2D Hydraulic Modeling Webinar Series

Accelerating 2D Hydraulic Modeling: GPU enabled SRH-2D in SMS

May 13, 2026

AQUAVEO®

TRANSPORTATION HYDRAULICS SOLUTIONS

2D Hydraulic Modeling Webinar Series Objectives

- Highlight best practices in 2D modeling for transportation hydraulics
- Showcase new features and capabilities in SMS/SRH-2D
- Share examples of 2D modeling applications
- Compare SRH-2D and HEC-RAS 2D modeling approaches
- Provide an open forum for questions and other insights

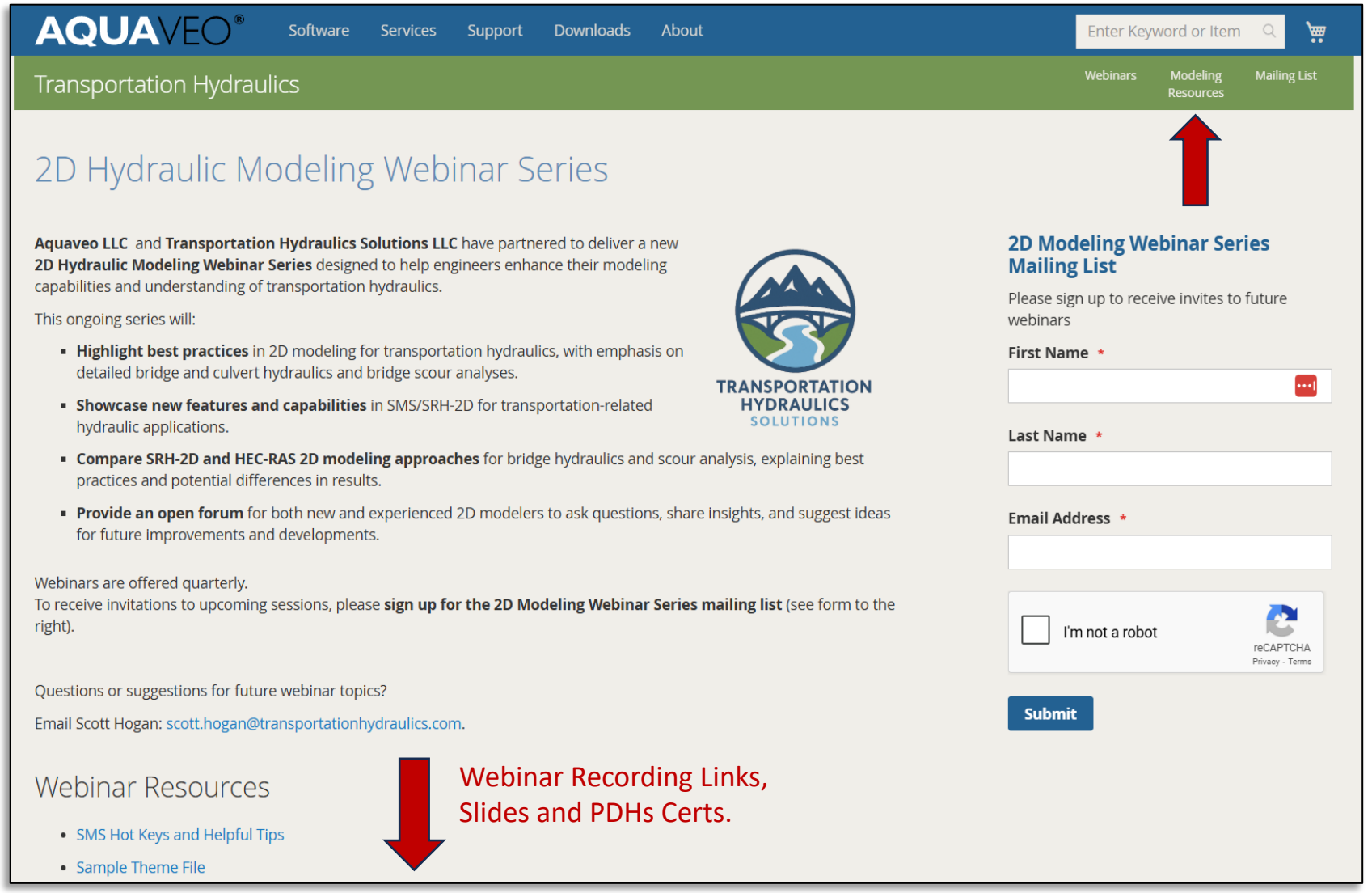
Agenda

- 2D Hydraulic Modeling Webinar Series Page and Resources
- Current version of SMS/SRH-2D
- Training opportunities
- **GPU Computing with SRH-2D/SMS**
- Initial Performance Testing

