iRIC Software

Changing River Science

FaSTMECH Tutorial 6

Contents

FaSTMECH Tutorial 6 – Evolution of Point Bars during Time-Dependent Discharge

This tutorial introduces variable discharge model runs. Using the simple meandering channel created in Tutorial 5 you will explore the effect of three different hydrographs (Figure 1), each using the same total volume of water, on point bar evolution. In this tutorial you will perform the following steps:

Tutorial 6 Steps:

1. Save the project file created in Tutorial 5 into a new folder using the Save As command.
2. Import stage-discharge rating curve and two time series of discharge.
3. Create three time-dependent solutions using variable discharge time series, a stage-discharge rating curve, and the sediment-transport model extension.
4. Observe the effect of time-varying discharge on simulated channel evolution and development of point bars.

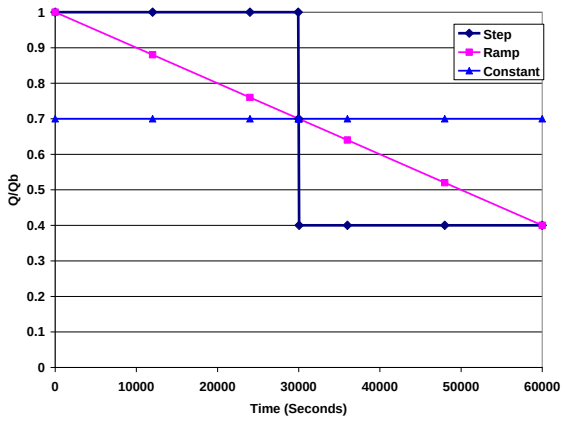


Figure 1. The three hydrographs used in Tutorial 6.

Run channel evolution simulations using three different hydrographs

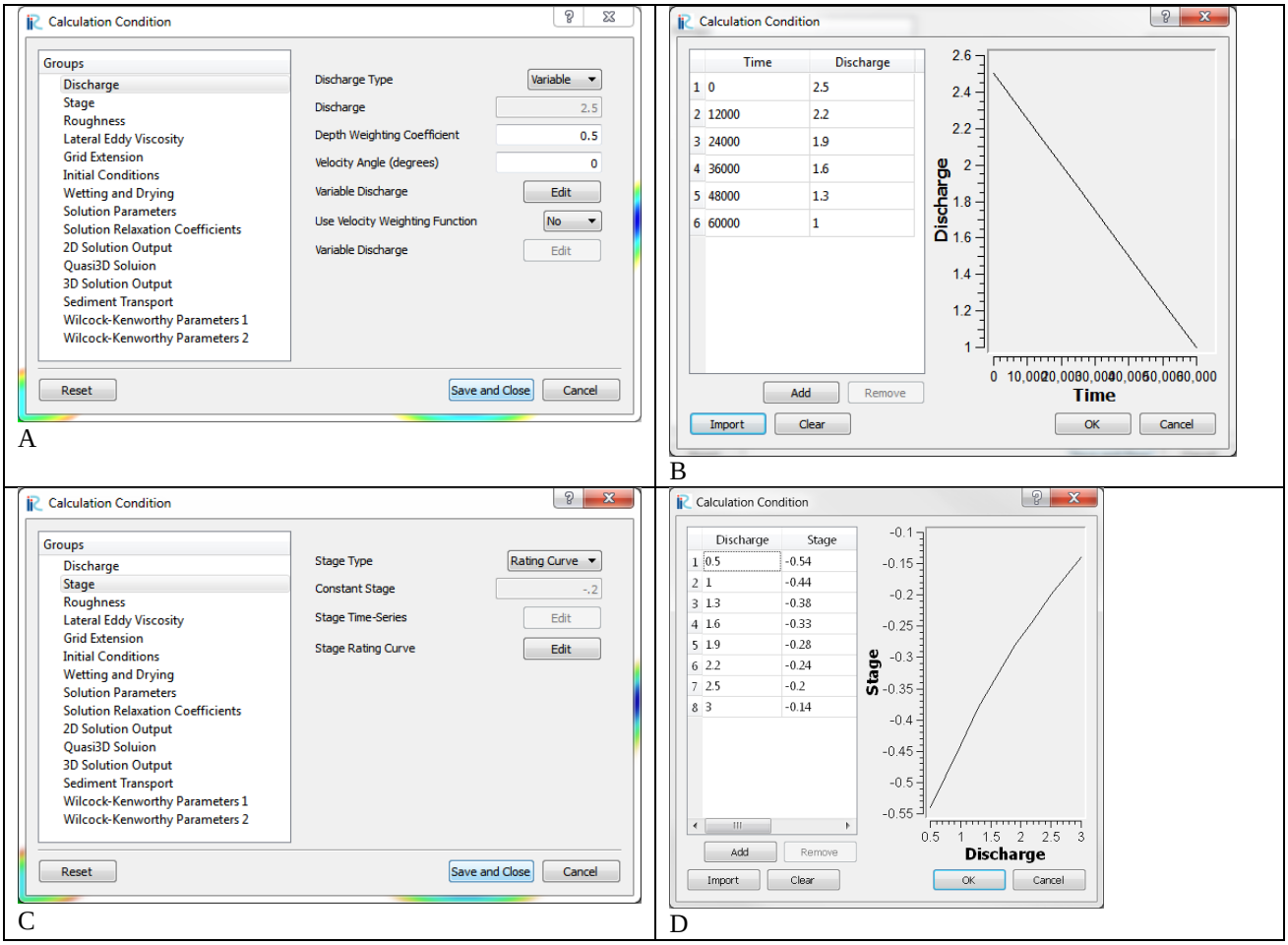
In this part of the tutorial you will run three simulations using the three hydrographs shown in Figure 3.2.6a. Each hydrograph represents the same volume of water. You will compare and contrast the resulting topography on the two middle meander bends. The results illustrate in a very simple way the potential to simulate the effect of flow magnitude, duration and hydrograph shape on the resulting channel topography.

