

# Rapid Holocene Evolution and Neotectonics of the Albanian Adriatic Coastline

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## ABSTRACT

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High-resolution 1986 Landsat TM images of the Adriatic coast of Albania have been compared with aerial photographs obtained in 1943, and published literature, in order to decipher the sedimentary architecture and evolution of the late-Holocene deposits of the coastal plain. This coastline is microtidal and dominated by wave action; and abundant sediment is supplied by rivers draining the uplifted mountainous interior of this tectonically active region. The coastal plain has prograded up to 40 km since relative sea level rise slowed down around 6000 years BP. The inland parts of the coastal plain are dominated by parallel storm beach ridges whilst the coastal fringe exhibits a diversity of symmetrical to asymmetrical wave-dominated deltas and spit-deltas encompassing cut-off lagoons. A genetic model to explain the variability of wave-dominated deltas on the Albanian coast is proposed showing a spectrum of forms between prograding symmetrical cusped deltas formed by bi-directional longshore drift and highly asymmetrical spit-deltas formed by uni-directional longshore drift. Avulsive switching causes abandonment; the symmetrical forms become smoothed out by wave action whereas the spit-deltas become detached barrier beaches that migrate onshore by washover, welding themselves onto the coast. The back barrier cut-off lagoons in this setting have a very low preservation potential.

Two much larger lagoons, now partly reclaimed, at Karavasta and Narta, lie within the belt of beach ridges; both have a straight seaward margin parallel to known post-Neogene faulting. The lagoons exhibit differential subsidence which is regarded as neotectonic in origin; the presence of a 60 km long graben or half graben structure linking the two areas of subsidence is suggested to explain the observed phenomena. Subsidence up to 5-10 m is indicated within the last 1,000-2,000 years.

**ADDITIONAL INDEX WORDS:** *Wave-dominated deltas, subsidence, neotectonic faulting.*

## INTRODUCTION

Albania is situated in the south-western part of the Balkan peninsula and its coast fronts the Adriatic and Ionian seas. It is land-locked on three sides by the mountains bordering Montenegro, Serbia, the Former Yugoslav Republic of Macedonia (FYROM) and Greece. The Albanian coastal zone is more than 450 km long and may be divided into two physiographic parts (Figure 1). In the south, the coastal land, along with most of the Albanian hinterland, is structurally elevated and forms mountainous terrain composed largely of Mesozoic and early Tertiary sedimentary and igneous rocks. This mountain terrain gives way at the coast to the deep water of the Ionian Sea with no appreciable continental shelf.

In contrast, the northern Adriatic coast comprises flat lowlands, underlain by extensive Holocene deposits and extending inland to a maximum width of about 40 km. The lowlands include lagoons and deltas fed by large quantities of fluvial sediment eroded from the mountainous hinterland. The physical changes that are occurring today on the Adriatic coast are dramatic and constitute the latest episode in a long history of coastal change.

The modern coastal zone straddles a sedimentary basin that has persisted since the early Neogene. The sedimentary sequence that has accumulated during this interval has been affected by faulting and folding in this seismically active region (KOCIU, 1996). The overall structural trend is aligned NNW-SSE and fault-bounded blocks of Neogene and Quaternary (pre-Holocene) sedimentary rocks with this orientation divide the coastal lowlands into discrete basins (Figures 2, 3). In contrast to the Ionian coast to the south, there is a wide continental shelf, formed in part by these accumulated sediments and extending up to 100 km offshore.

Little is published about the Holocene geology of Albania. Previous studies have concentrated on the bedrock geology (of the country) with a view to identifying economically viable hydrocarbon or mineral resources. Studies of the Quaternary include its aquifer potential (EFTIMI, 1966; EFTIMI *et al.*, 1989), river terrace chronology (PRIFTI, 1981; 1984) and short-term and contemporary coastal processes (CIAVOLA and SIMEONI, 1995; SIMEONI *et al.*, 1996, 1997). The aim of this paper is to build on the results of initial studies on the Holocene geomorphological evolution of the coastal lowlands bordering the Adriatic part of the Albanian coast (*e.g.* BOÇI, 1994). The results provide a spatio-temporal context for the consideration of more detailed records of short-term coastal

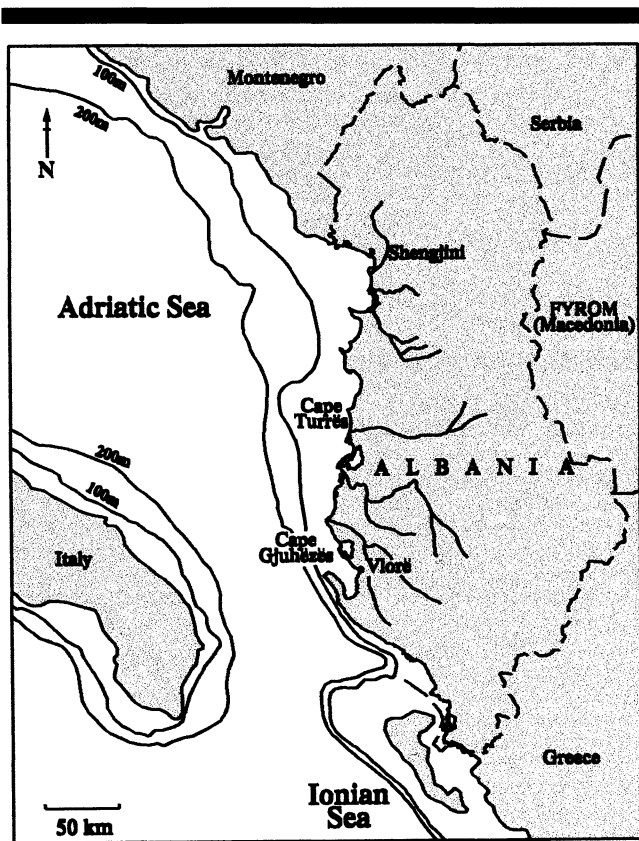


Figure 1. Geographical setting of Albania's Adriatic coastal plain.

change as well as a foundation for the prediction of future coastal behaviour.