2D Hydraulic Modeling Webinar Series Page

https://aquaveo.com/software/sms/srh2d-hydraulic-modeling-webinar-series

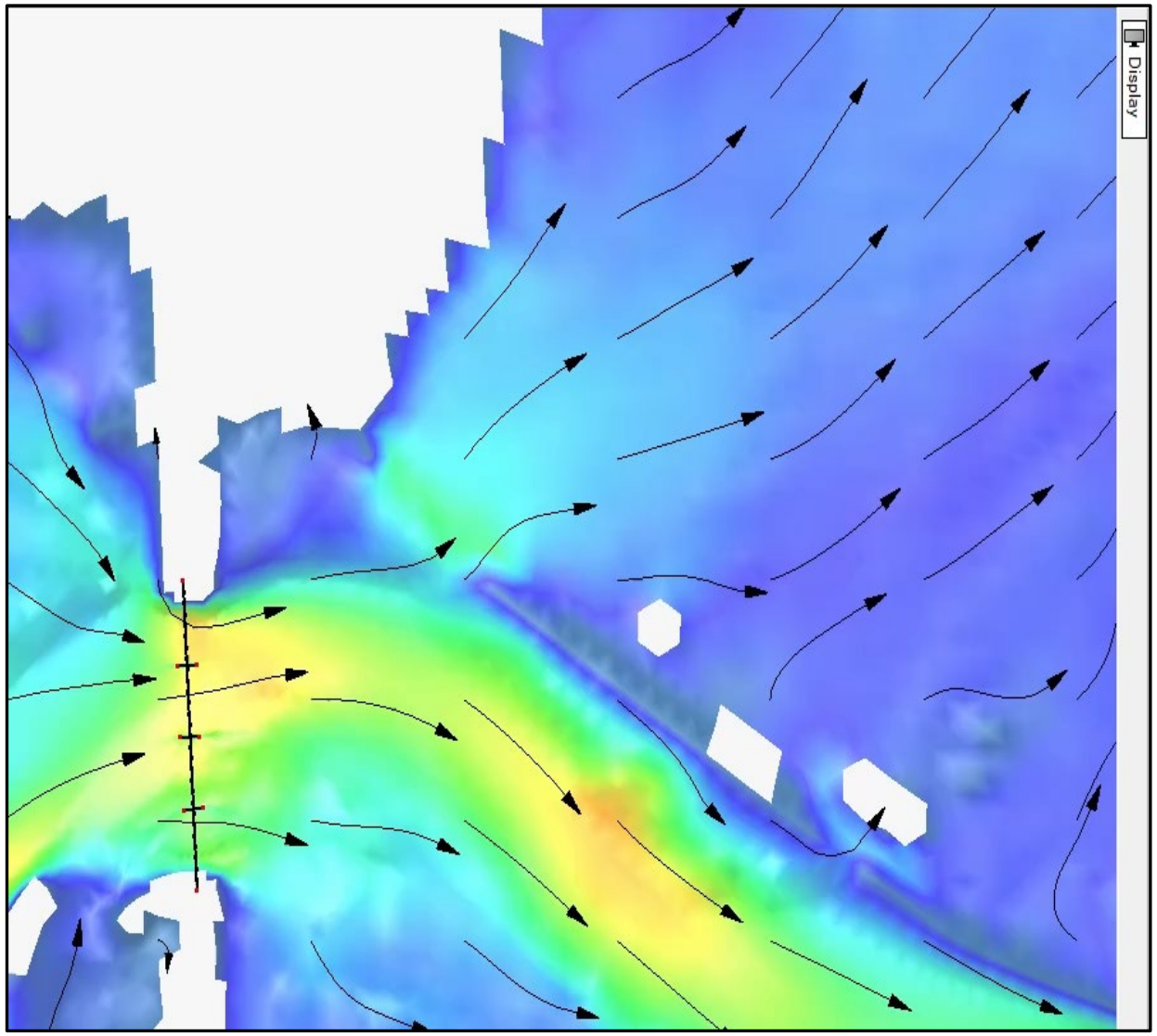
- Sign up to receive future webinar invites
- SMS Hot Keys and Tips
- Sample Theme file
- Presentation slides and recording links
- PDH certificate
- Modeling resources



SMS Current Releases

- Current version: SMS 13.4.11 / SRH-2D v3.7.2
- Build date: March 10, 2026
- Several revisions/bug fixes
  - SMS Release Notes

- Beta version: SMS 13.5 SRH-2D v4.0
  - GPU processing
  - Quick Display Options
  - New Select Tools
  - New vertex redistribution options
  - Bridge Scour Tool with HEC-RAS 2D Results
  - Updates to the Project Explorer folder/tree




IT'S HERE!
UNDO BUTTON
You asked. We listened. You got it!
FINALLY!
CTRL + Z
UNDO
ABOUT TIME!
THANK YOU!
GAME CHANGER!

Training Opportunities

2D Hydraulic Modeling For Transportation Hydraulics (2DHM)

- Virtual Course September 8-11 

- Additional virtual and in-person courses available on request

Bridge scour training - *From Modeling to Mitigation: An Applied Bridge Scour Master Class*

