esa esrin

CORRELATION BETWEEN METEO-MARINE CONDITIONS AND SEDIMENTARY BALANCE OF THE BEACHES:

AIMS OF THE STUDY AND METHODOLOGICAL APPROACHES

A.OZER(1), G.FIERRO(2), A.RAMELLA(3), Y.CORNET(1), J-F.CREMER(1)
(1) Laboratoire de Geomorphologie et de Geologie du Quaternaire, Universite de Liege, -B- (2) Dipartimento di Scienze della Terra, Universit di Genova, -I- (3) Comune di Genova, Sezione Geologica

Med-ERS Workshop

ESRIN, Frascati
March 26-27, 1991

A Collection of Abstracts prepared by R. Frassetto, ISDGM-CNR, Venice, Italy.

Supervised by A. Amery, B. Greco
Approved by G. Calabresi - Earthnet Programme Office
Printed at ESRIN

CORRELATION BETWEEN METEO-MARINE CONDITIONS AND SEDIMENTARY BALANCE OF THE BEACHES:

AIMS OF THE STUDY AND METHODOLOGICAL APPROACHES

A.OZER(1), G.FIERRO(2), A.RAMELLA(3), Y.CORNET(1), J-F.CREMER(1)
(1) Laboratoire de Geomorphologie et de Geologie du Quaternaire, Universite de Liege, -B- (2) Dipartimento di Scienze della Terra, Universit di Genova, -I- (3) Comune di Genova, Sezione Geologica

The principal theme of our research is correlated with the various objectives of ERS-1's mission programmed by

ESA (European Space Agency). The 2 main points are: a better survey of the coastal dynamical processes with the SAR (Synthetic Aperture Radar) and the estimation of its specific interest in this domain.

Our research will be made according to 3 axes:

a) "in situ" studies,

b) application of present day provisional models,

c) results' comparison of a) and b) with satellite observations.

The "in situ" studies concern to the 4 following sites:

- Finale Ligure (I, Western Liguria),
- Lavagna (I, Eastern Liguria),
- Calvi (F, Northern Corsica),
- Sorso (I, Northern Sardinia).

Brief presentation of the sites

Finale Ligure - Italy

The shore of Finale Ligure can be considered as a "natural " physiographic unit, in which the anthropical interferences consist of a simple breakwater built in 1851. The construction divides the unit in two segments: the shore of "Marina" and the shore of "Pia". Both of them show a tendency to accretion.

Sedimentological extended studies confirm that the Pora torrent is the only supplier of sediment to the shore. The longshore downdrift, due to the wave motion, goes from west to east.

According to these sedimentological studies, the sea-bottom slope shows a constant increase from east to west at the bathymetry of 10 meters.

Chiavari Lavagna - Italy

This is a typical example of a collapsed area due to human interferences. A general erosional tendency on the shore has been observed since 1820 (CORTEMIGLIA et al., 1981). Before this time, the shore showed accretional evolution in relation with the sediment supply of the Entella river. This supply has disappeared with the construction of dams across the Entella.

The erosion was increased by the building of the tourist harbours in 1963-1965 and 1973-1975 placed on the right and on the left of the Entella estuary. These constructions obstructed coarser sediments from the Entella reaching the shore and interrupted the longshore transport.

Besides, rip currents carry away fine sediments. Construction of jetties, spilling and dredging of millions of m3 of sand has been necessary to combat this evolution.

Calvi - Corsica

The beach of Calvi essentially constitutes sand, dunes and fluviatil formations. The granite bed-rock only out-crops on the eastern side of the bay. The beach is pebbly on the eastern part.

Two streams flow into the bay: the Fiume Secco and the Figarella. At present, the beach is fed by two sources:

- ancient rework material contributions: erosion of the cliff cut by ancient alluviums of the Fiume Secco. Studies on the centile and the roundness have shown that it's an important source of sediments for the beach. (A.L. COHMAIRE), 1988).
- present day sediment contributions: the studies of sand texture, roundness and centile show that the Fiume Secco contribution is important. On the other hand, the Figarella does not supply coarse sediments (A. PISSART, unpublished).

The littoral drift goes from east to west. This is demonstrated a) as pebbles by the evolution of the centile and the roundness, and b) as sands by the decrease of the average diameter in the same direction. Presently, we can see an erosion of the beach. Studies of aerial photographs taken at intervals of a few years have shown a retirement from some sectors of the beach during the last 25 years. This erosion is from about 40 meters (A. OZER, 1988).

The intense growth of touristic appointments, the construction situated on the foredune and on the seaside disturb the protection role of the dunes and sedimentary balance of the beach. Dunes are also made fragile and destroyed by the numerous foothpaths and by the trampling of tourists.

Sorso - Sardinia

The beach of Sorso is situated on the eastern part of the golf of Asinara. It extends for 16 kilometres and is essentially sandy but irregularly covered with pebbles from local origin. With the analysis of centile, flattening and roundness, A. OZER (1976) has shown that:

-pebbles come from Rio Pedras de Fogu alluviums, the only source of sediments. Later they are transported by littoral drift.

-Transport is selective according to the granulometry and is oriented toward the west.

-In this direction, we can see an increase of flattening and roundness linked with the distance of the source.

The interannual variations of flattening and roundness lead us to consider these factors with care. These 4 sites must be completed by the following two for which little ground data is available:

-Thenia-Dellys (Northern Algeria),

-Strymon-Kavala (Greece-Thessalonica).

Previsional models

The previsional models used in this study will be:

-Waves previsional model (wave length and wave height) applied to the critical meteo

-marine conditions defined on the bases of the analysis of the climatological data.

-mobilisation models of sediments under the influence of waves and under the combined action of waves and steams.

"In situ" studies: actualization of "in situ" observations

Before the analysis of satellite data, an actualization of ground informations in the sites is important. A mission will be executed in the end of May with three principal pourposes:

a. collection of data near local authorities: bathymetric maps, aerial photographs, ondometric and currentometric records, climatological data (speed, frequency and duration of wind action);

b. from the analysis of chronological series of aerial photographs, a definition of critical axes will be made. According to these, bathymetric and topographic profiles will be realized;

c. local observations with sampling of sediments (petrographic and textural studies) will be made along the beach (zone of littoral drift).

Ground studies must be completed by one or several missions on the coast and oceanological cruises at the same time as the passage of ERS-1.

The purpose of these cruises is to obtain elements of comparison between "in situ" data and ATSR (Along Track Scanning Radiometer) and AMI (Active Microwave Instrumentation) "Wave".

The satellite data SAR, AMI "Wave", AMI "Wind" and ASTR will be dealt with by ERDAS System on PC compatible.

A scheme of the methodological approach is presented in the Appendix.

This research is part of the "Belgian Research Programme on remote sensing by satellite - Phase two" (Services of the Prime Minister - Science Policy Office). The scientific responsibility is assumed by its authors.

3 Types of approach (1, 2, 3)

3 Phenomenons considered ar different time and spacial scales (I, II, III)