### Physical Setting and Key Processes

The Adriatic coast of Albania may be divided into two parts. The northern part runs from the border with Montenegro south to Cape Turrës (Figure 2). In the north the coast is oriented WNW–ESE (Figure 2) and contains the delta of the River Buna. At Shengjini the coastline becomes oriented N–S and is intersected by the general NW–SE trend of tectonic structures. This trend is reflected in three headlands; Cape Rodonit, formed of Neogene sandy clays, and Cape Pallës and Cape Turrës, formed of Neogene sandstones, clays and sandy conglomerates. Three long bays are present between the headlands, Drini-Rodonit, Lalëzi and Durrës, each backed by a coastal plain.

The southern part of the coast runs from Cape Turrës south to the Bay of Valona (Figure 3), and is characterized by a very wide coastal plain punctuated by low, N–S aligned fault-bounded ridges of Neogene sediments. The Holocene sediments are dominated by the deltas and former courses of the Shkumbin, Seman and Vjosë rivers. The two largest lagoons Karavasta and Narta, are located here. The Bay of Valona marks the boundary between the Adriatic lowlands and the Ionian coastline of high relief.

One of the most important factors controlling contempo-

rary change along the Albanian coast is the large amount of sediment discharged by rivers and redistributed by waves. On the Adriatic coast the dominant winds are southeasterly, easterly and northwesterly. The biggest waves observed along the coastline come from the northwest and are up to 3.5 m high (CIAVOLA and SIMEONI, 1995). In contrast the tides have little influence; their range in this part of the Mediterranean being less than 1 m. PANO (1992) has estimated the total average sediment discharge by Albanian rivers into the Mediterranean Sea at  $65.7 \times 10^6$  tonnes/yr for the period 1948–1990, corresponding to an average water discharge of  $1308 \text{ m}^3/\text{s}$ . Although the water discharge is low compared to other Adriatic rivers (such as the Po), the sediment load carried to the sea is comparatively high. Human activities including the damming of upper river courses, reclamation of floodplains and the removal of sand and gravel from river beds have altered the sediment discharge in recent years. In some cases these human factors may have triggered recent coastal erosion. SHUISKY (1985) estimated that 42% of the total coastal length is currently affected by coastal recession, while BOÇI (1994) proposed a value of 55%.

### Analysis and Interpretation of Earth Observation Data

Several recent studies have underlined the usefulness of satellite imagery in the investigation of the broad-scale morphology of large Holocene deltas and coastal plains (e.g. SGAVETTI and FERRARI, 1988; MATHERS *et al.*, 1996). Such analysis forms a useful framework which can be further developed by the examination of large-scale aerial photographs and by fieldwork. The deposits of the Albanian coastal plain have been examined using a combination of satellite images (Landsat TM, 2/10/86, TM 186/032), printed at 1:100 000 scale, and orthogonal aerial photographs at 1:10 000 and 1:25 000 scales, flown in 1943 by the Royal Air Force and curated by the Department of Geography, Keele University, UK. These data have been considered together with examination of relevant literature, topographic and hydrographic maps and a brief field visit to some of the key areas. Despite the differing scales of the earth observation data, their temporal separation of 43 years has enabled observations to be made of dramatic physical change over this period at several coastal locations.

The small tidal range results in wave-dominated forms such as deltas, spits and barrier beaches, between which transitional forms exist. A systematic description of these features follows, tracing the Adriatic coastline southwards firstly from the border with Montenegro to Cape Turrës (Figure 2), then from Cape Turrës to Cape Gjuhëzës (Figure 3), the southern limit of the area studied.

### Northern Part of the Albania's Adriatic Coast

#### Buna Delta

The Buna Delta lies astride the Albania-Montenegro border in the extreme north-west of the country (Figure 2A). Its sediment supply has been reworked bi-directionally. Three stages of Holocene wave-dominated delta formation, each clearly defined by sub-parallel clusters of beach ridges,

