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Warm-up Model Run Duration Mike21-BW Numerical Sea Wave Diffraction

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Abstract

Wave diffraction is a sea phenomenon occurs around breakwaters and islands that is an important factor in designing a suitable port basin. The portion of the Wave passing the end of the barrier will have a lateral transfer of wave energy along the wave crest. The diffracted wave crests in the lee of the border will form approximately concentric circular arcs with the wave height decreasing exponentially along the crests that we consider it as “Diffraction”. By the means of powerful Softwares such as “DHI Mike21-BW Model” (based on Boussinesq Wave theory) that would easily be described.

Warm up period is a one of basic Mike21-BW Module items that should be considered thoughtfully in each model, either the wave generated randomly or regularly. To evaluate the changes on warm-up period on these models in coastal regions, using a verified model for manipulate the value of this parameter seems to be necessary. The MIKE user manual considered a variant for this parameter that is 5T to 10T, which make this parameter T related function.

In this paper by using MIKE21-BW model, the affection of the warm-up period change on the diffraction will be discussed.

It is concluded by changing the warm-up periodin model characteristics mentioned in, the changes on the Diffraction Coefficient (Cd) is not tangible, but may have much more affection such as wave velocity in different model nodes.

Keywords: Diffraction, Sensitive Analysis, Warm-up Period, MIKE 21, Boussinesq Wave Theory, Numerical Model.

1. INTRODUCTION

Diffraction arises because of the way in which waves propagate; this is described by the Huygens–Fresnel principle. The propagation of a wave can be visualized by considering every point on a wave front as a point source for a secondary radial wave. The subsequent propagation and addition of all these radial waves form the new wave front. When waves are added together, their sum is determined by the relative phases as well as the amplitudes of the individual waves, an effect which is often known as wave interference. The summed amplitude of the waves can have any value between zero and the sum of the individual amplitudes. Hence, diffraction patterns usually have a series of maxima and minima.

The form of a diffraction pattern can be determined from the sum of the phases and amplitudes of the Huygens wavelets at each point in space. There are various analytical models which can be used to do this including the Fraunhofer diffraction equation for the far field and the Fresnel Diffraction equation for the near field. Most configurations cannot be solved analytically, but can yield numerical solutions through finite element and boundary element methods.

In fluid dynamics, the Boussinesq approximation for water waves is an approximation valid for weakly non-linear and fairly long waves. The approximation is named after Joseph Boussinesq, who first derived them in response to the observation by John Scott Russell of the wave of translation (also known as solitary wave or soliton). The 1872 paper of Boussinesq introduces the equations now known as the Boussinesq equations.

The Boussinesq approximation for water waves takes into account the vertical structure of the horizontal and vertical flow velocity. This results in non-linearpartial differential equations, called Boussinesq-type equations, which incorporate frequency dispersion (as opposite to the shallow water equations, which are not frequency-dispersive). In coastal engineering, Boussinesq-type equations are frequently used in computer models for the simulation of water waves in shallowseas and harbors.