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ABSTRACTS VOLUME

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sustainability* »

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Friday August 30

08:00-10:30

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1542 **Anthropic interference versus littoral dynamics: Aguda (Northern Portugal) breakwater, Holocene evolution and recent coastal erosion** - Maria ARAÚJO, Porto, PORTUGAL

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Anthropic interference versus littoral dynamics: Aguda (Northern Portugal) breakwater, Holocene evolution and recent coastal erosion

ARÁÚJO M.(1), MONGE SOARES A.(2), CUNHA P.P.(3), GOMES A.(1), VIEIRA M.(4)

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Northern Portuguese coast has a general trend of NNW-SSE from Silleiro Cape, in Galicia, till Espinho (ca 124km). This coastline has a Precambrian/Paleozoic bedrock, generally covered by modern sandy beaches and aeolian dunes. In some places, beach erosion allows us to see ancient marine and lagoon deposits (from last interglacial until the Holocene) upon the bedrock.

Aguda beach is located near Porto, 11km south of Douro river mouth, close to Espinho (southern part of the Iberian Massif littoral outcrop).

The construction of a detached breakwater, accomplished in Spring 2002 in order to help the artisanal fishing activity had several consequences:

1 – Accumulation of sand in the North of the breakwater and severe erosion to the South affecting "aristocratic" Granja beach.

2 – This erosion revealed interesting sedimentary sequences and archaeological remains.

3 - Authorities began to transport sand accumulated by the breakwater to feed the Granja beach. This transport was made over the beach sands and underlying sediments by 50 tones trucks, destroying the sedimentary and archaeological evidences.

Fortunately some stratigraphic/sedimentologic work had already been done. However, the scarcity and discontinuity of the deposits, together with man made disturbance made sediment correlation more difficult.

We had an initial TL dating 8.7 ka BP in a black lagoon sediment, ca 3-4 m above mean sea level. However a more recent C14 data indicates a younger age for the sediment: 2950-3460 cal BP. A piece of *Salix* collected from that sediment was dated 2960-3214 cal BP and pollen analysis suggests a fresh-water environment.

These data indicates the existence of a lagoon with no-direct influence from the sea until a very recent time and may be a key to understand relative sea level during Holocene.

As a general conclusion we would like to underline the consequences of man interventions in the coastline: revealing old deposits, and, in the other hand, destroying them.

The relief cartography in coastal areas: a contribution to the environmental planning of Bertioga, Sao Paulo State, Southeastern Brazil

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The coastal environmental systems are areas of high complexity, due to material and energy exchanges existing in the interaction processes between the sea and the continent. These areas play an important role in territorial dynamics of a considerable group of countries, which shows intense human activities in coastal environments. The city of Bertioga, located in the coast of São Paulo state, southeastern of Brazil, it is in this context and shows a recent urban expansion, mainly related to the touristic activities. This phenomenon brought changes to the coastal environmental systems of Bertioga, pointing out the importance of an appropriated environmental planning of the area. In this context, this research aimed to analyze the relief morphometry of Bertioga, quantifying the attributes of the relief to understand the morphological structure and the fragilities of the area. The analysis was made elaborating three morphometric maps: Slope, Vertical and Horizontal Dissection and Geomorphology. Bertioga is comprised by three geomorphological compartments: Atlantic Plateau, Serra do Mar and Coastal Plain. In the Atlantic Plateau region the relief forms have a large variation, requiring a complex management of the land use. The Serra do Mar region is a mountain range with an abrupt relief with high slope values. This area is protected by a state park and the urban activities are not allowed. The Coastal Plain is a flat surface formed by sea and continent sediments. In this area the flat relief contributes to the urban occupation, but the environmental characteristics are not appropriated to the intense activity, because the soil sediments are not consolidated and there are mangroves and sandbanks remaining. Finally, this research contributed to increase the understanding of the land use dynamics and the fragilities of environmental system in Bertioga, and can be combined with other environmental studies to contribute to the environmental planning of the coastal regions.

