This directory contains the 1,000 cases of SRH-2D simulations for flow partitioning in open channels partially blocked by porous structures. This document describes the steps to prepare the mesh and cases, run the simulations, and postprocess the data.

1. Install the “pyHMT2D” python package if it has not been installed. It is used in this work extensively.
2. Preparation of base mesh:
   1. The base mesh is generated first by Gmsh. In the subdirectory “prepare\_mesh”, the file “LWD\_in\_channel.geo” is the input file for Gmsh. A 2D mesh “LWD\_in\_channel.msh” is then generated. The mesh has to be saved as “Version 2 ASCII” format (In Gmsh, using “File”->”Export”, choose “Save as type: Mesh – Gmsh MSH (\*.msh)”)
3. Preparation of base case: All the 1,000 cases are based on the same template called “case\_base”.
   1. From “prepare\_mesh” directory, copy the Gmsh mesh file “LWD\_in\_channel. msh” to “case\_base”.
   2. Inside “case\_base” is the template case for SRH-2D. Notice there are several main SRH-2D input files:
      1. “LWD\_case.srhhydro”: the main control file for SRH-2D. This is one of the two files that need to be prepared manually (others will be created by the Python script). This file contains information such as time, mesh file, material file, monitoring points, etc.
      2. “LWD\_case.srhmpoint”: monitoring points file for SRH-2D (needs to be prepared manually).
      3. Other files: “LWD\_case.srhgeom” is the SRH-2D mesh file (here it will be generated by pyHMT2D in the Python script); “LWD\_case.srhmat” is the SRH-2D material file for Manning’s n zone (only one zone is used in this case; generated by the Python script).
4. Run all cases using the script “run\_all\_cases.py”, which utilizes pyHMT2D to do preprocessing, control the runs of SRH-2D, and postprocessing. Some of the functions have been grouped in to the “LWD\_module.py” file as a Python module. A few things to note:
   1. The script does the following:
      1. Generate the parameter combinations (Fr, beta, Cd) for the 1,000 cases.
      2. For each case, copy the “case\_base” and the modify the case files to set the parameters, convert the “LWD\_in\_channel. msh” file to SRH-2D mesh format, and preprocess the SRH-2D cases.
      3. Run the cases.
      4. Postprocess the cases and collect the results. All results are stored in the directory “results”.
   2. The runs of SRH-2D can be performed in serial or in parallel (need to comment/uncomment the corresponding parts of the script). For parallel runs, the number of processors to use is a parameter on the command line for the script.