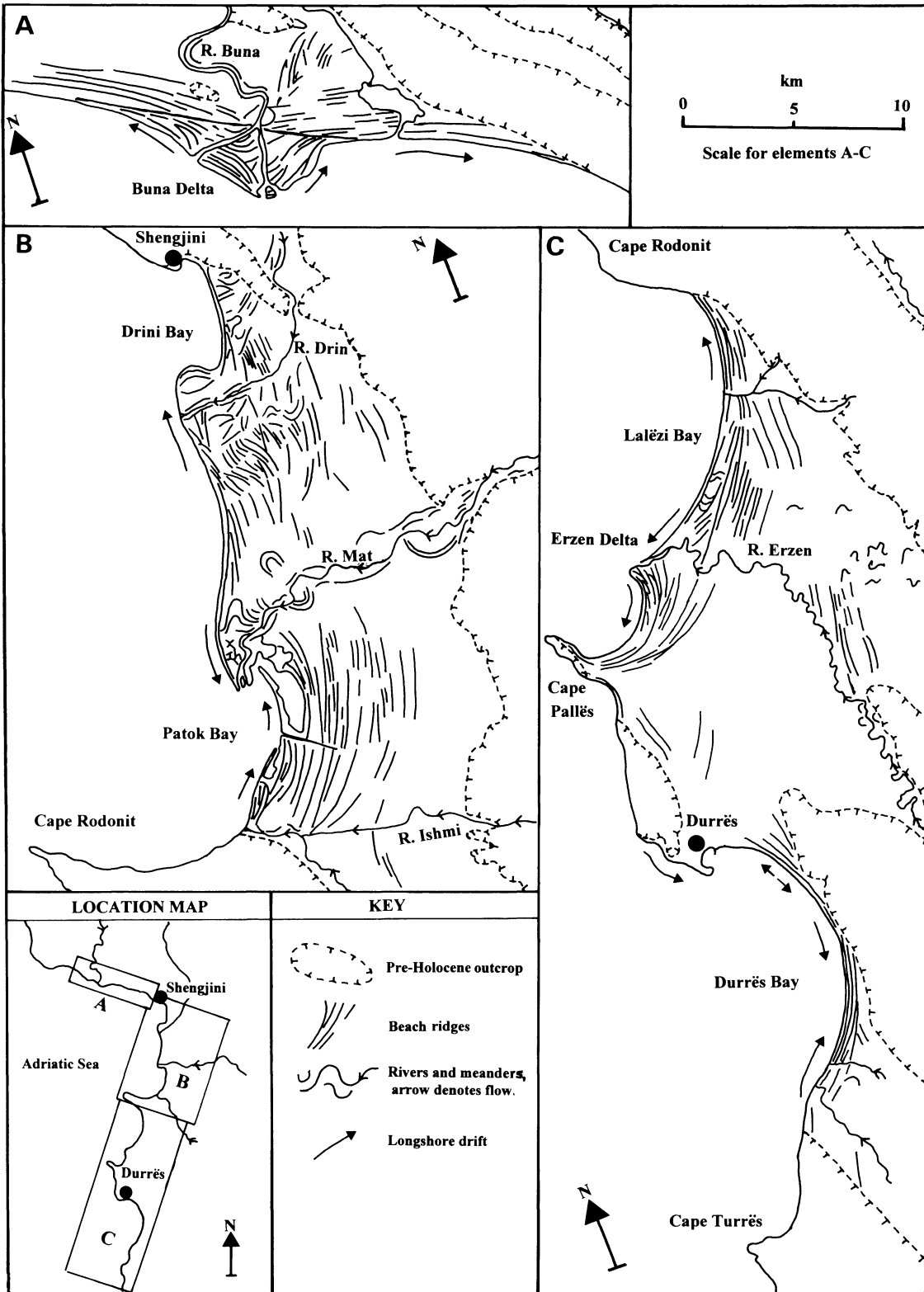


Figure 2. Interpretation of Landsat TM imagery (1986) for the northern Adriatic coast of Albania.

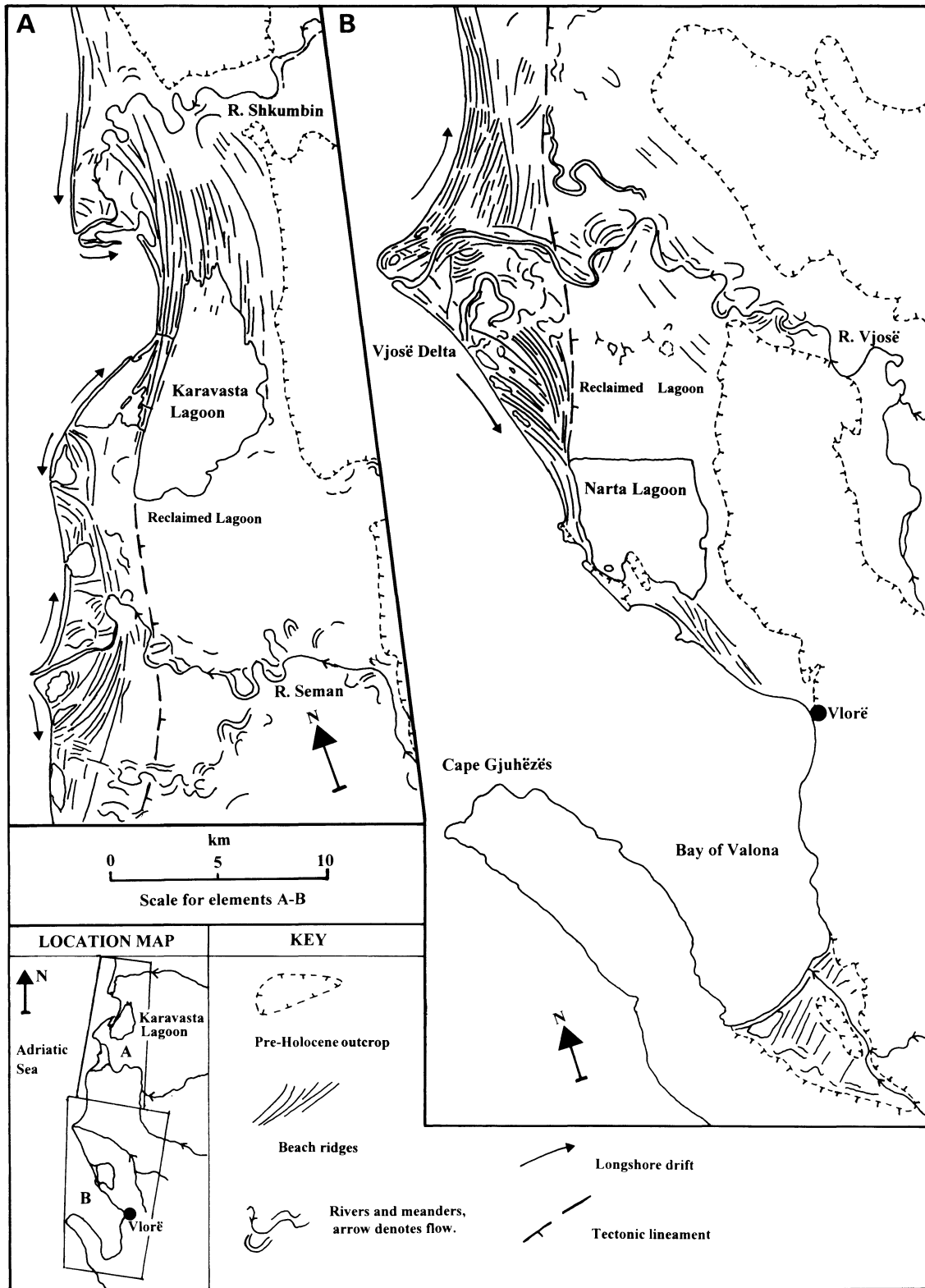


Figure 3. Interpretation of Landsat TM imagery (1986) for the southern Adriatic coast of Albania.