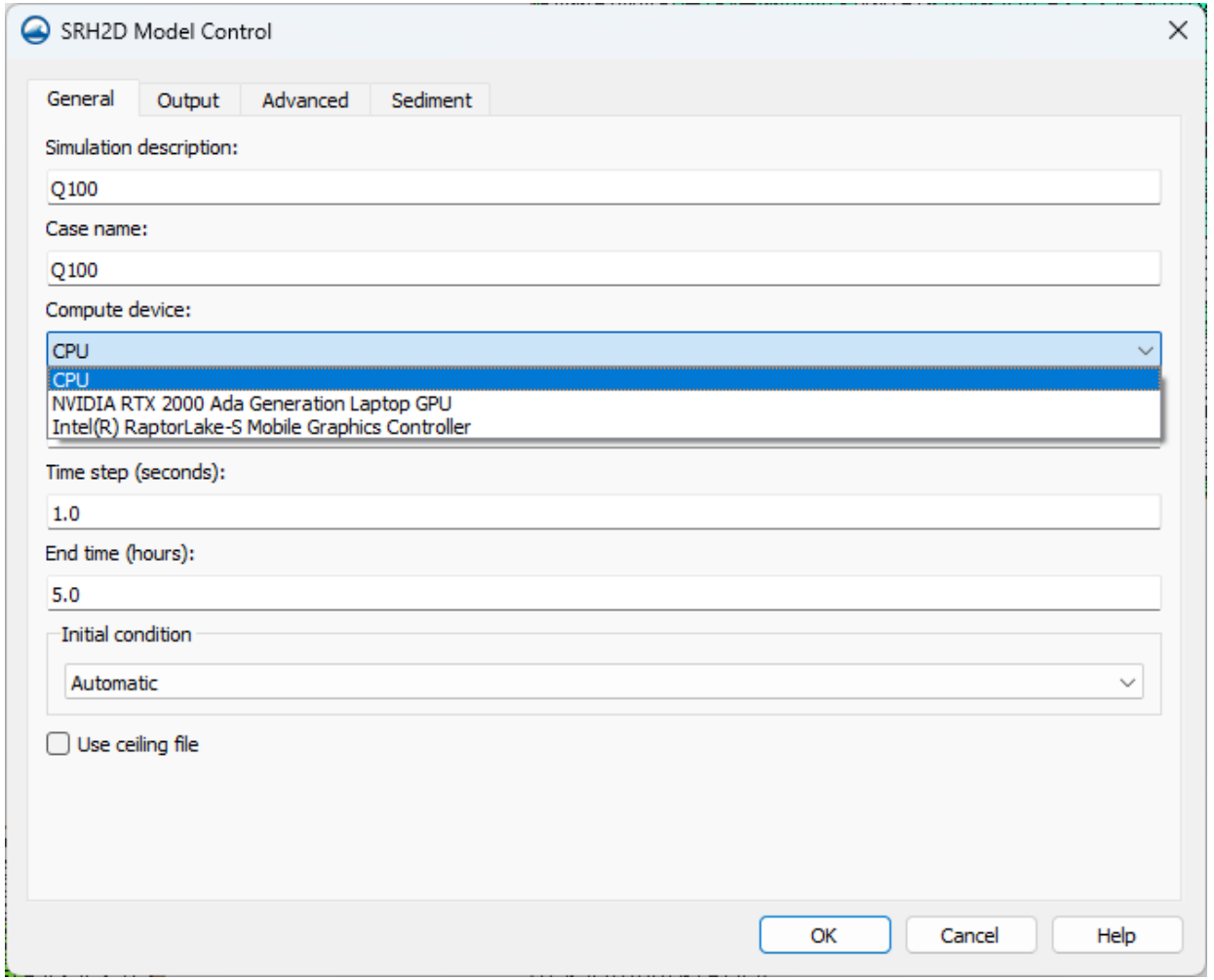
- Virtual Course July 28-30 and August 4-6 

- Additional virtual and in-person courses coming soon and on request

GPU Computing with SMS/SRH-2D

Overview

- SMS 13.5 Beta / SRH-2D 4.0
- SRH2D 4.0 GPU Background and Development
  - Yong Lai and Ben Abban (USBR)
- Aquaveo/THS Initial Performance Testing



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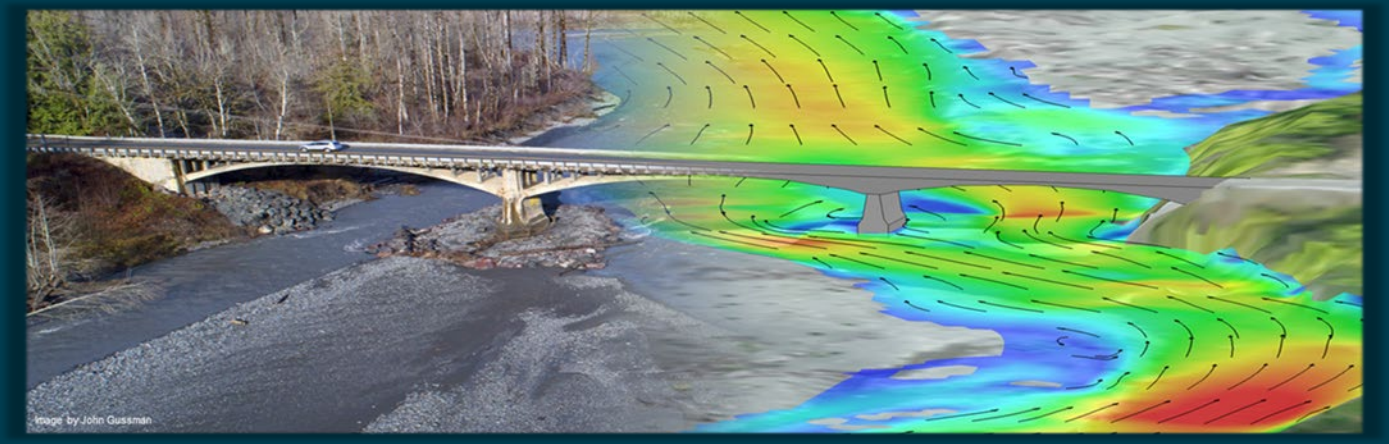
SRH-2D 4.0 - GPU Version Release

Yong G. Lai and Ben Abban
Technical Service Center
Denver, Colorado

Background

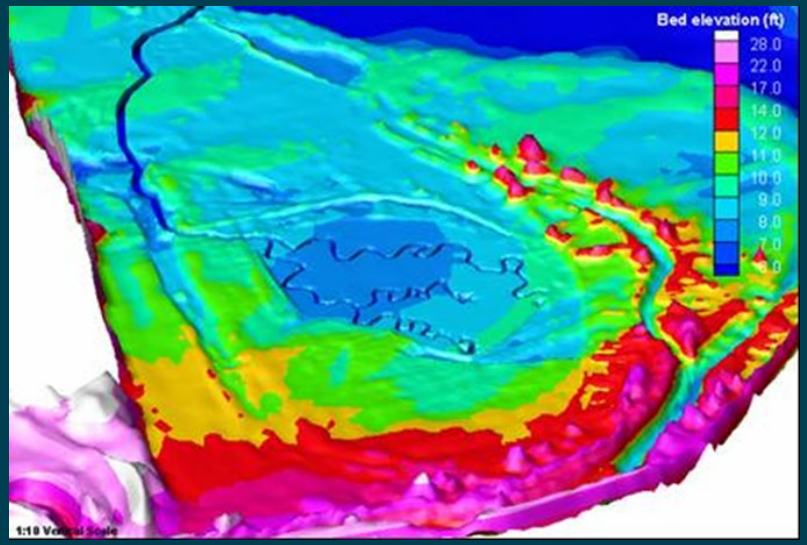
2D Hydraulic Modeling is being used widely

