

CHAPTER 99

COASTAL PROCESSES IN GUARDAMAR BAY (SPAIN)

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ABSTRACT

The surrounding coastal area of the Segura's River mouth has registered in the last years many erosion problems. It is one of the biggest coastal conjunct in the spanish mediterranean coast. A whole of studies was carried out to determine littoral and coastal processes in this area.

INTRODUCTION

As regard to the complete characterization of the conjunct coastal-littoral existing in Guardamar Bay some studies were realized some years ago to determine actuals and subactuals littoral processes in this area of the spanish mediterranean coast in order to the resolution of determined problems created around the Segura's River mouth.

Recently general occupation of the coastal area has generated deep disfunctions in many of them. Since that coast has experimented a deep revaluation due to tourism some works and actions have been got in general, which have not considered secondary effects that werw going to be done, producing erosive problems in a lot of coastal formations. Environmental degradation needs quick actions. However coastal arrangement requires exhaustive knowledge of coastal processes because its consideration lets have the reliability needed to undertake any action.

SITUATION. GEOMORPHOLOGIC

Guardamar Bay is placed in the great morphodynamic coastal unit which is between Santa Pola and Cervera Capes, in Alicante province. It constitute one of

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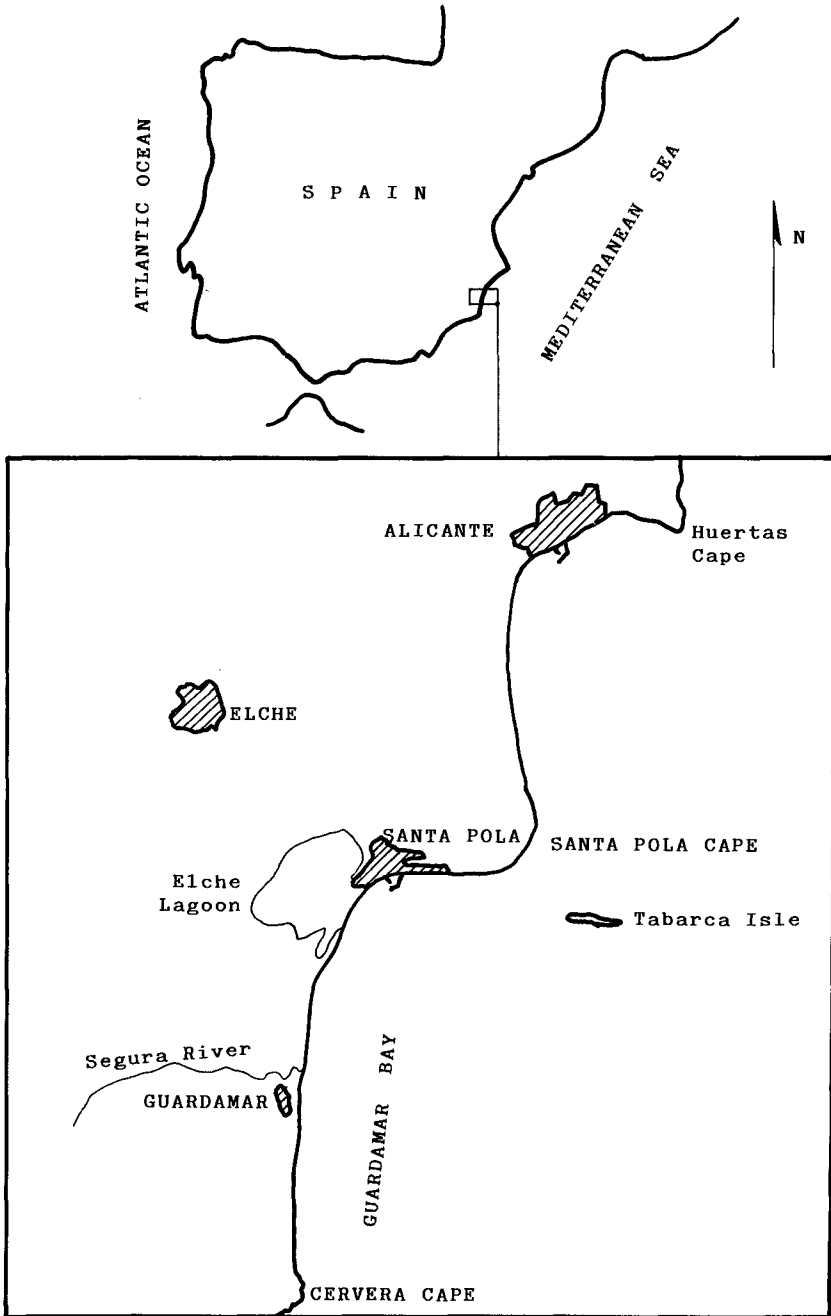