are apparent on the satellite imagery. The strandplain accounts for up to 7 km of progradation (average 3–4 km).

The earliest deltaic phase built-out to the south-east (Figure 2A). These sediments were then truncated by the southward progradation of a large cusped delta, slightly wider than the modern delta lobe but occupying a similar location. The third phase involved the construction of the active cusped delta lobe, which is about 10 km across at its base and progrades about 3 km from the adjacent coastline. The active lobe of the delta has built out from a marked linear coast-parallel truncation of the earlier deposits indicating a period of intense wave activity and partial destruction of pre-existing lobes. The Buna Delta is unusual in Albania in that it has two principal anastomosing distributaries which diverge at the base of the active lobe. Further upstream, the River Buna is of meandering style, laterally reworking the older deltaic lobes. The delta is composed of closely spaced beach ridges broadly concordant with the overall lobate form, reflecting the progressive development of a cusped-lobate wave-dominated delta.

### Drini-Rodonit Coastal Plain

The large coastal embayment between Shengjini and the headland of Cape Rodonit contains a broad coastal plain in which an average of about 10 km of progradation has occurred (Figure 2B). On its landward edge the coastal plain is bounded by uplands from which three major rivers emerge. The River Drin drains southwards, entering the sea between Shengjini and Patok. The River Mat flows westwards and debouches near Patok, and the River Ishmi flows northwards to enter the sea east of Cape Rodonit. It is probable that the three rivers have maintained separate identities throughout most of the later Holocene as evidenced by the discrete patterns of abandoned meander belts associated with the modern channels but absent elsewhere on the plain; these river mouths have maintained relatively fixed positions. This broad coastal plain is dominated by laterally stacked, broadly N–S aligned, beach ridges that are cut by the active and abandoned meander belts of the principal rivers. As in the Buna Delta, three principal belts of beach ridges have been identified.

Farthest inland, adjacent to the upland areas, the coastal plain is characterized by a 5 km wide zone of straight, closely-spaced, N–S aligned ridges. These ridges are heavily vegetated and fairly indistinct on both the aerial photographs and satellite images.

A central belt, also up to 5 km wide, is dominated by tightly clustered, sub-parallel beach ridges, that are noticeably more curved than the inner ridges, and show the presence of truncation surfaces bounding two or three individual cycles of wave-dominated cusped delta formation. Individual delta lobes are locally well preserved. Within this belt, localized (superimposed) tidal-creek style drainage patterns occur adjacent to the main tidal river channels. These areas have probably experienced differential subsidence (most noticeable south of the River Mat).

The outer belt is the most diverse and contains deposits concordant with the present-day coastal configuration. Wave-

dominated deltas of variable morphology have been formed, including cusped-symmetrical lobes produced by bi-directional longshore drift and highly asymmetrical elongate spit-deltas, produced under conditions of strong unidirectional longshore drift. The strongly asymmetrical spit-deltas enable the development of protected quiet water lagoonal environments in which tidal sediments and small river-dominated deltas have been deposited. The Ishmi spit-delta has prograded north in Patok Bay. In 1943 the delta exhibited marked variation between its two banks as revealed by the aerial photograph interpretation (Figure 4). The outer (left) bank was composed of stacked sand beach ridges formed by northerly-directed longshore drift, which had progressively deflected and lengthened the river northwards. In contrast, the inner bank was dominated by levee and crevasse splay deposits passing distally into tidal flats. A southerly prograding spit-delta had also developed by 1943 in the northern part of Patok Bay deflecting the mouth of the Mat River to the south, towards that of the Ishmi and progressively enclosing the Patok Lagoon behind it. Patok Bay at this time was therefore a zone of marked convergence of longshore drift. Considerable coastal change is, however, evident in this area when the 1943 aerial photography is compared with the 1986 satellite imagery. By 1986 the two spit-delta systems had coalesced and both rivers had avulsed upstream to produce much more direct routes to the sea. The abandoned spit-deltas at Patok remained as a barrier which is now migrating landwards by washover and sediment redistribution through flood tide-dominated channels in which small deltas are forming. Evidence for this landward migration and erosion of the barrier is the partial drowning of military bunkers, built in the 1970s, which were originally set back from the beach, and the presence of exhumed tree trunks and lagoonal sediments on the seaward side of the barrier (CIAVOLA *et al.*, 1995).

Traversing the coastal plain broadly normal to the beach ridges are cross-cutting meanders associated with the present and past routes taken by the principal rivers. Establishing a precise chronology from these complex meander patterns is difficult. However, some general conclusions can be drawn with regard to the River Drin which reveals three separate meander belts traversing the coastal deposits. There is evidence that the Drin occupied two former courses, respectively to the north and south of the present course (Figure 2B). There is no clear indication of the relative ages of these former courses. Both are associated with adjacent and probably contemporaneous cusped beach ridges tracing the development of fairly symmetrical wave-dominated deltas. The present Drin Delta is rounded and probably undergoing net erosion (destruction) with longshore removal of sediment northwards towards the beaches of Shengjini.

