This document provides a brief introduction to the proposed model, including the structure of the code, how to run the model, and some instructions for code compiling. We refer the reader to Lopez Dubon and Lanzoni [2019] and Zhao et al. [2019] for the primary governing equations and numerical approach.

1. Code Structure

The proposed model consists of two sub-models: meander migration model and bank collapse model. The meander migration model is written using MATLAB while the bank collapse model is written using Fortran. The bank collapse model is a subroutine invoked by the meander migration model, by means of MEX File Functions. A MEX file is a function, created in MATLAB, that calls a C/C++ program or a Fortran subroutine. A MEX function behaves just like a MATLAB script or function.

The entrance (or called main program) of the meander migration model is **Main.m** file. In **Main.m,** we provide a lot of annotations to introduce each function and show the code structure. Some important functions are summarized as follows:

Pre_Flags_And_Mex_Fortran.m
compile MEX file for bank collapse model; set methods for bank erosion (e.g., parameterized collapse or stress-strain analysis)

Pre_Initial_Parameters_and_Read_Data.m
Read data from 'input' file

ero_dep_fortran
A MEX function calculating bank erosion, collapse, and deposition

Geometry5.m
Update river bank line

Save_XY_Parameters.m
Output data such as bank line, erosion rate, and collapse distance. The output file is a binary file, and can be found in:
bank collapse and river meandering\Output\Test1_Outputs\Banks_Test1

Read_Output.m
Read output binary file

Floodplain_Parameters.m
Consider floodplain heterogeneity, not tested

Oxbow_Record_And_Set_Collapse_Variables.m
Record cut-off events

The entrance of the bank collapse model is BANK_EROSION_CALCULATION_ENTRY in **ero_dep_fortran.f90** file. Also, we provide a lot of annotations to introduce each subroutine and show the code structure.

2. Run the Model

We provide a simple function **generate_bank_geometry.m** to generate an initial sinuous configuration. The output binary file can be directly read by the **Main.m** file.

Values for morphodynamic and geotechnical parameters can be set in bank collapse and river meandering\Input\ **Test1_Param.dat** and bank collapse and river meandering**SOIL PARAMETERS.dat**.

Before running the model, please carefully set FLAG in **Pre_Flags_And_Mex_Fortran.m** file. For example, if **FLAG_BANK** is set to 3 the model will use stress-strain analysis to simulate bank collapse. The simulation time can be set by Nyear in **Pre_Initial_Parameters_and_Read_Data.m** file.

After running a simulation, we also provide an example of how to read the data and plot a figure. The reader can use **Figure_Erosion_Deposition_final.m** to plot Figure 3 of the paper.

3. Code Compiling

The code can be compiled using Windows, or alternatively, Linux systems, by changing FLAG_SYS in **Pre_Flags_And_Mex_Fortran.m** file. Since we use Intel MKL (Math Kernel Library) to accelerate simulations of bank collapse, MKL must be installed before compiling. We refer the reader to official website of **MATLAB** and **Intel** for more details on code compiling. The links below relate to useful threads about model compiling in Matlab or Linux:
https://stackoverflow.com/questions/59507831/matlab-crashes-when-invoking-functions-from-intel-mkl
https://stackoverflow.com/questions/62035354/no-speedup-with-openmp-when-using-matlab-mex-in-linux

Lopez Dubon, S., and S. Lanzoni (2019), Meandering Evolution and Width Variations: A Physics-Statistics-Based Modeling Approach, Water Resources Research, 55, 1-19.
Zhao, K., Z. Gong, F. Xu, Z. Zhou, C. K. Zhang, G. Perillo, and G. Coco (2019), The role of collapsed bank soil on tidal channel evolution: A process-based model involving bank collapse and sediment dynamics, Water Resources Research, 55(11), 9051-9071.