

EEMS Test Case Model Description

TC_Pasche&Rouv _Rigid_Vegetation

1 Overview

This model replicates the test cases presented in Pasche and Rouv  [3], which examine vegetation–flow interactions in laboratory flumes described in the journal article by Fischer-Antze et al. [2], *3D Numerical Modelling of Open-Channel Flow with Submerged Vegetation*. The objective is to use EFDC+ Explorer (EE) and EFDC+ to simulate these vegetation–flow interactions and to validate model performance against measured velocity data from three experimental configurations. Through this comparison, the study aims to assess how effectively EFDC+ represents the influence of rigid submerged vegetation on open-channel flow dynamics.

2 Demonstration Feature

This test case demonstrates the rigid vegetation capability within EFDC+’s Hydrodynamics module, specifically its ability to simulate the effect of vegetative roughness on the lateral velocity distribution across an open channel cross-section. Vegetation in open channels introduces additional flow resistance, creates complex velocity gradients between vegetated and non-vegetated zones, and significantly alters the overall flow structure.

By replicating the three Pasche and Rouv  [3] flume experiments (P222, P224, and P225), this test case illustrates how EFDC+ handles submerged vegetation in open channels and how well the model reproduces the measured lateral velocity profiles across the channel width under different vegetation and floodplain configurations. This is particularly valuable for users working on river restoration, floodplain management, or any application involving vegetated watercourses.

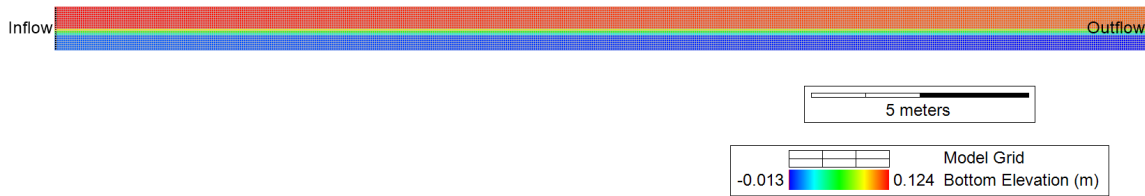
The governing equations implemented in EFDC+ are detailed in the [EFDC+ Theory Document \[1\]](#).

3 Model Description

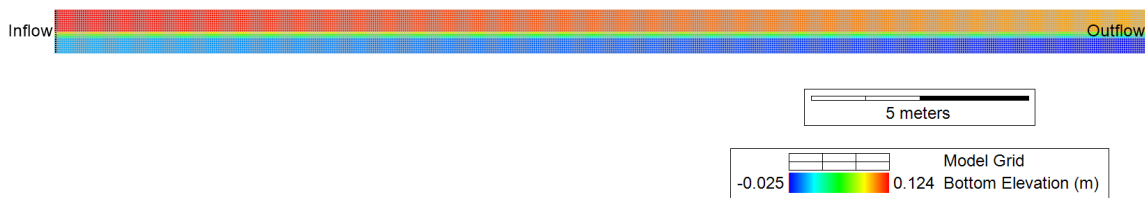
The model configuration is summarized in Table 1. The model domain, shown in Figure 1, consists of 10,200 horizontal grid cells representing the flume geometry used in the Pasche and Rouv  [3] experiments, with sufficient resolution to capture the lateral velocity gradients along the main channel. The vegetated floodplain zones are defined as shown in Figure 2 for all testing scenarios. In this study, only the Hydrodynamics module is activated.

Table 1 Model configuration summary

Dimensions	Horizontal cells	Vertical cells	Activated modules
2D	10,200 cells	1 layer	Hydrodynamics



(a) P222 and P225



(b) P224

Figure 1 Model domain and bottom elevation of the three models

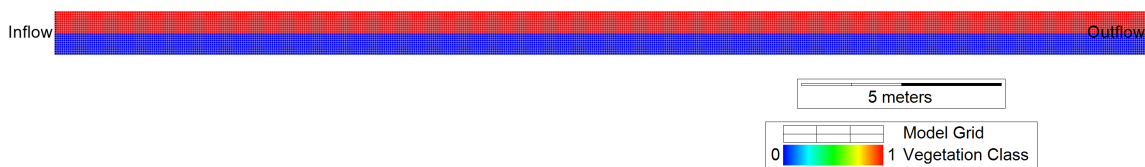


Figure 2 Model domain and vegetation classes configured for all three models

4 Model Results

Figures 3, 4, and 5 present direct comparisons of modeled and experimental velocity distributions across the channel width for experiments P222, P224, and P225, respectively. The experimental values are taken from Pasche and Rouvé [3]. The model results demonstrate good agreement between the EFDC+ simulated lateral velocity profiles and the experimental data across all three flume configurations, confirming EFDC+'s ability to accurately reproduce the influence of rigid vegetation on open-channel flow.