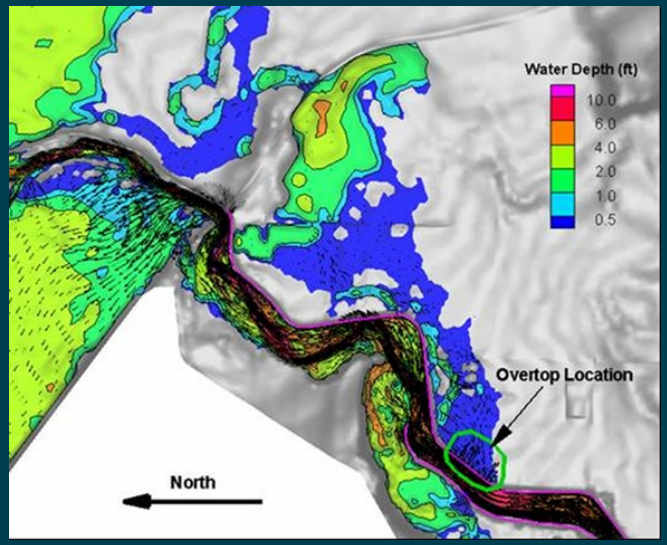


2D Modeling Challenge?

Runtime is Prohibitive for "Large" Models

- Spatial Scale: > 50-mile rivers
- Time Scale: > multi-year simulation



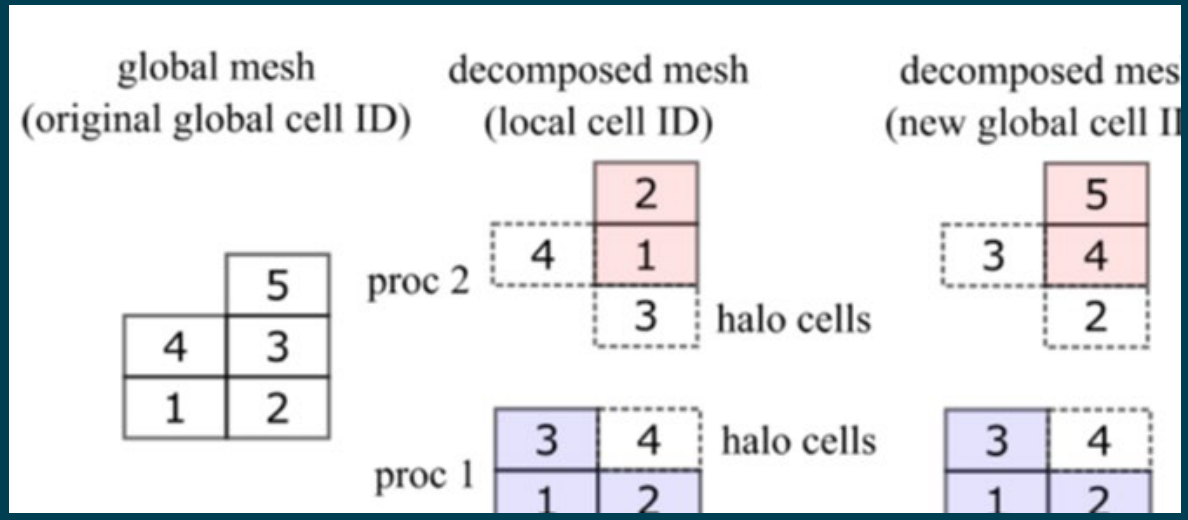


Solution?

Parallel Computing!

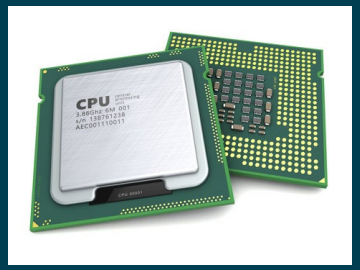
- Divide and Conquer
- MPI or GPU

GPU is the choice for future!



GPU versus CPU

- CPU Technology
  - Powerful Cores optimized for sequential processing
  - Low Latency, focusing on finishing one task quickly
  - Cheaper Hardware generally



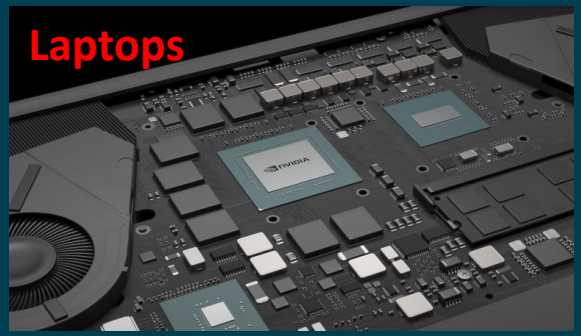
- GPU Technology
  - Massively Parallel - thousands of cores
    - designed to process large data sets simultaneously
  - Each core is not as fast – potential for future!
    - technology continues to improve
  - More Expensive Hardware
    - but excellent cost-benefit ratio IF …

CPU versus GPU with SRH-2D

- CPU Solver
  - Best for smaller mesh size < 50,000 cells
  - Superior stability
  - Slow for large mesh size
- GPU Solver
  - Best for larger mesh size > 100,000 cells
  - Less stable, though robust enough
    - may require smaller time step for some cases
  - Speedup scales with $ paid for the hardware!

