

GSTAR-M Fact Sheet

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Overview

GSTAR-M (Generalized Sediment Transport for Alluvial Rivers – Meandering Rivers) is a computer model that simulates the bed topography, flow field, and bank erosion rate in curved channel with an erodible bed. In each time step, GSTAR-M first calculates the flow field based on the standard step method or normal depth method. It then computes the channel bank erosion rate. Finally the channel alignment is updated with the erosion rate, followed by a channel cutoff if needed. The model can be used to predict channel migration in meandering rivers.

Potential Applications

There are potential uses of the model. Specific applications include:

- Identification of nature rates of channel migration.
- Estimation of channel migration under various conditions to plan or maintain infrastructure near the channel bank.
- Estimation of meandering rate changes caused by dam construction, floodplain vegetation clearing, changed hydrology, or changed sediment yield.

Limits of Application

GSTAR-M is an engineering tool for solving channel migration in meandering rivers with the following limitations:

- GSTAR-M is a simplified model with minimization or linearization methods. It should only be applied to channels with small width to radius ratios.
- The erosion rate parameters are highly sensitive to the bed material, vegetation, large woody debris, and other unknown factors. Calibration is required in choosing the parameters.

- Changes to bed material gradation is not simulated.
- Many of the sediment transport modules and concepts used in GSTAR-M are simplified approximations of real phenomena. Those approximations and their limits of validity are embedded in the model.
- GSTAR-M is currently compiled to run only within the Windows 2000/XP operating system.

Features

- GSTAR-M can simulate water surface profiles with the standard step method or the normal depth method.
- Minimization method or linearization method is used to predict the bank erosion rates.
- Many different sediment transport capacity formula are available.
- ARC-GIS files can be used to input the channel profile, channel axis, and erosion rate parameters.
- Channel cutoffs are simulated.
- Erosion volume due to channel migration can be calculated.
- Excel can be used to generate input files.
- Output is in structured text files that can be directly imported into TECPLOT.