

PREDICTION AND DYNAMICS OF RIPPLES AND THE BOTTOM BOUNDARY LAYER UNDER COMBINED WAVE AND CURRENT FLOW IN THE FIELD

Padilla-Hernández Roberto

Hydraulics Laboratory, KU Leuven, Kasteelpark Arenberg 40, B-3001 Heverlee, Belgium

Previously published investigations on the wave bottom boundary layer and ripple geometry are combined to derive a new ripple predictor for flows under waves or under combined wave-current flows. The ripple predictor of Nielsen (1981) for waves only was modified in order to use it in combined flows. The modified model now uses the effective Shields parameter total roughness-related in contrast to the most commonly used Shields parameter grain roughness-related. To predict the ripple geometry the proposed model uses the results of the Christoffersen and Jonsson (1985) model, which describes the dynamics of the wave-current bottom boundary layer (WCBBL). The ripple predictor and the WCBBL model take into account the bedforms already existing to predict the new ripple and flow field. The predicted ripple and WCBBL parameters fits very well the selected measurements of Li and Amos (1998) for ripple geometry and observations on saltation/suspension and sheet flow. The ripple predictor proposed models the ripple field in the break-off range and when large wave ripples were observed in the field, after the peak of the storms, without explicit assumptions. The apparent roughness length modelled by the WCBBL model is similar to measurements, made by other researchers in laboratories.