OWP HAND-FIM Generation

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Presented By

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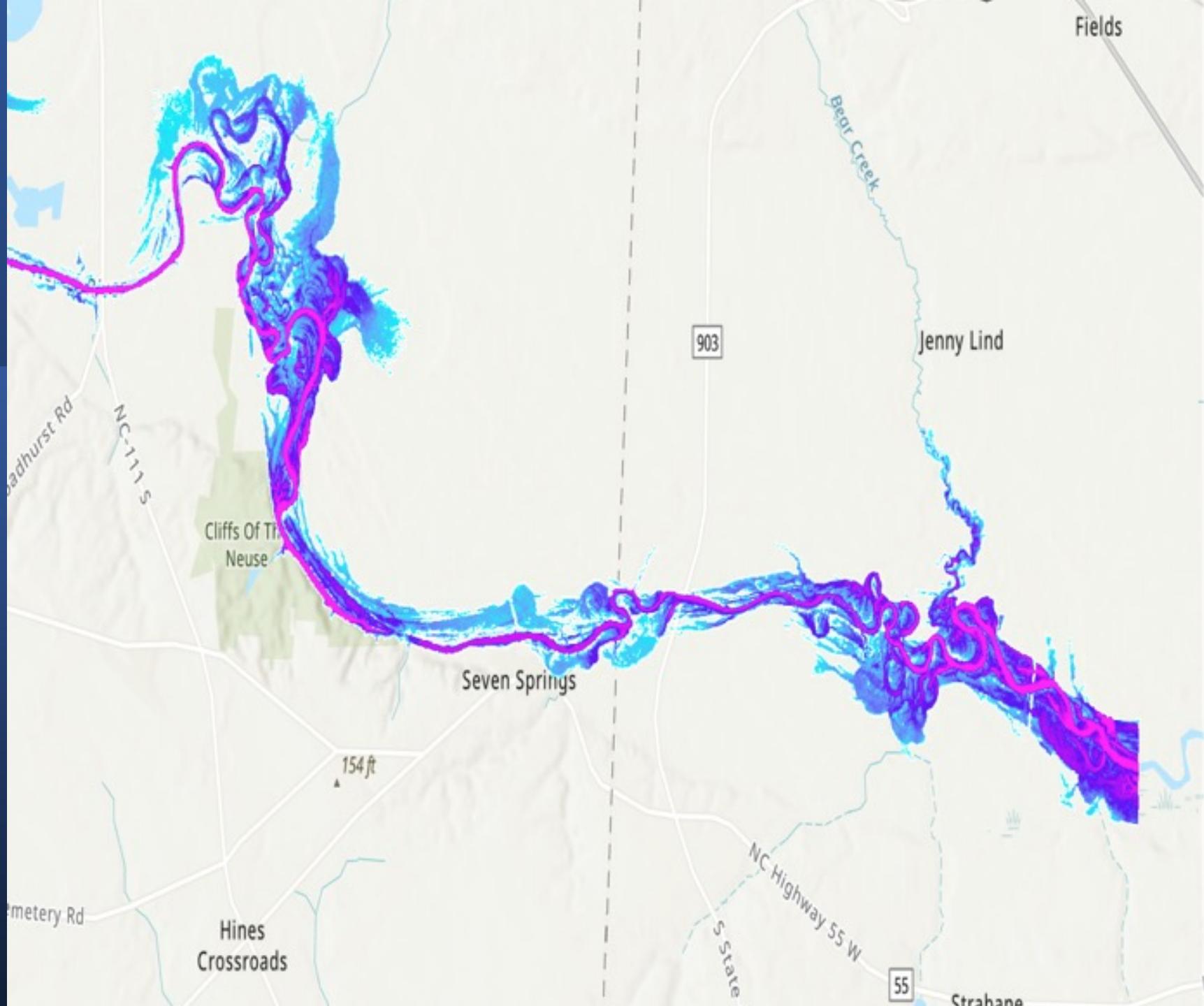


Content

- Brief overview of HAND-FIM
- Hands on training with HAND –FIM in Jupyter Notebook
  - Data Downloading and visualization from AWS
  - Preparing the streamflow data
  - Docker image build and docker run
  - FIM run

Introduction

The increasing intensity and frequency of global flooding necessitate the application of robust models capable of rapid and precise inundation assessment.

Fluvial flood inundation models are often associated with different sources of uncertainties such as appropriate mesh size, boundary condition and geomorphological characteristics.

In contrast to high-fidelity models such as 1D-2D hydraulic models, terrain-based solutions, such as the Height Above Nearest Drainage (HAND), are a less complex approach for generating event-based flood maps

HAND-FIM

HAND-(Height Above The Nearest Drainage)-FIM(Flood Inundation mapping)

HAND is a geoprocessing technique that converts a Digital Elevation Model (DEM) to a Relative Elevation Model (REM) depicting the elevation of the surrounding terrain above the river to which it drains.