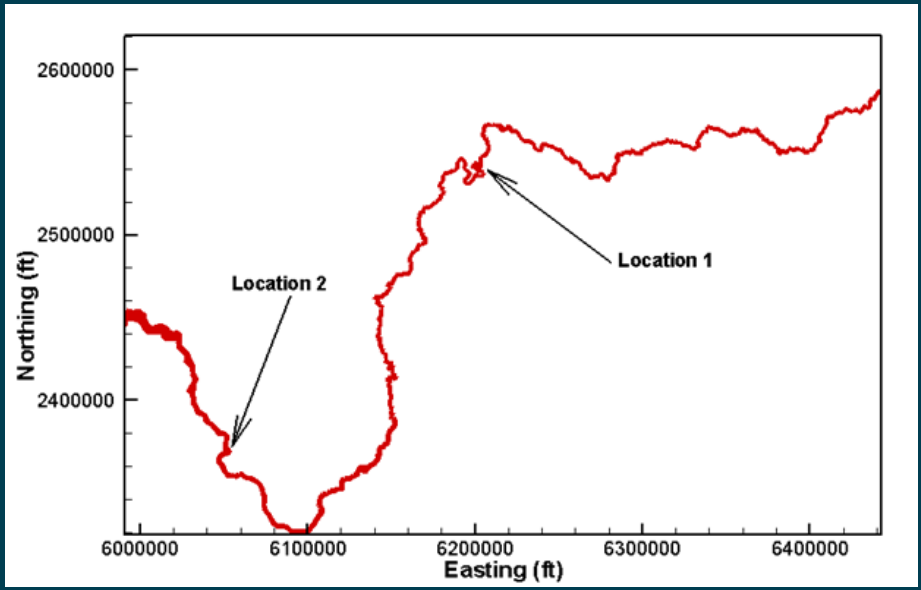
SRH-2D v4.0

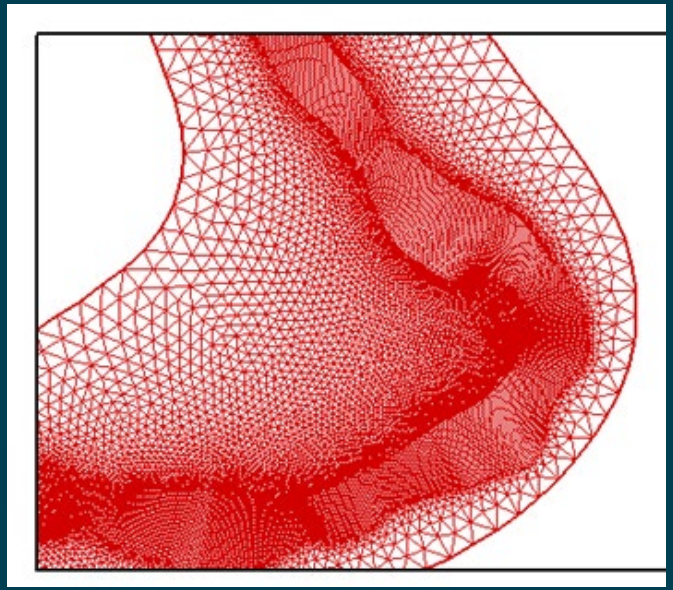
- CPU and GPU in one!
- GPU based on OpenCL (Open Computing Language) standard
  - Work on cards that implements OpenCL
  - Card has double-precision capability



Case: Klamath River

- 200-Mile Section (Iron Gate to Estuary)
  - Constant-Q Flow simulation
- 2.3 million mesh cells