Point bar evolution using a ramp time-series

An easy way to start is to open your meandering simulation from Tutorial 5 and using the File->Save As File(*.ipro) command save the file into the Tutorial 6 folder as Ramp_Q.ipro. From the menu select **Calculation Condition->Setting**. Keep all parameters the same with the following exceptions as shown in Figure 2. New in this tutorial are the discharge time-series and stage rating curves. The steps below provide some guidance for importing these into the calculation conditions.

1. Discharge:
    - Set the Discharge Type – Variable
    - Variable Discharge – Select the Edit button and in the resulting dialog select Import and then select the Ramp_Q.csv file.
2. Stage:
    - Set Stage – Rating Curve
    - Stage Rating Curve – Select the Edit button and in the resulting dialog select Import and then select the Stage_Discharge.csv.

Run the simulation.



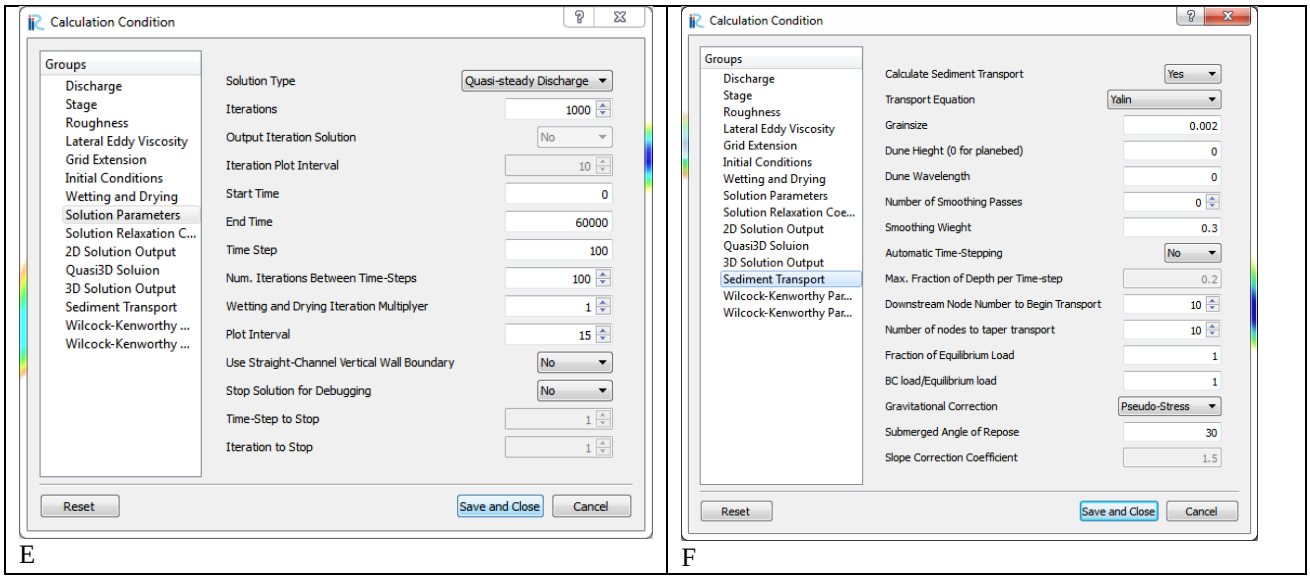


Figure 2. Enter the following parameters into the FaSTMECH Calculation Conditions dialog. (A) Discharge, (B) Discharge times-series, (C) Stage, (D) Stage rating curve, (E) Solution Parameters, and (F) Sediment Transport.