It is not a Hydraulic model. It doesn’t solve the St. Venant equations.

Although the HAND-FIM lacks flow physics compared to hydraulic models, it is widely used for its scalability, computational efficiency, and low data requirements.

Synthetic Rating Curves (SRC)

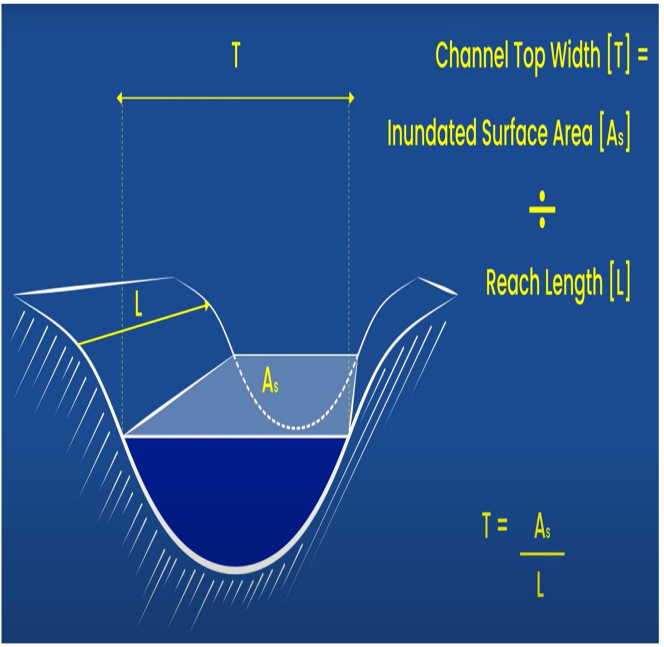
In OWP HAND-FIM framework, synthetic rating curves are a primary input that translates streamflow predictions by the National Water Model to water levels

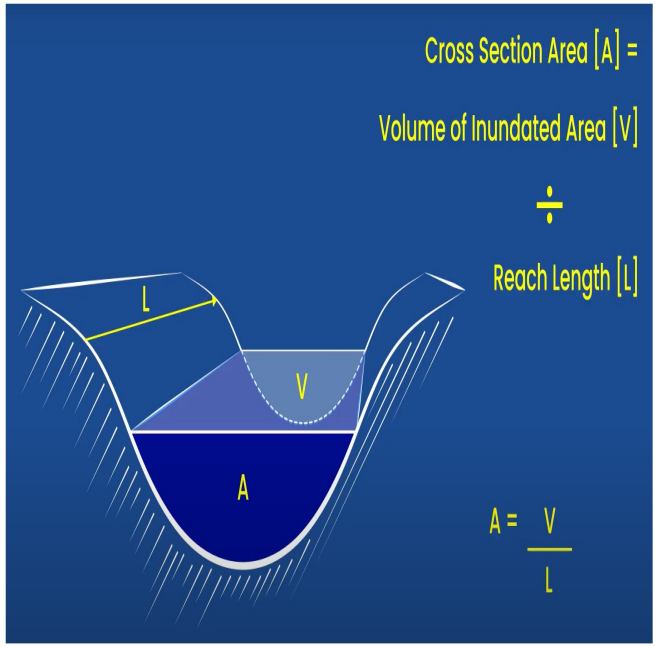
SRCs are rating curves but derived using reach averaged parameters from Manning's equation.

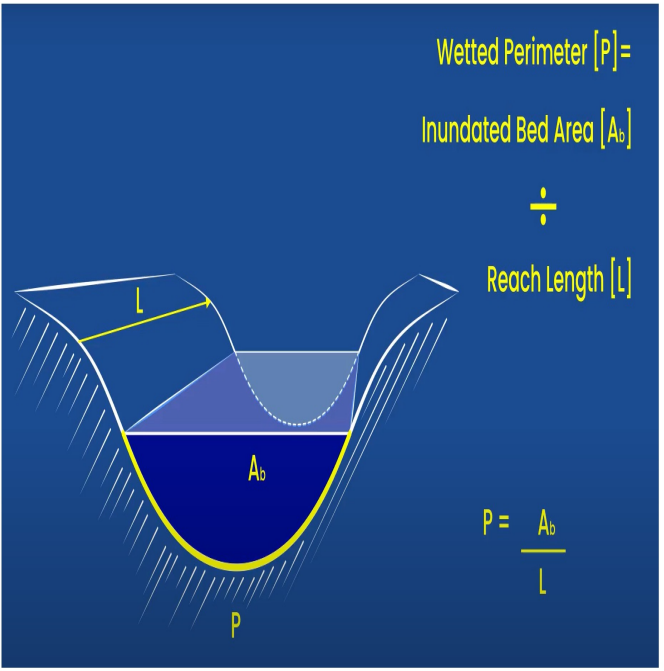
More efforts are being made to calibrate the SRCs using USGS Rating curve data and FIM spatial maps.

