

Integrated analysis of Mediterranean urban beaches in relation to climate, geoenvironmental and anthropogenic changes during the Late Quaternary

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Around 90% of the beaches in the world are in erosion, 5% is considered stable on average and only the remaining 5% is in progradation. The speed of retreat varies greatly from one area to another from a few meters to over 15 m a year, especially in Mediterranean-type morphoclimatic systems. The beaches represent a natural buffer between the marine environment and the mainland, in which there are sometimes dune ridges, rivers, lagoons, and coastal environments as well as urban centers.

There are many factors contributing to the degradation of the Quaternary lagoon-dune-beach systems and among these also the poor management of dam-river-coast systems. However, amongst the various types of beach morphotypes, sandy and/or pebbly urban beaches certainly represent a stimulating and new research topic. Actually, they show unique geomorphological, morphosedimentary, geonaturalistic, historical and tourist-recreational aspects. These beaches are also excellent training gymnasium for observing seasonal or daily morphological and sedimentological changes in relation to changing weather conditions and climate trends. In some cities, urban beaches developed where before there was an artificial seafront only after the construction of other maritime works, such as ports, barriers, groins, while other beaches disappeared all, at the same boundary conditions, for reasons yet to ascertain.

In the light of these elements, it is unquestionable that in the coming years these particular transitional environments will be the subject of various national and international research programs, as indicated by the latest IPCC report on the potential effects of climate change on islands and cities considering the increase in flash floods and sea storms.

Proposal for a PhD position

In recent years a great interest of researchers and local authorities in understanding the geomorphic processes of the beaches is evident.

Indeed, it has been scientifically ascertained that there is a morphological control over the dispersion in the sea of fluvial-marine sediments which contribute to the formation of depositional morphologies, such as dunes and submerged bars, or erosional ones, such as deflation forms and underwater incisions.

These sediments, mostly fine, could be associated with allochthonous materials, such as clay debris, bioclasts of alien species, microplastics, pollutants (PAHs, PCBs, heavy metals, rare earth elements, etc.), or they could be evacuated offshore and not to return more to the coastal dynamics with loss of large sediment volumes and consequently also economic deficit for the tertiary sector.

Therefore, it is of fundamental importance to know the evolutionary dynamics of the beaches, in particular, the urban ones both for the emerged and the submerged sector, in which such allochthonous elements accumulate in certain areas, also taking into account their important geonaturalistic and tourist-recreational value. Furthermore, there is also a geomorphological interest in how these singular beaches, which are formed even close to or between artificial barriers or within ports, have not yet been well studied and classified.

The study would be carried out by means of targeted geomorphological and photographic surveys as well as field sediment sampling, but practically at almost zero cost using the local, national and international satellite images, cartographic meteo-marine databases, with geothematic map processing using a GIS.

Therefore, the activation of specific research on this new topic would allow filling most of these gaps and at the same time to identify the best actions to mitigate the erosion and pollution phenomena, in accordance with the European Community recommendations on sustainability, resilience, adaptivity and recently also on urban security and health of those geo-environments and ecosystems, high or less natural, threatened by degradation or disappearance.