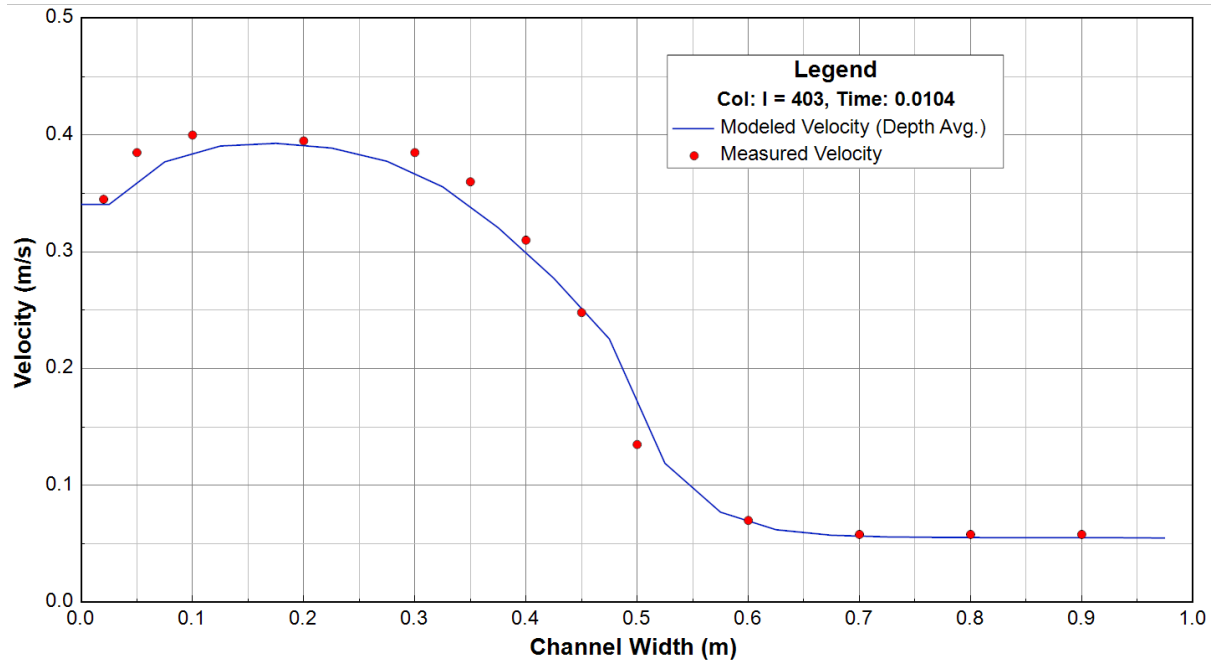


Figure 3 Comparison of P222 experimental velocities with depth-averaged model velocities at the cross-section located at cell I = 403

