Numerical Modeling of Submerged Groin Fields

Pier Luigi Aminti, Carlo Brandini

Dipartimento di Ingegneria Civile, Facoltà di Ingegneria, Firenze, Italia
Tel + 39-55-4796224 Fax +39-55-495333 e-mail: aminti@dicea.unifi.it

Abstract

Groins are widely used all over the world as effective structures for beach protection against erosion. In Italy there is an increasing attention to submerged groins because of their reduced environmental impact. A condition for the good performance of these structures is a limited tide excursion, as it is verified in the Mediterranean Sea. Design criteria to define the optimum groins length, spacing and submergence are mainly based on empirical relationships, usually obtained from laboratory investigations or field practice. Mathematical models can help to understand the interaction of these structures with currents and sediment transport. This paper reports the main results obtained for various geometrical layouts using a numerical model solving the 2DH depth integrated flow equations for the description of the nearshore currents field around the structures. The calculated wave field takes account of the combined effects of refraction, reflection and diffraction. The sediment transport calculations as well as the morphological short-term variations around the structures are then carried out. A parameter giving the mean velocity reduction with respect to the unprotected situation is shown to be a good one to assess the efficiency of each layout. As a result it is shown how the geometric parameters of a submerged groins system (submergence and length of groins, distance among them) influence the good performance of each protection scheme.