Klamath River Performance

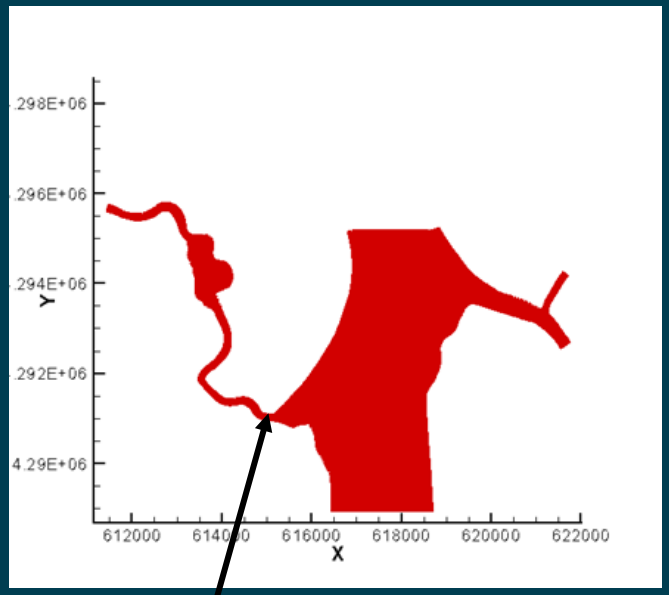
CPU run: ~ 1 week

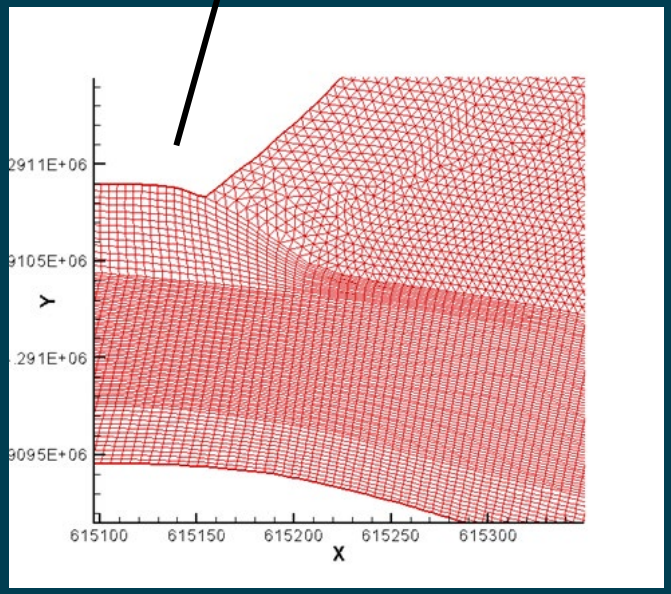
typical desktop PC

GPU with RTX 4090: 3.5 hours

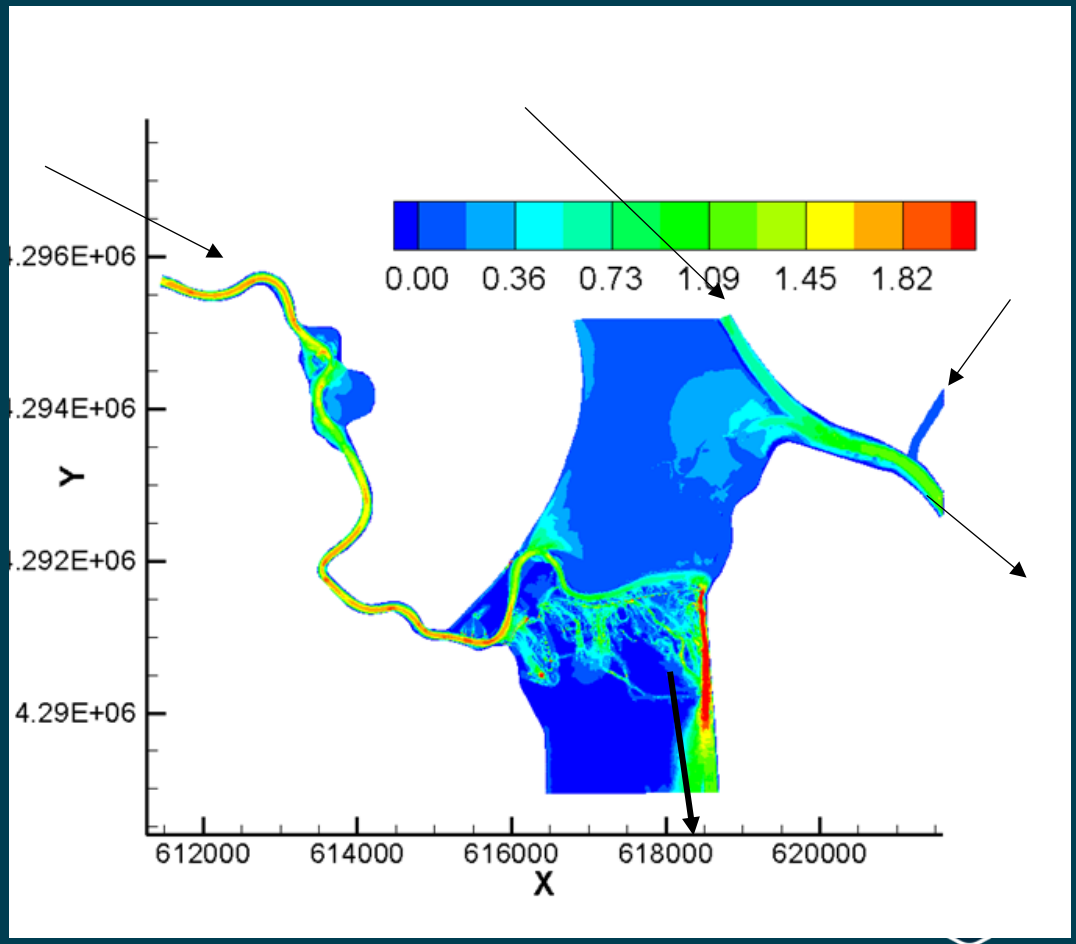
Speed-up = 40

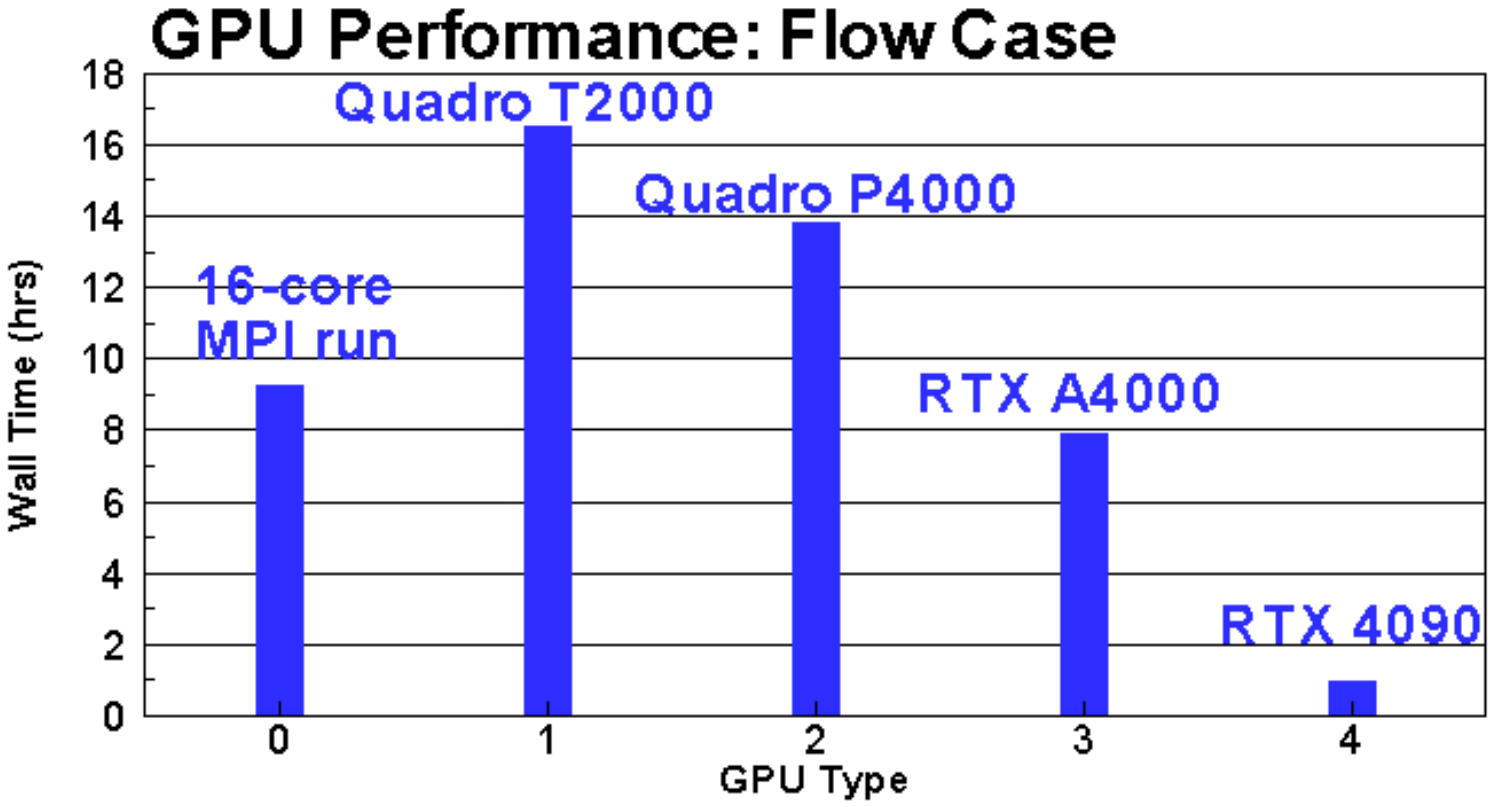
Flow Case: Sacramental River





832,547 cells (100 hrs CPU)