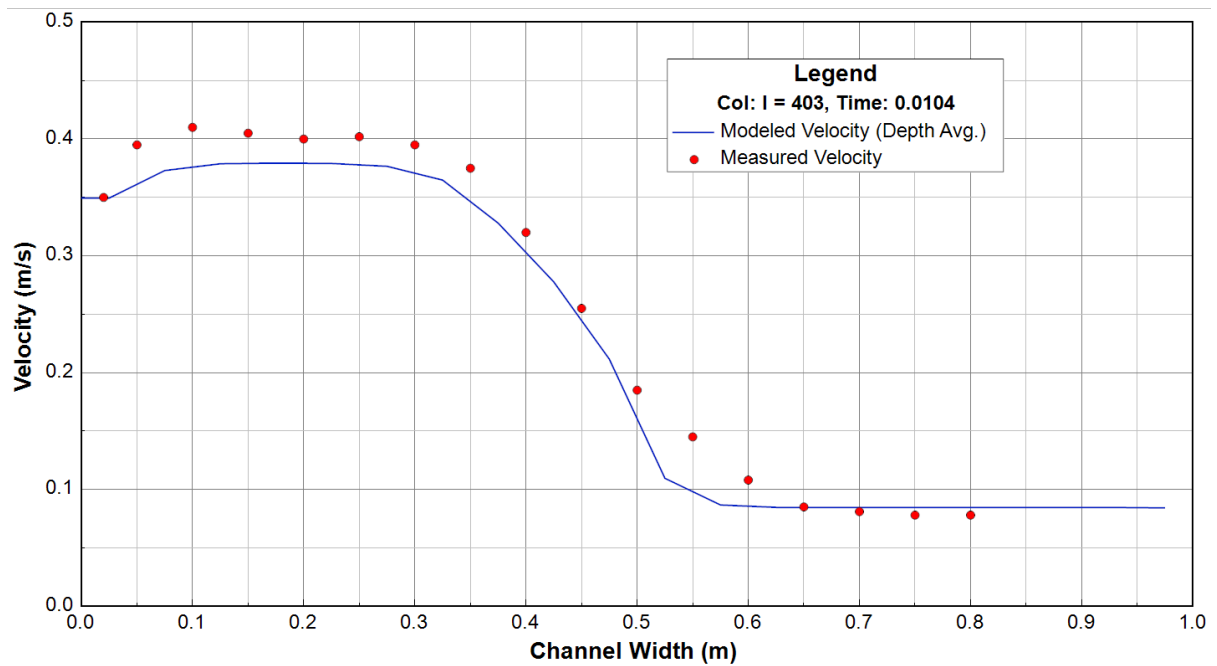


Figure 4 Comparison of P224 experimental velocities with depth-averaged model velocities at the cross-section located at cell I = 403

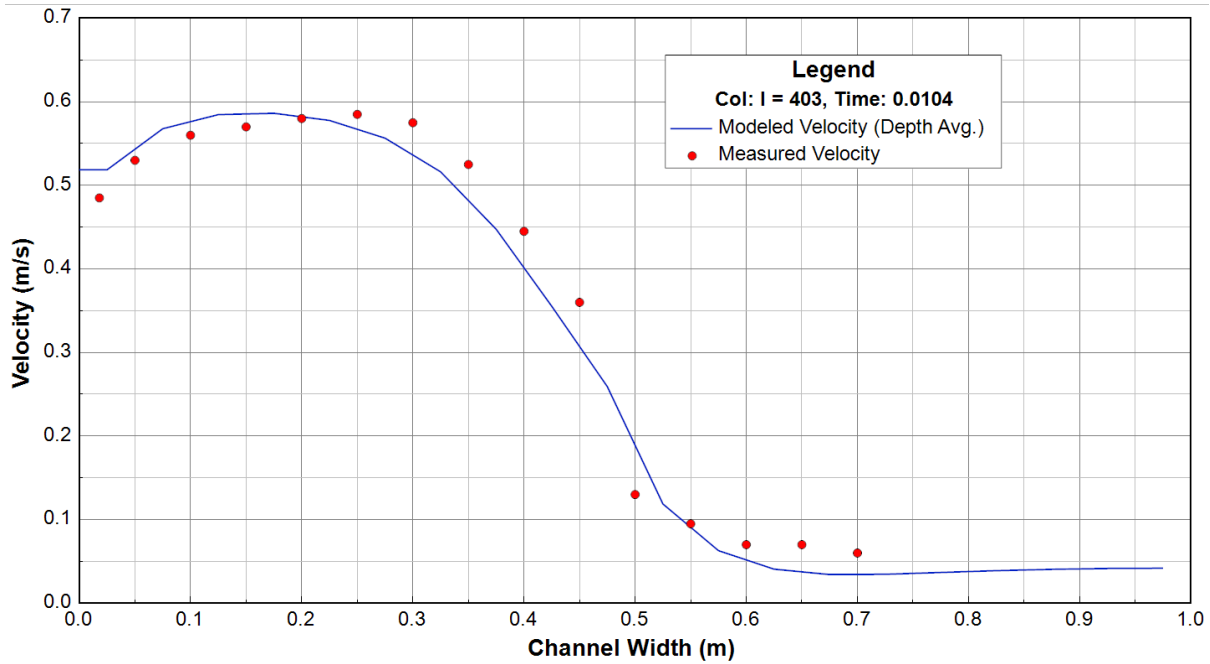


Figure 5 Comparison of P225 experimental velocities with depth-averaged model velocities at the cross-section located at cell I = 403

References

- [1] DSI LLC (2024). *EFDC+ Theory: Version 12*. DSI LLC, Edmonds, WA, USA. Accessed: 2026-04-06.
- [2] Fischer-Antze, T., Stoesser, T., Bates, P., and Olsen, N. (2001). 3d numerical modelling of open-channel flow with submerged vegetation. *Journal of Hydraulic Research*, 39(3):303–310.
- [3] Pasche, E. and Rouvé, G. (1985). Overbank flow with vegetatively roughened flood plains. *Journal of Hydraulic Engineering*, 111(9):1262–1278.

Disclaimer: This model is provided to demonstrate that EFDC+ Explorer and EFDC+ can be used to better understand how to build this kind of model. The model is running as expected; however, it should not be considered final, as it can be modified and refined to obtain improved results.