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Highly-resolution quantitative reconstruction of detritic quaternary cliffs retreat based on anatomical changes in exposed roots (Porquerolles island, France)

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Coastal monitoring and medium-term shoreline dynamics in Brittany (France)

Highly-resolution quantitative reconstruction of detritic quaternary cliffs retreat based on anatomical changes in exposed roots (Porquerolles island, France)

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The coasts of the western Mediterranean basin are interesting to quantify global warming effects as marine level rising or storms actions. Three types of coasts can be distinguished: cliffs, sandy beaches and rocky coasts with alternatively capes and pocket beaches. These pocket beaches are often associated with small detritic cliffs (<10 m) shaped by sea in quaternary slope sediments. The study concerns these small cliffs in Porquerolles (France), a forested island weakly impacted by coastal development and sedimentary inputs. In this context, the recent retreat of these cliffs, revealed by the increasing of numerous exposed roots and border pines falls for two decades, could be related to more frequent strong storms and sea level rising.

The first aim of this study is to quantify the contribution of the cliffs in the sedimentary balance of pocket beaches, which are isolated geomorphic units. The second is methodological: we use a dendrogeomorphic approach based on exposed roots of *Pinus halepensis* to quantify cliff retreat. A total of 58 exposed root sections were sampled and anatomical variations in annual growth rings resulting from denudation have been analyzed.

On average, the roots were 25 years old and have been exposed since 15 years. At the plot scale, average medium-term erosion rates range between 4.5 and 34.5 mm yr⁻¹ (average: 20 mm yr⁻¹). The dropped debris volumes vary between 10 and 50 m³ yr⁻¹. These values are significantly lower than those obtained for the Mediterranean beaches (60 cm yr⁻¹, 200 m³ yr⁻¹), but higher than cliff erosion rates. This contribution demonstrates that dendrogeomorphic analyses of roots have a significant potential for the quantification of cliff retreat and beach reloading in areas where past measurements are lacking. Detritic cliffs closed to pocket beaches seem sensitive spots to record strong storms effects and marine level rising, if the increase of these phenomena continues.

S. Paio (Labruge, Vila do Conde, Northern Portugal). A protected area and its geomorphologic value

ARAÚJO M., GOMES A.

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Northern Portuguese coast has a general trend of NNW-SSE from Bayonne till Espinho. This is a generally low coastline. Sandy beaches and dunes often cover Precambrian/Paleozoic bedrock. However, in some rare points, we have rocky cliffs. S. Paio is one of the highest points in this coastline.

An Iron Age settlement was discovered in the top of a 14 m amsl platform. Archaeologist calls it a "castro". At Galicia (northern Spain), this "castros" appear by the sea. But in Portugal this is the only one upon the coastline, and it was jugged as quite unique by archaeologists. In the eighties this place had a difficult road access. The road improvement brought many visitors seduced by the scenic beauty of the place and also the danger of destructing archeological remains. Fortunately the city council decided to excavate the site and to protect it. It was important to make the city council archaeology cabinet understand that the scenic interest of the area was a consequence of geological and geomorphologic singularities and that all this valences together should be an important asset to local people economic sustainability and welfare:

- 1 – Imposing, rectilinear cliffs, all in NNE-SSW direction.
- 2 – Preserved rocky benches bearing marine deposits at several altitudes.
- 3 – A spectacular notch carved in fresh granite hanging over a vertical cliff, 9m amsl.
- 4 – A sequence of deposits (marine, probably Eemien, solifluidal, aeolian – TL dated 84k years).

The singularity of this staircase like topography, with hanging benches, deposits and notches suggests a recent uplift. A thrust fault affecting a quaternary deposit is found at a small distance (5km). This suggests that neotectonics are a possibility, improving the scientific value of the site.

The centre is now ready for visitors and it shows geologic, geomorphologic, archaeological, ethnographic and biologic information in a simple and interactive way.

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