### Lalëzi Bay

Between the bedrock promontories of Cape Rodonit and Cape Pallës lies Lalëzi Bay (Figure 2C). The bay is separated into two smaller embayments by a cusped wave-dominated delta at the mouth of the River Erzen. This river and its tributaries drain a broad NW–SE aligned lowland plain stretching 10–15 km inland from the coast. The plain is ex-

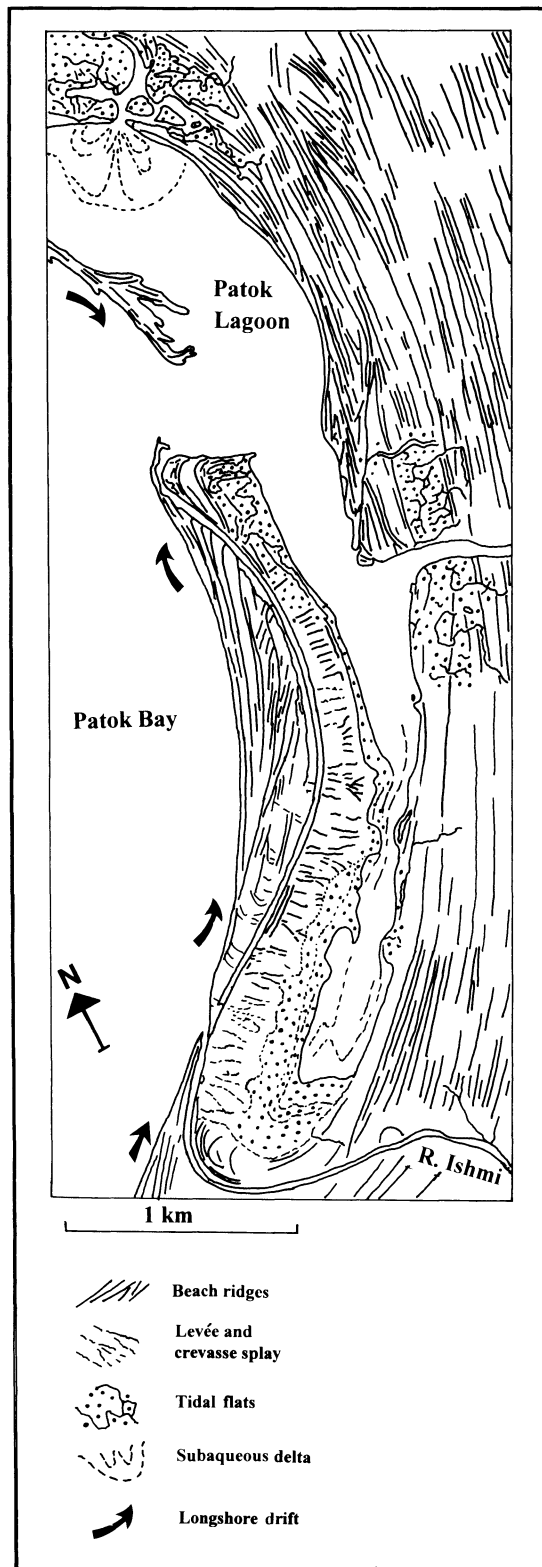


Figure 4. Detailed interpretation of 1943 aerial photography of Patok Bay.

tensively cultivated and the satellite images reveal only sparse geomorphological information. The outer part of the coastal plain is characterized by broadly N-S aligned beach ridges which can locally be traced seawards to the presently active coastal zone. A marked truncation surface defines the inland boundary of the symmetrical cusped Erzen Delta. The delta lobe occupies a zone of longshore drift divergence with sediment supplied by the River Erzen transported both to the north and south. North of the delta, a spit has progressively enclosed a 500 m wide lagoon. The lagoon has a limited connection with the sea via a long tidal channel, which, for most of its length, flows N-S between parallel beach ridges. This channel has developed a small flood-tidal delta at its entrance into the lagoon.

### Durrës Bay

Durrës Bay extends from the town of Durrës southwards to Cape Turrës, a low headland cut into fault-bounded Neogene sediments (Figure 2C). In the northern part of the bay south-easterly directed longshore drift has produced a short spit, sourced at its western end by an outcrop of Neogene sediments which extend northwards from Durrës. East of Durrës a narrow cluster of coast parallel, NW-SE then N-S trending beach ridges has developed, backed by a ridge of Neogene sediments. In the southern part of the bay the coastline trends NE-SW and several small rivers drain a NW-SE aligned, fault-bounded graben. Beach ridge clusters are preserved forming small cusped wave-dominated deltas. However, the stretch of coast appears to be erosional at present resulting in progressive smoothing out of the delta forms (SIMIONI *et al.*, 1996).

Durrës Bay has a particularly interesting onshore geomorphology, since the adjacent alluvial plain is very wide and difficult to relate to the small river presently in the area. PANO (1992) and ALBANIA COASTAL ZONE MANAGEMENT PLAN (1995) have proposed that the extensive alluvial deposits might indicate that the River Shkumbin used to flow into Durrës Bay.