FIG. 1

the most relevant coastal formation in the spanish mediterranean (Fig.1). Behind it a very wide saltwater lagoonplace formed in Segura-Vinalopó depression known under the generic name of "Albufera de Elche" (Elche Lagoon). Uninterrumptly the sandy formation spread to Cervera Cape, orientated to the E. An important duner field expands in this stretch around Segura River mouth. Great dunes are uned up along determined directions due to problems derived from its mobility there were reforestations in the beginning of the century. Segura River mouth was situated artifitially to drain easily lowland areas. Recently two jetties were built for its channelization. Because building a shorter than the built at present time over the soth side, mouth was filled of sediments. In spite of all problems have continue and even have increase, this have been necessary to raise it again.

Sandy formation start in the south of Santa Pola harbour almost uninterrumpted to the Cervera Cape, although with important singularness (Vinalopó and Segura Rivers, and its mentioned above channelization, Punta Pilas, etc.). It is refered to a coastal front oriented to the E. Beaches are named in different ways because of historic and situation seasons, although the formation is unique and with maintained characteristics. Along then a whole of traditional buildings used as second dwelling are placed longitudinally and they have supposed to be a problem for transversal sediment movement. This is especially grave near Cervera Cape because it makes up a completely built-up and degraded area with increasing erosive problems.

FIELD INVESTIGATIONS AND ANALYSES DONE

The above mentioned fact induced development of studies to the determination of the present littoral dynamic from the previous determination of the directional frecuential, seasonal and anual wind wave regime and results about theoric determination of littoral transport from were also taken initially. This potential littoral transport was got also from directional, seasonal and anual points of view. Therefore it has been possible to stablish the dynamic conditions of the sandy coastal from and the correlate them to other results, taking into consideration waves propagation phenomenon, especially refered to wave refraction. Also it was possible to study eolian deposits in the area : Fig. 2 shows rose diagram obtained by the classification of dunes in transverses and longitudinals. That allows study the wind regime. Also was studied sedimentology of beach materials and bathymetric campaigns were done in all the area, investigating coast line evolution from aerial photographs from differents years. Fig. 3 and 4 show grainsize analyses of beach material proceeding from north area (Fig. 3a) and south of the Segura River mouth (Fig. 3b). Mineralogic results (Fig. 4) are of sand strand of the second place mentioned above.

