Mixing of stratified flow around bridge piers in steady current

This paper presents the results of an experimental and numerical investigation of the mixing of stratified flow around bridge pier structures. In this study, which was carried out in connection with the Fehmarnbelt Fixed Link environmental impact assessment, the mixing processes of two-layer stratification was studied in which the lower level had a higher salinity than the upper layer. The physical experiments investigated two different pier designs. A general study was made regarding forces on the piers in which the effect of the current angle relative to the structure was also included. This was done in uniform flow with no stratification. Following this, a study was performed in which the mixing efficiency was investigated in the case of a stratified flow. The numerical investigations supplemented the findings of the physical experiments and gave information on scale effects, drag coefficients for low velocities, and natural background mixing. The present study provided a general understanding and knowledge about the mixing processes around bridge piers as well as a direct measure of the impact of the proposed designs on the natural stratification.

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