### Southern Part of the Albania's Adriatic Coast

#### Karavasta area

South of Cape Turrës the Holocene sediments of the coastal plain gradually become wider reaching about 15 km around the town of Fier. The coastal plain is divided in two by a discontinuous low ridge of Neogene sediments which is cut through by the rivers Shkumbin and Seman. Landward of the ridge lies the 5-10 km-wide graben or half graben containing Holocene deposits. The coastal plain seaward of the ridge comprises two belts, one inland and the other along the coast (Figure 3A). The inland belt is characterized by N-S trending beach ridges interrupted by the large Karavasta Lagoon. At the seaward edge of this belt is a major erosional truncation surface (Figure 5). The straight western margin of the lagoon (Figures 3, 5) continues as a lineament that can be traced for 50-60 km southwards, where it also forms the straight seaward edge of Narta Lagoon. The expression of the beach ridge system can be seen clearly to the north of

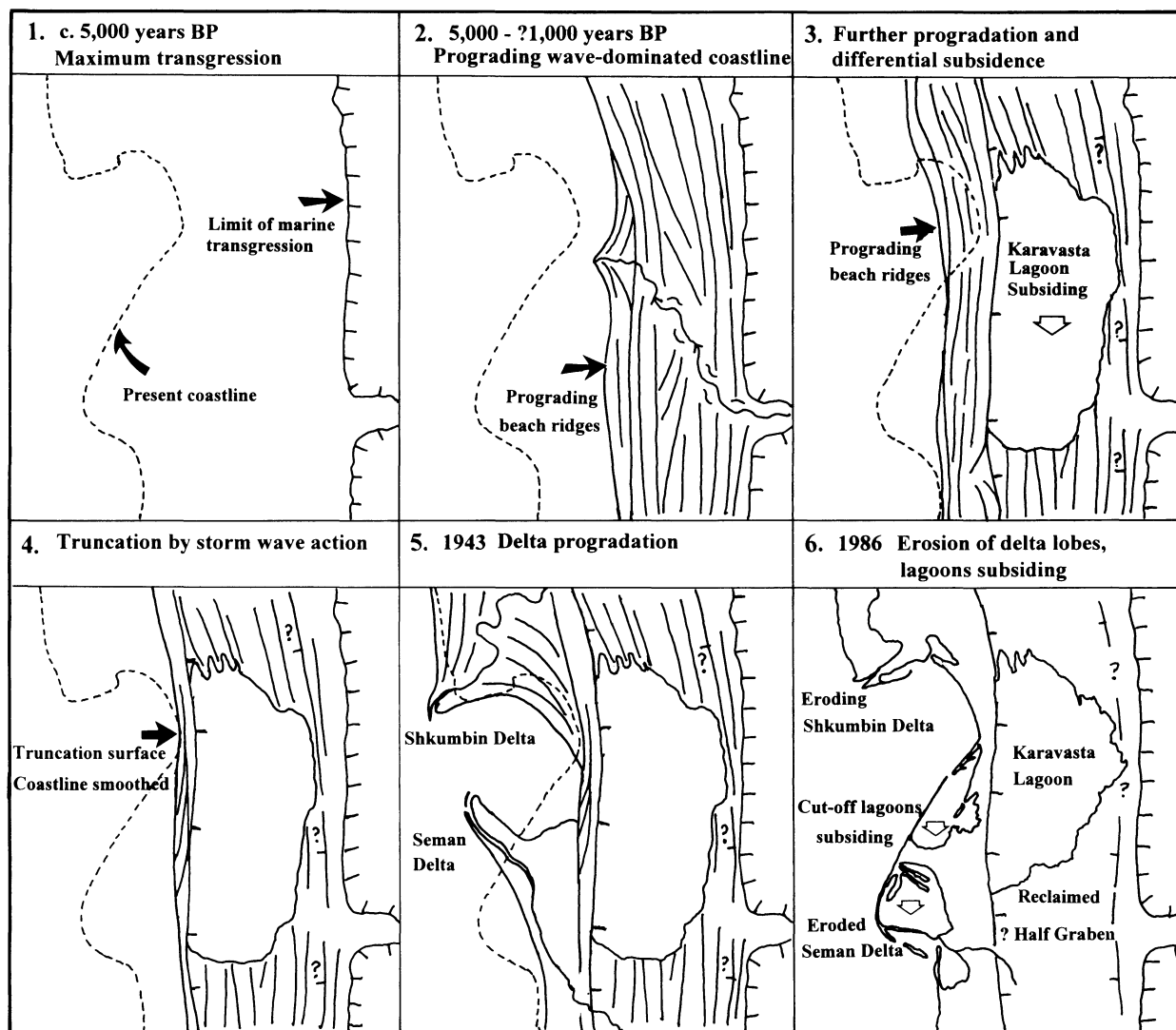


Figure 5. Schematic reconstruction of the evolution of the Karavasta area over the last 5,000 years.

Karavasta Lagoon, traced southwards these ridges fall in elevation and become submerged beneath the Lagoon, this results in the northern lagoon edge having an indented form. We believe that Karavasta Lagoon and adjacent areas have experienced relatively recent subsidence and that the linear nature of its western margin is suggestive of faulting or a hinge line. Maximum subsidence has been estimated at 5–10 m.

Despite the natural appearance of Karavasta lagoon, human alteration of the landscape has taken place in the form of drainage and reclamation of the surrounding wetlands during the last 40 years. The outer zone, seaward of the erosive truncation surface, constitutes the more recent stages of coastal evolution, with complex patterns of delta building and switching by avulsion. Within this zone comparison of the 1943 aerial photographs with the 1986 satellite images and recent maps indicates that major morphological change has occurred around Karavasta in very

recent times (see also BOÇI, 1994; BREW *et al.*, 1995; CIAVOLA and SIMEONI, 1995). According to BOÇI (1994) the Shkumbin Delta occupied a similar position to the present in 1870. Maps published in 1918 show two major distributaries that existed until 1968, the northerly one being initially dominant but since 1970 the southerly channel has carried the sediment load. On the 1943 aerial photographs the Shkumbin Delta broadly occupied its present location and was slightly asymmetrical owing to southerly directed longshore drift. In the following years the Shkumbin Delta has become rounded at its mouth as a result of wave action. As developed in 1986, it characterizes an intermediate form between symmetrical cusped deltas which experience diverging longshore drift and the highly asymmetrical delta-spits produced under strong unidirectional longshore drift. The mouth of the River Seman has often changed its position over the last 150 years (for a detailed history see BOÇI, 1994). In 1870 the mouth