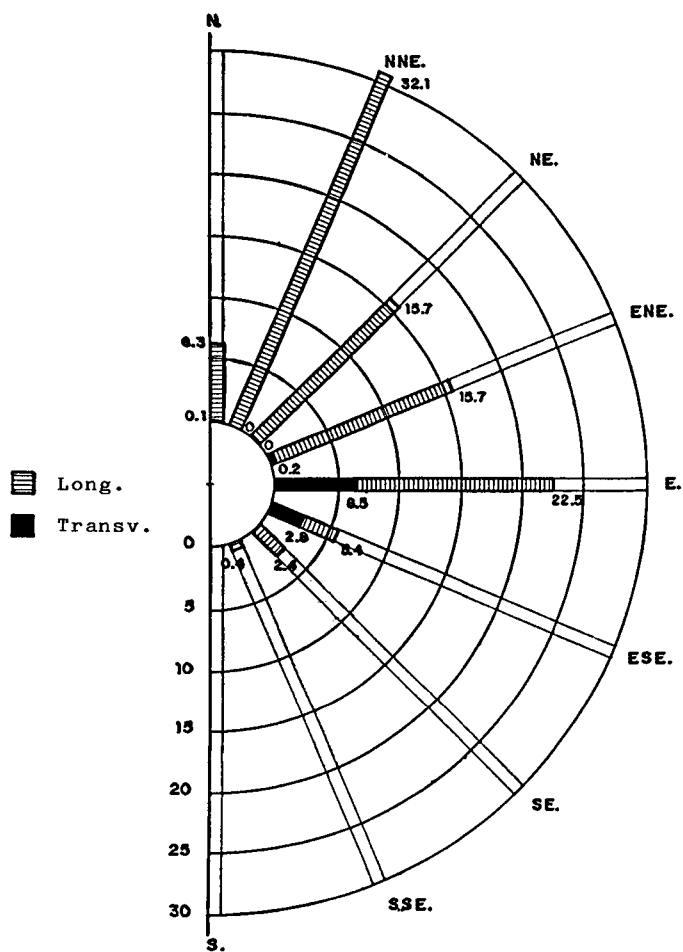


Fig. 2 Rose diagram of Guardamar dunes

GRAINSIZE ANALYSIS

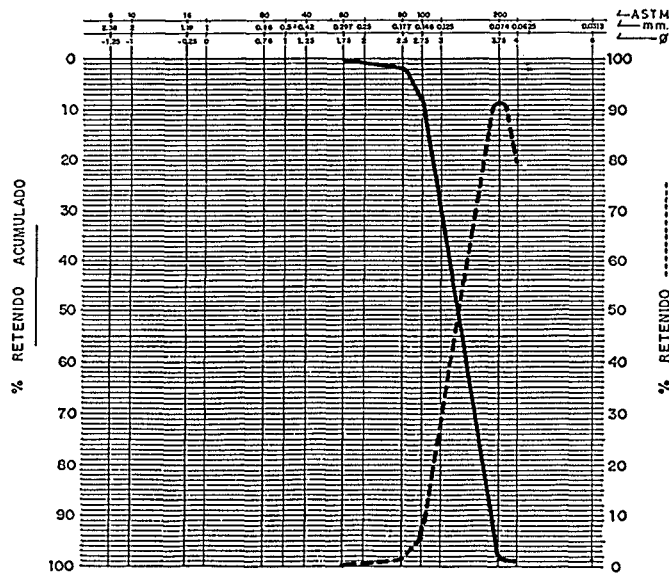


FIG. 3a

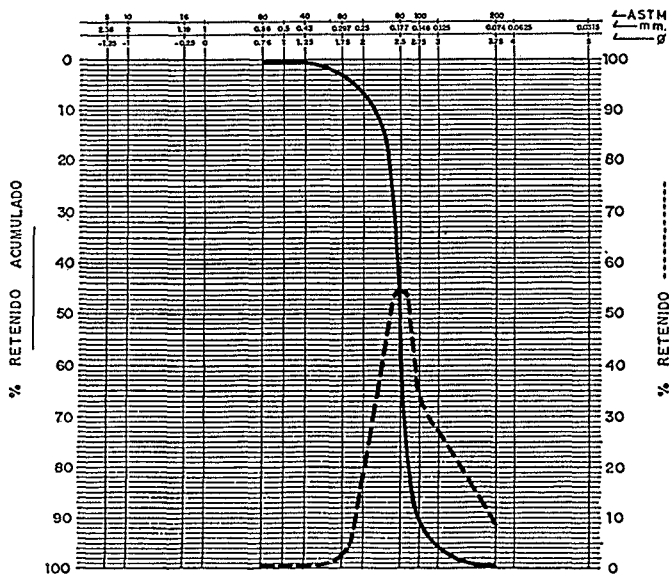


FIG. 3b

FRACCION RETENIDA TAMIZ ASTM N° 50			
TAMANO DE PARTICULA(mm): 0,30-0,42		%RETENIDO: 3,39	
FRACCION CARBONATADA : 57,6 %			
COMPOSICION MINERALOGICA EN % DE LA FRACCION NO CARBONATADA			
CUARZO BLANCO	85	TURMALINA	
CUARZO ROJO	8	EPIDOTA	
CUARZO AZUL	5	CIRCON	
CUARZO NEGRO	2	ANFIBOLES	
MIXTOS CUARZO		PIROXENOS	
MOSCOVITA		OXIDOS	
BIOTITA		OPACOS	
MORFOLOGIA CUARZO BLANCO EN%		GRADO DE REDONDEO	
REDOND. 6	POCO RED. 31	52	
MUY RED. 53	NO RED. 10		

FRACCION RETENIDA TAMIZ ASTM N° 80			
TAMANO DE PARTICULA(mm)0,18-0,30		%RETENIDO52,26	
FRACCION CARBONATADA : 53,4 %			
COMPOSICION MINERALOGICA EN % DE LA FRACCION NO CARBONATADA			
CUARZO BLANCO	84	TURMALINA	
CUARZO ROJO	10	EPIDOTA	
CUARZO AZUL	2	CIRCÓN	
CUARZO NEGRO	2	AMFIBOLES	*
MIXTOS CUARZO		PIROXENOS	
MOSCOVITA		OXIDOS	2
BIOTITA		OPACOS	
