^6 tonnes, respectively [1].

Results and Discussion Reliable historical charts, published in the 17th Century, indicate that the mouth of the Arachthos River was located about 6 km to the west from its present position, at the Paleobouka site. At the end of the 19th or the beginning of the 20th Century, the mouth moved naturally to the east, approximately 1 km from its present position. During the end of the 1930's, the lowest course of the river was aligned by the construction of artificial levees and diverted more to the east, at its present position (Fig. 1).

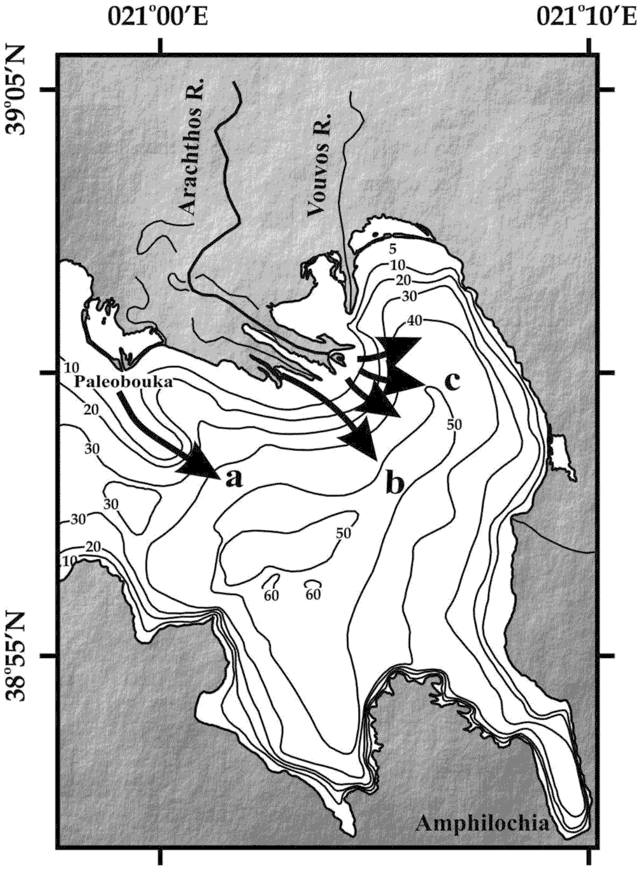

Fig. 1. Migration positions (a, b, c) of the Arachthos River mouth.

The above migration phases have been detected from high resolution seismic profiling as three equitant acoustic units within the recent prodeltaic deposits [2]. The lowest Unit C consists of almost *transparent* internal reflectors indicating distal prodeltaic deposits; it is very likely for these sediments to have come from the Paleobouka site when the river mouth was initially located there. The intermediate Unit B shows a prograding sigmoid configuration pattern, presumably, made when the river mouth was located about 1 km westwards to its present position. The uppermost Unit A is characterized by wavy reflectors representing modern foreset deposits (Fig. 2).

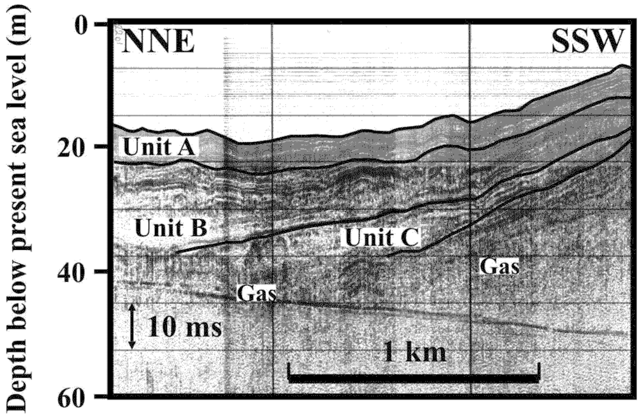

Fig. 2. High resolution seismic profile located near the present Arachthos River mouth, showing the succession of the prodeltaic deposits.

The geomorphological evolution and shoreline displacement of the Arachthos River delta during the last 70 years was identified through a Geographical Information System (GIS) manipulation and analysis of: (a) three sets of aerial photographs taken in 1945, 1960 and 1985; (b) a satellite photograph taken in 2000; and (c) topographic diagrams of a scale 1:5000 published in 1981. The interpretation and comparison of the above data demonstrate the following: After the alignment and diversion of the Arachthos River in the end of 1930's and until 1960, an extended deltaic lobe in front of the new mouth had been rapidly developed, whilst the deposits near the older mouth were being subjected to erosion. The subaerial progradation of the new deltaic lobe decelerated during the period 1960-1987, with the older river mouth suffering a further retreat. Finally, since the construction of the hydroelectric dams at the Pournari site (located 20 km upstream the river mouth) in 1981 and 1996 and the development of an extended irrigation network, the sediment fluxes into the sea have become limited and the erosion processes have already dominated the estuarine area. This will inevitably lead to a significant reduction of the currently existing wetlands with a subsequent biodiversity loss, aquifer salinization, and rapid coastal subsidence.

References

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