was 20 km south of Karavasta Lagoon in the period that followed until 1957 the delta migrated northwards to near the southern end of Karavasta Lagoon. This is evidenced by the 1943 aerial photographs which show the River Seman emptied into the sea via an elongate northerly accreting spit-delta (Figure 5); the intervening zone between the two deltas marking a pronounced area of longshore convergence. Triggered by major flood discharges in 1962–1963, avulsion of the River Seman enabling it to follow a much more direct east-west route to the coast, repositioned the river mouth about 15 km farther south, where it has since constructed a more symmetrical wave-dominated cusped delta. Since its abandonment, the former spit delta of the Seman has undergone intense erosion and redistribution of its sediment northwards involving wave reworking into spit-barrier ridges and subsequent onshore migration by washover. All that remains today is a broad convex form where the spit-delta once stood (Figure 5).

### Vjosë Delta—Narta Lagoon

South of the River Seman, the broad coastal plain continues to reflect the two belts described above. Along the coast active sedimentation is focused around the Vjosë Delta (Figure 3B), whilst inland the accumulation of a blend of lagoonal and fluvial deposits has occurred.

In the inland belt the lineament discussed above still forms the seaward limit and coincides with the straight seaward margin of the partly reclaimed Narta Lagoon, which occupies the 8 km-wide tract between the River Vjosë in the north and the coast of the Bay of Valona to the south.

The coastal belt is dominated by the Vjosë Delta which is presently the largest on the Albanian Coast. It has a symmetrical cusped form whose promontory acts as a divergent point for longshore drift. The overall delta form extends 20 km along the coast and progrades up to 8 km from the lineament which forms its inner margin. Between the deltas of the Seman and Vjosë several old meander belts can be recognized marking former routes to the coast of either one or, at times both of the two rivers. The River Seman has debouched farther south and the River Vjosë farther north. Within the cusped present-day Vjosë Delta truncation surfaces within the stacked beach ridges clearly indicate at least five phases of construction of symmetrical cusped deltas and their partial subsequent destruction by severe storm events. A major former mouth of the river is located 5 km south-east of the present mouth (Figure 3B). The southern lobe of the delta has recently experienced strong erosion and southwards removal of material, whilst deposition has continued to dominate on the northern flank.

### Bay of Valona—Gulf of Gjuhëzës

A small triangular area of Quaternary sediments infills the head of the Bay of Valona and contains evidence of a prograding series of beach ridges, cut through by small meandering rivers. This basin is probably fault-controlled with its southern edge continuing north-westwards as the northern flank of the prominent Cape Gjuhëzës. From here the coastline assumes the NW-SE alignment of the Ionian portion of

the Albanian coastline, which is cut into folded Mesozoic and Tertiary sedimentary rocks.

## COASTAL EVOLUTION—A DISCUSSION

### Late Pleistocene—Early Holocene

According to isostatic predictions made by LAMBECK and JOHNSTON (1995) relative sea level along the Albanian coastline was 3–4 m below the present level 6000 years ago, and 1–1.5 m below the present level 2000 years ago. It is possible, therefore, that the present Adriatic coastal geomorphology provides a record of coastal change that extends back at least 6000 years. Ten thousand years before that, at the maximum extent of the Weichselian glaciation which affected much of northern Europe and North America, the sea level reached a low stand some 120 m below today's level (FAIRBANKS, 1989). Rivers carrying sediment from the hinterland would have crossed a coastal plain up to some 100 km wide before reaching the sea much farther west than the present shoreline. During the latest part of the Pleistocene and the early Holocene, sea level rose rapidly, the rate rising perhaps to as much as 20–30 mm/yr at the peak. This was a period of major transgression when the shoreline would have migrated rapidly eastwards across the coastal plain. The distribution along the shoreline of sandy sediment delivered to the coastal waters by the contemporary rivers is likely to have become increasingly restricted, with any beach or deltaic deposits being ephemeral, destroyed by the transgression.

### Mid- to Late-Holocene

By about 6000 years BP, the sea would have reached many of the uplands which today form the landward limit of the coastal plain. The position of this palaeoshoreline is conspicuous in several parts of the Adriatic coastal zone. From this time onwards, relative sea level rise was relatively slow (0.4–0.9 mm/yr, LAMBECK and JOHNSTON, 1995) compared to the early Holocene and the input of sediment from the rivers rather than the rise in sea level would have begun to dominate the coastal morphodynamic regime. Seaward sedimentary progradation across the earlier Holocene transgressive surface is likely to have commenced at about this time, and continued through much of the late Holocene, largely by the accretion of successive beach ridges. This wave-dominated evolution of the coastal plain sediments appears to have been largely uninterrupted through most of the late Holocene. The preserved sedimentary record shows, however, a major hiatus, probably within the last 1000 years (though this event needs to be dated), when the formation of regular beach ridges which resulted from the cyclic construction and destruction and smoothing out of previous coastal features ceased and was replaced by a more chaotic regime of erosion and sedimentation along the coast including episodes of major and rapid deltaic progradation. It is of course possible that these diverse coastal landforms will themselves be eventually totally smoothed out by wave action some evidence for this is afforded by the recent evolution of several asymmetrical delta-spit complexes (comprising paired beach ridge and levée-crevasse-splay-tidal flat sedimentation). These forms are