MORFOLOGIA CUARZO BLANCO EN%		GRADO DE REDONDEO	
REDOND. 11	POCO RED. 40	48	
MUY RED. 36	NO RED. 13		

FRACCION RETENIDA TAMIZ ASTM N° 100			
TAMANO DE PARTICULAmm0,15-0,18		%RETENIDO:32,31	
FRACCION CARBONATADA : 55,8 %			
COMPOSICION MINERALOGICA EN % DE LA FRACCION NO CARBONATADA			
CUARZO BLANCO	82	TURMALINA	1
CUARZO ROJO	13	EPIDOTA	
CUARZO AZUL	2	CIRCON	
CUARZO NEGRO		ANFIBOLES	1
MIXTOS CUARZO		PIROXENOS	
MOSCOVITA		OXIDOS	1
BIOTITA		OPACOS	
MORFOLOGIA CUARZO BLANCO EN%		GRADO DE REDONDEO	
REDOND. 13	POCO RED. 26	54	
MUY RED. 49	NO RED. 12		

FRACCION RETENIDA TAMIZ ASTM N° 200			
TAMANO DE PARTICULA(mm): 0,07-0,15		%RETENIDO: 11,95	
FRACCION CARBONATADA : 60 %			
COMPOSICION MINERALOGICA EN % DE LA FRACCION NO CARBONATADA			
CUARZO BLANCO	64	TURMALINA	ANG.yR. 8
CUARZO ROJO	16	EPIDOTA	
CUARZO AZUL	5	CIRCON	
CUARZO NEGRO	3	ANFIBOLES	1
MIXTOS CUARZO		PIROXENOS	
MOSCOVITA		OXIDOS	3
BIOTITA		OPACOS	
MORFOLOGIA CUARZO BLANCO EN%		GRADO DE REDONDEO	
REDOND. 33	POCO RED. 41	62	
MUY RED. 23	NO RED. 3		