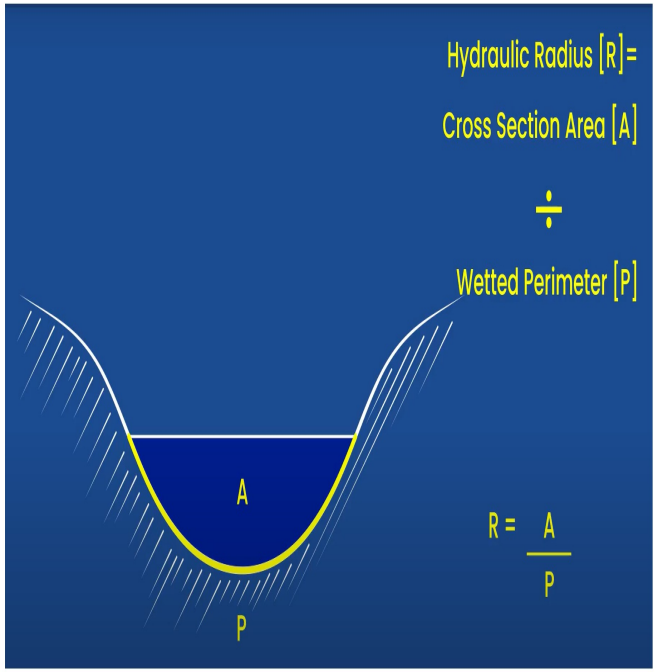
https://github.com/NOAA-OWP/inundation-mapping/wiki/3.-HAND-Methodology

Synthetic Rating Curves (SRC)









Manning's Equation

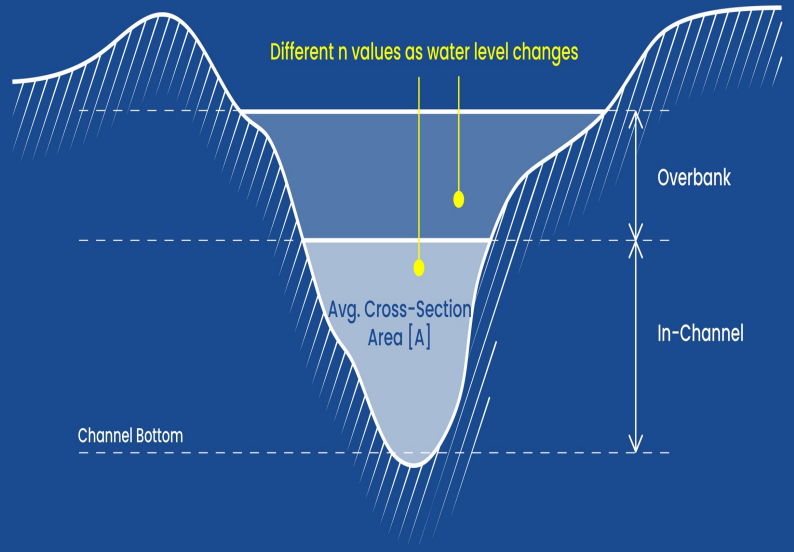
$$Q = \left(\frac{1}{n}\right) A R^{\frac{2}{3}} \sqrt{S}$$