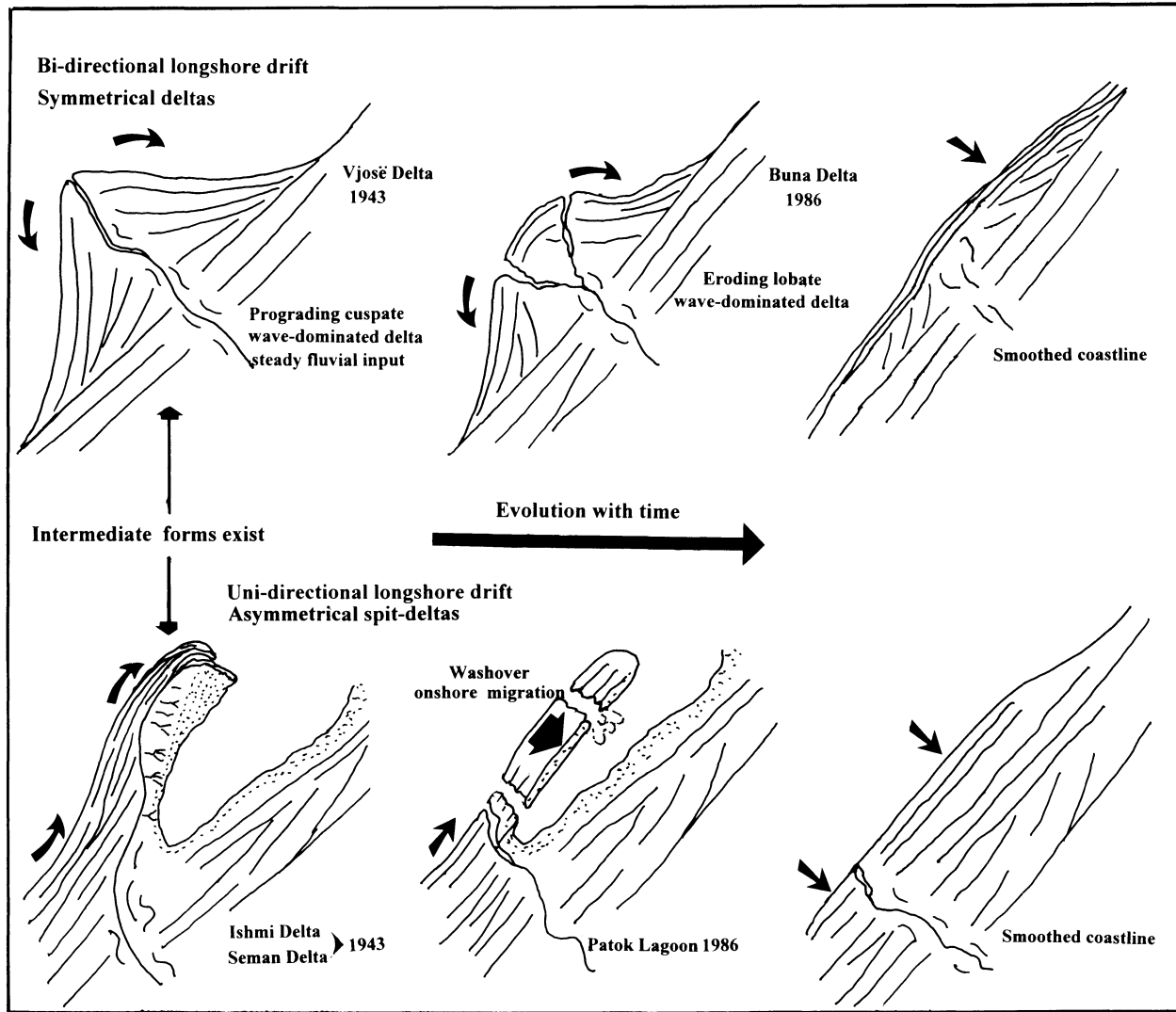


Figure 6. The evolution of wave-dominated delta types represented in Albania.

common in recent times along the present coastline, for example the 1943 aerial photographs reveal development of spit deltas at the mouths of the Mat, Ishmi and Seman rivers (Figures 2,3,4). These paired sedimentary architectures appear not to be preserved in the older deposits of the plain, which is dominated by tightly clustered sub-parallel beach ridges. This suggests that, on abandonment, these delta-spit forms become nearshore barriers, which are then reworked landwards by washover (Figure 6). This landward migration eventually results in the barrier being welded on to the coastline leaving no morphological trace of the pre-existing intervening lagoon. Hence it seems probable that many of the diverse coastal forms seen today have a low preservation potential and are likely to end up being reworked into more permanently accreted beach ridges. However, increased discharge from the region's rivers, largely as a result of deforestation and resulting accelerated erosion rates as man has

used the terrain more intensively in recent centuries, may have temporarily tilted the balance in favour of formation of deltas and spits, reflecting augmented fluvial power and sediment supply. With the damming of many of the rivers for water resources and power generation over the last decades it is probable that the significantly reduced sediment supply will now result in starvation at the coast and the return of overall wave-dominance leading to destruction of most of the presently diverse coastal morphology. This process is already well underway.

Another significant change in the coastal zone has occurred probably during the last 1000 years. The relationships described above at Karavasta Lagoon (Figure 5) and Narta Lagoon and the presence of a prominent lineament running between the two on their seaward edge (Figures 3, 5) indicate the presence of a graben, or half-graben structure about 5–8 km wide extending at least 60 km and showing what is es-

timated to be up to 5–10 m subsidence. The structure is aligned N–S, parallel to post-Neogene faults that bound bedrock ridges in the area. The concept of sediment compaction is not thought adequate to explain the observed features since subsidence has been differential within identical sandy beach ridge sediments in the affected zone. A neotectonic origin would, however, be plausible in view of the recorded seismic history of this part of Albania. This analysis of remote sensing and aerial photography will provide a framework for detailed Holocene studies in an attempt to more closely define the temporal evolution of the Albanian Adriatic coastal plain and to test out some of the concepts presented here.

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