Point bar evolution using a step discharge time series

Save the previous project using the File->Save As File(*.ipro) command. Name the file Step.ipro. From the menu select **Calculation Conditions->Settings**. Keep all parameters the same with the following exception:

1. Discharge:
    - Variable Discharge – Select the Edit button and in the resulting dialog select Import and then select the Step_Q.csv file.

Run the simulation.

Point bar evolution using a constant discharge

Save the previous project using the File->Save As File(*.ipro) command. Name the file Constant.ipro. From the menu select **Calculation Conditions->Settings**. Keep all parameters the same with the following exception:

1. Discharge:
    - Set the Discharge Type – Constant
    - Discharge – 1.75

Run the simulation.

Discussion

The channel topography and cross-section (I=150; J=1,12) for each of the three hydrographs is shown in Figure 3. The difference in topography between each of the three runs is subtle, especially between the Ramp and Step hydrographs. Can you explain the differing topography in each of the three simulations as a function of the discharge history?

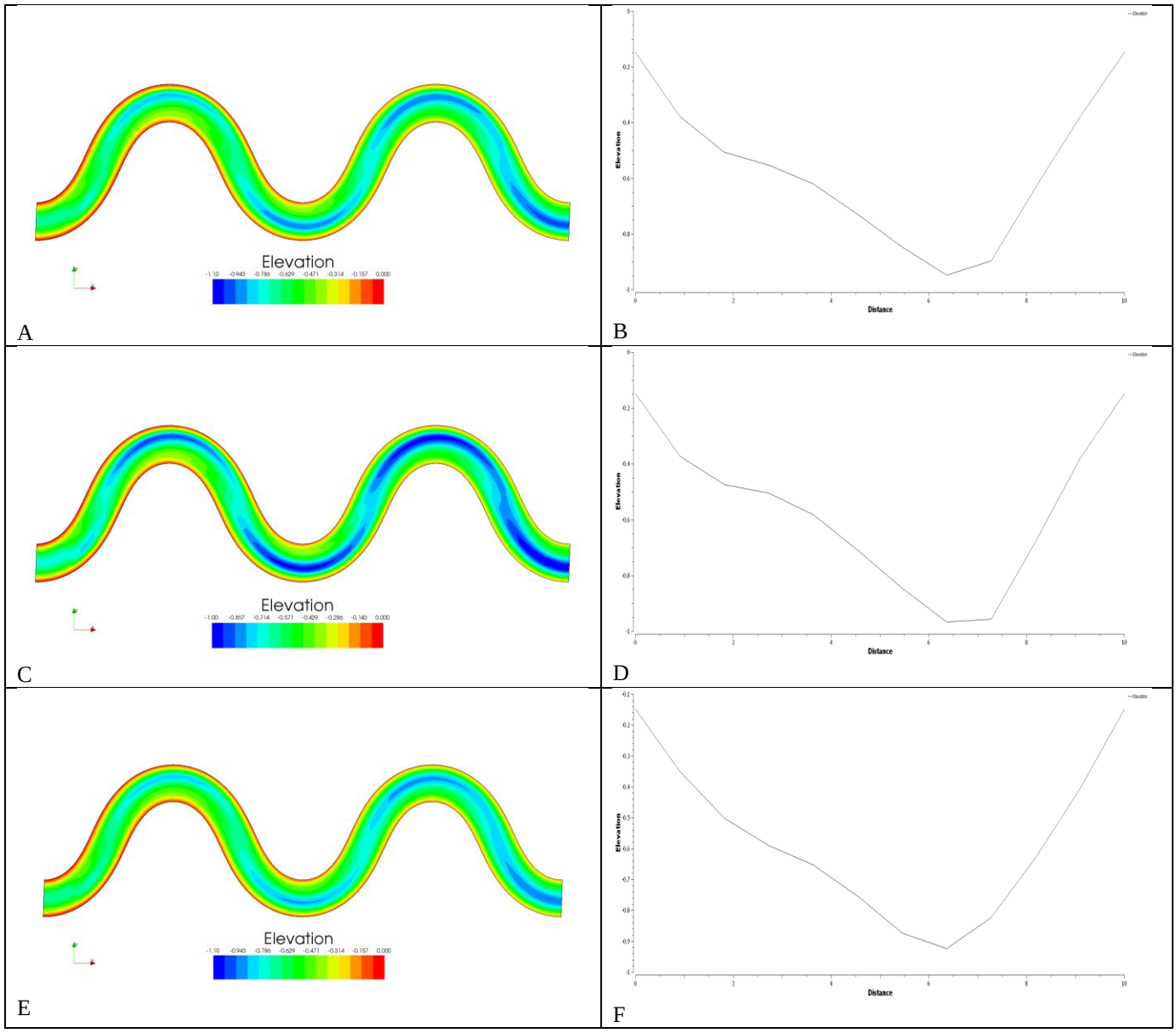


Figure 3. (A,B) Ramp Simulation, (C,D) Step Simulation, (E,F) Constant Simulation