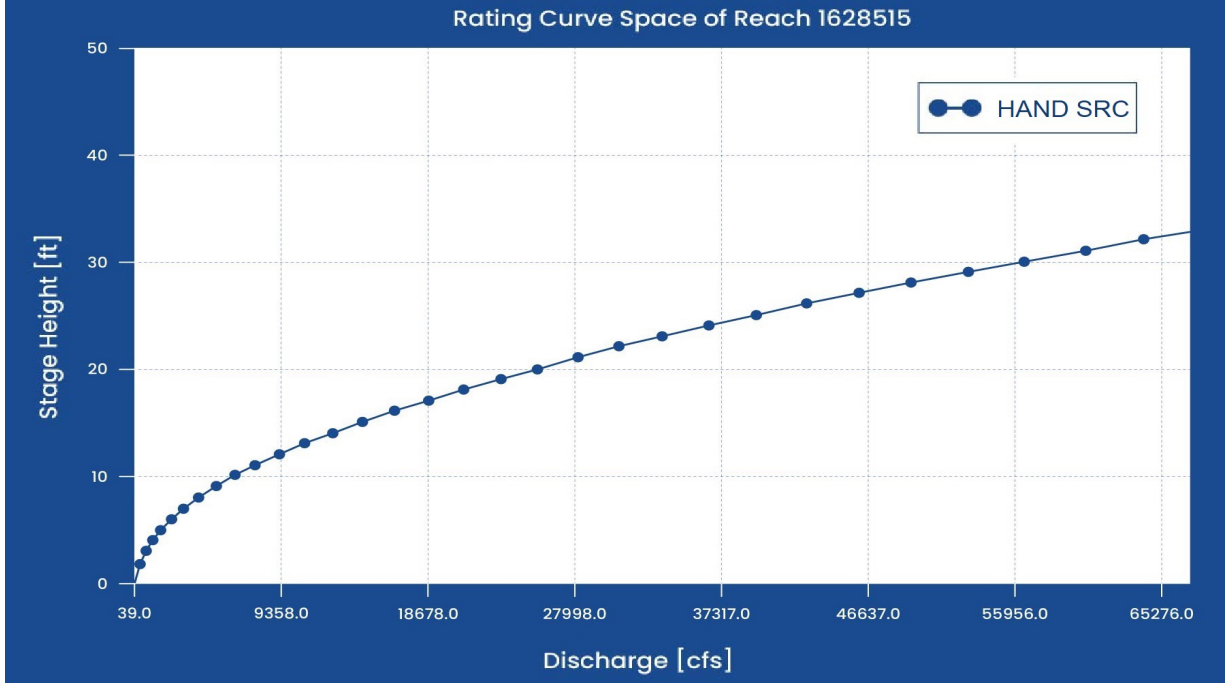
n = Roughness Coefficient

A = Avg. Cross-Section Area

R = Hydraulic Radius

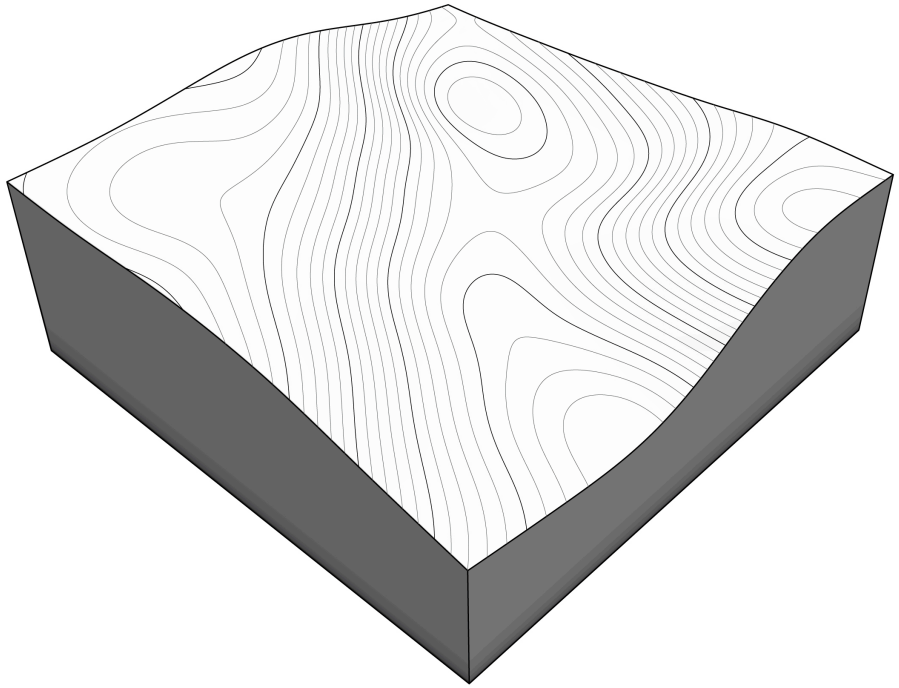
S_0 = Bed Slope





HAND –FIM generation

DEM Representation of Earth's Surface



CALCULATING HAND
SYNTHETIC RATING CURVES

https://github.com/NOAA-OWP/inundation-mapping/wiki/3.-HAND-Methodology

Reference

Water Resources Research

Research Article | Open Access

Extending Height Above Nearest Drainage to Model Multiple Fluvial Sources in Flood Inundation Mapping Applications for the U.S. National Water Model

Fernando Aristizabal, Fernando Salas, Gregory Petrochenkov, Trevor Grout, Brian Avant, Bradford Bates, Ryan Spies, Nick Chadwick, Zachary Wills, Jasmeet Judge

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Abstract

Height Above Nearest Drainage (HAND), a drainage normalizing terrain index, is a means able of producing flood inundation maps (FIMs) from the National Water Model (NWM) at large scales and high resolutions using reach-averaged synthetic rating curves. We highlight here that HAND is limited to producing inundation only when sourced from its nearest flowpath, thus lacks the ability to source inundation from multiple fluvial sources. A version of HAND, known as Generalized Mainstems (GMS), is proposed that discretizes a target stream network into segments of unit Horton-Strahler stream order known as level paths (LPs). The FIMs associated with each independent LP are then mosaiced