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LONG TERM, RECENT AND NEAR-FUTURE SEA-LEVEL EVOLUTION (**)

ABSTRACT: PIRAZZOLI P.A., *Long term, recent and near-future sea-level evolution*. (IT ISSN 0391-9838, 2009).

Past sea-level positions deduced from field observations are generally only of local value, while estimations of global (eustatic) sea-level changes can be obtained with assumptions only in a very few cases, or attempted with limited accuracy by using proxy data. Since 1993, satellite altimetry is providing global sea-level estimations every ten days, showing that coastal sea-level trends may differ from trends offshore. Evidence of an acceleration in the global sea-level rise since the last century has recently been provided by both satellites and tide-gauges, and confirmed by oceanographic and glaciological studies.

KEY WORDS: Global sea level, Relative sea level, Tide gauge, Satellite altimetry.

INTRODUCTION

A close relationship exists between the present sea level, the vertical biological zonation, and some geomorphological features that may result from erosion or sedimentation processes. Wave erosion may produce recognizable features and can be especially rapid on soft rocks. Bioerosion is active especially on limestone rocks, where it produces typical intertidal notches. Sedimentation processes near sea level may also produce recognizable features, e.g. favour the development of tidal flats and tidal marshes in estuaries or lagoons. Storm deposits may produce typical beach ridges that testify to wave height at high tide. On exposed coasts, strong wave action can be a very effective geomorphological tool, creating spectacular abrasion platforms.

When working in the field, it is frequent to observe sea-level marks that cannot be associated with the present sea-level position. Elevated marine platforms often indicate a former altitude where wave action was active. Marine terraces can be spectacular geomorphological features and often contain stratigraphic evidence that makes it possible to date former shorelines. Biological sea-level indicators still preserved in growth position are often of paramount importance to specify and date former sea-level positions. A good knowledge of the marine features related to the present sea level is therefore essential to identify and interpret marks related to former sea levels (Pirazzoli, 2007). However, if local identification and measurement of former sea levels can be essential to demonstrate and date relative sea-level changes at a certain site, very little information is generally available for an estimation of the global sea level elevation at the same time.

In this paper it will be shown that the contribution of data from other disciplines, like oceanography, geophysical modelling and satellite altimetry, can be essential to reach conclusions on a global scale that would not have been possible using only sparse geomorphological, biological or tide-gauge observations.

LONG-TERM SEA-LEVEL CHANGES

Climate change, which modifies the quantity of ocean water, has been during the Quaternary period the main cause of sea-level change on a global and regional scale. The development of an ice sheet has not only deprived the oceans of important quantities of water (glacio-eustasy) but has also produced, with its load, subsidence beneath the ice mass (glacio-isostasy). In this case deeper earth material will have to flow away and build a peripheral bulge around the ice margin. When the ice sheet melts, unloading occurs, resulting in glacio-isostatic uplift beneath the melted ice. The marginal peripheral rim will consequently tend to subside and move towards the centre of the vanishing load. In addition, the melt water will produce a load on the ocean floor, which will tend to subside (hydro-isostasy).

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