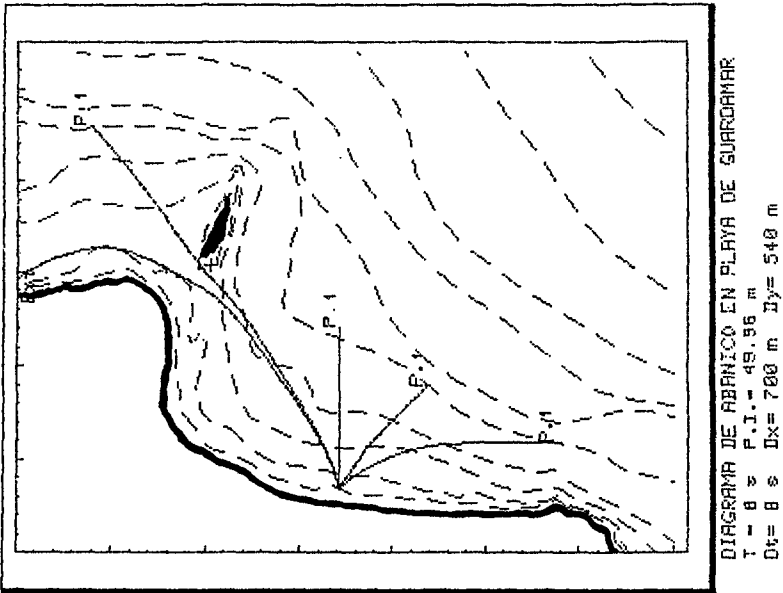
FIG. 4 Mineralogic Analysis

WAVE REFRACTION AND LITTORAL TRANSPORT RATES

In order to understand the effect and influence of wave refraction it has been established six point along the area to determine results. Wave periods and heights of 6, 8 and 10 sec., and 2, 6 and 8 m. were fixed respectively. A computer program was applied to find incident waves in deep water from S, SE, E and NE, and determine refraction coefficients and wave angle of incidence. Fig. 5 shows results in central point of the area.

Littoral transport rates were after calculated utilizing CERC methods :

$$Q = \sum \left[p_v \times \left\{ 3.59 \times 10^6 \sum_n \left[(H_o \times K_r)^{5/2} p_{H_V} \sin 2\alpha_b \right] \right\} \right]$$



Ortogonal	Punto	Coord. X (m)	Coord. Y (m)	Prof. (m)	Ang. con DX+ (DEG)
1	1	17070.0	3405.0	4.8	45.0
1	142	28773.0	5932.3	50.0	-7
2	1	17070.0	3405.0	4.9	58.0
2	87	21780.6	8945.6	50.0	45.3
3	1	17070.0	3405.0	4.8	66.0
3	100	17109.9	12074.7	50.0	90.8
4	1	17070.0	3405.0	4.8	99.0
4	274	3948.2	25006.1	50.0	130.5
5	1	17070.0	3405.0	4.8	99.5
5	300	44.7	14610.4	8.8	220.3

FIG. 5 , Wave refraction diagram result

In addition, for the three southeast points referred

it has been considered littoral transport induced by wave generation in Guardamar Bay.

Waves from E, SE and S reach the shoreline. Logically refraction is bigger in waves from SE and S. Waves from NE have a different way as a function of its characteristics : biggest reach the north area across seasurface between Santa Pola Cape and Tabarca Isle, but do not reach southeast areas, except its extreme. It is due to the island. So there is a large stretch that it is not reached by waves from NE, these who would induce bigger littoral transport rates. Smaller waves reach the half north area across channel and in the south arrive waves from the Guardamar Bay. Estimated littoral transport rates are shown in Table 1.

---TABLE 1---

POINT	Q_1	Q_2	$Q(m^3/y)$
1. PLAYA LISSA	-281.800	-	-281.800
2. PLAYA PINET	-35.300	-	-35.300
3. PLAYA PINET (*)	+168.900	-	+168.900
4. PLAYA PESQUERAS	+442.400	-	+442.400
5. PLAYA GUARDAMAR	+221.400	+29.500	+250.900
6. PLAYA LA MATA	+199.000	+35.400	+234.400
7. CABO CERVERA	+209.000	+35.000	+244.000

(*) Were considered two orientations of the shoreline
Sign + indicates direction to the south.

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