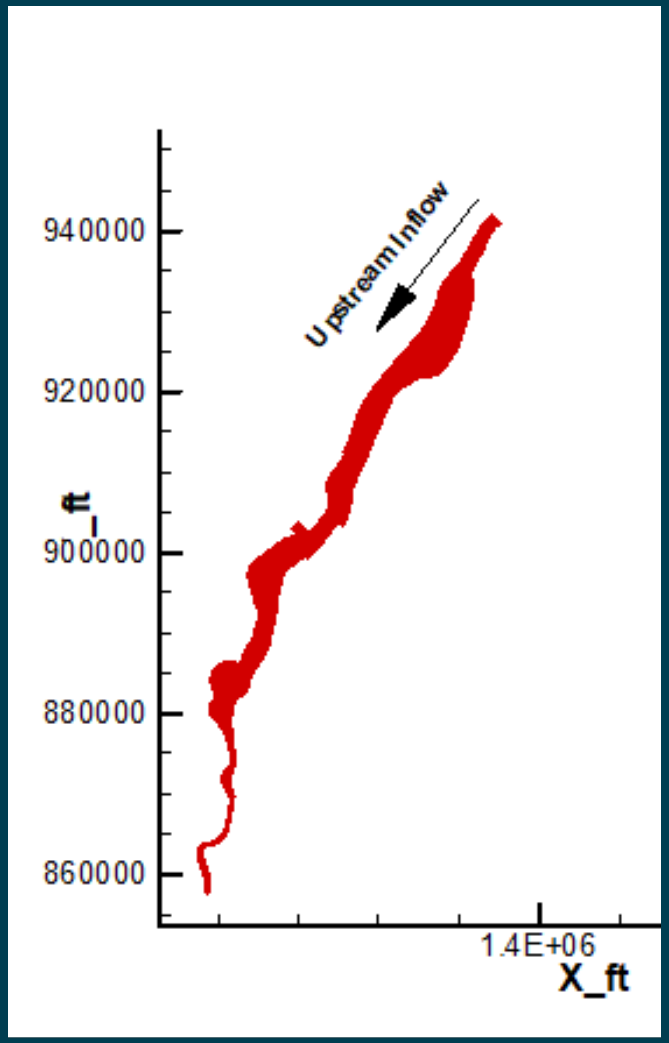


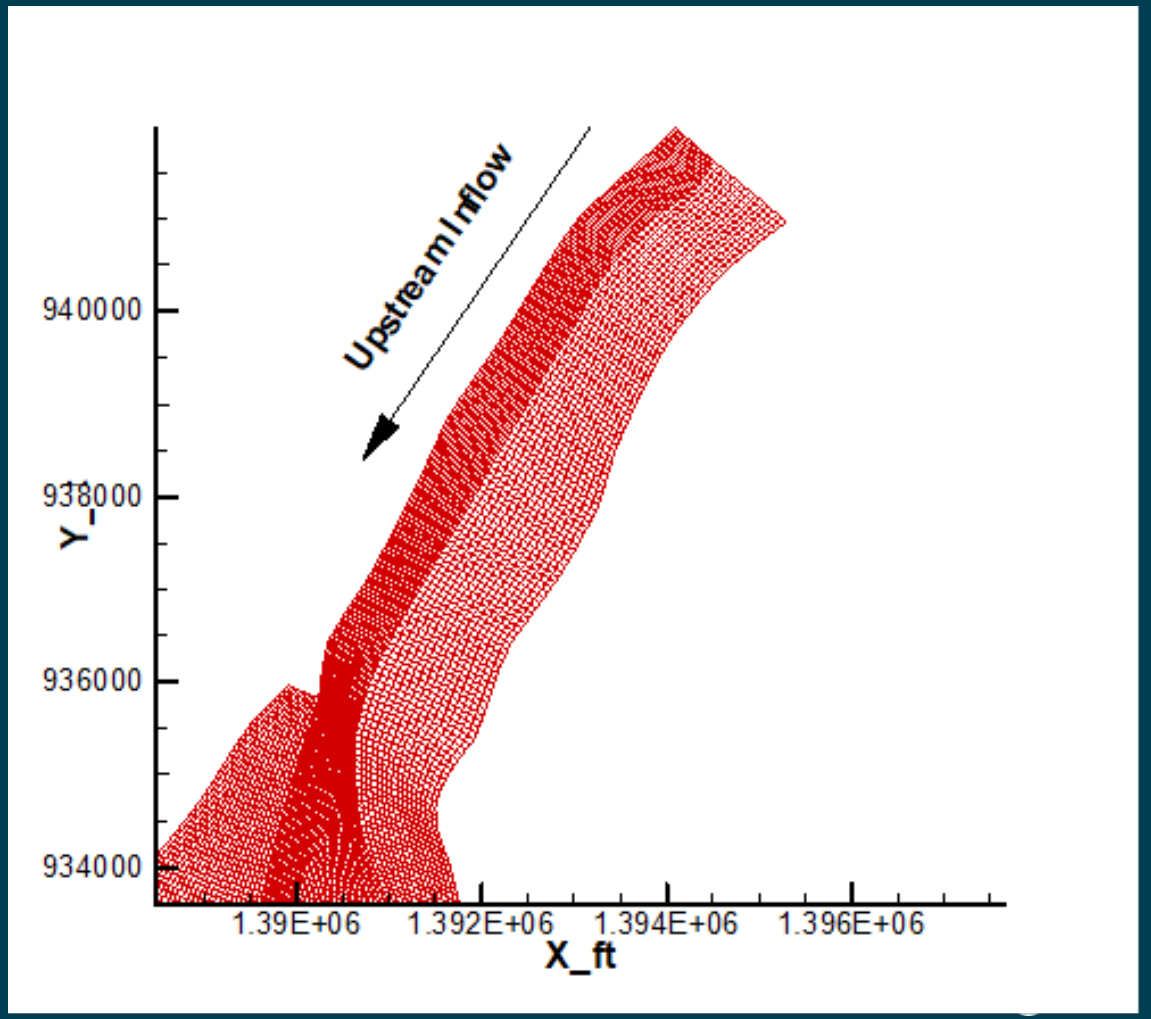


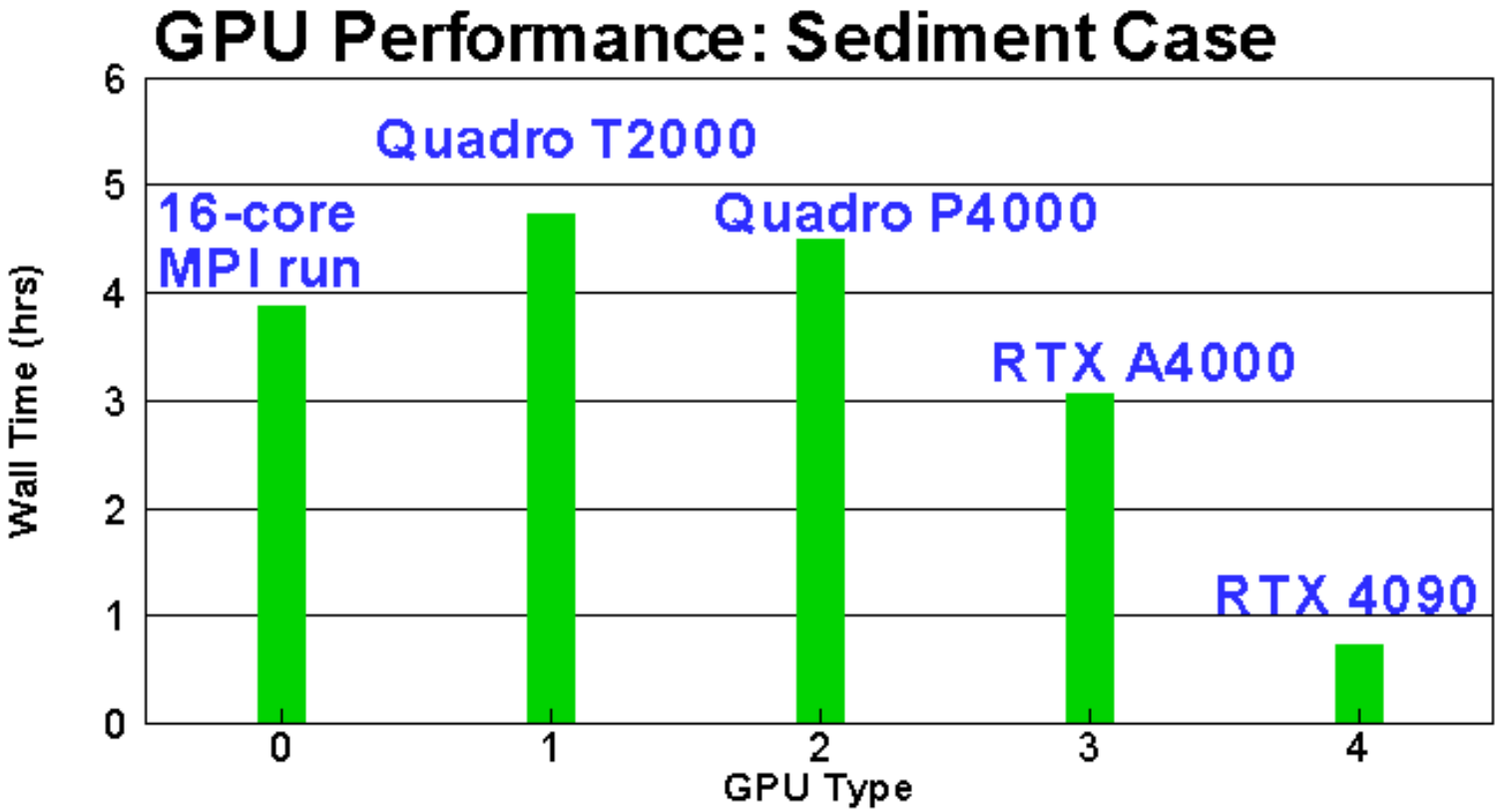
Card	Cuda Core Count/Base Speed	VRAM	Mem. Bus/Bandwidth	Year Release
Quadro T2000 (Laptop)	1,024 @ 1,575 MHz	4GB GDDR5	128-bit @ 128 GB/s	2019
Quadro P4000 (Desktop)	1,792 @ 1,202 MHz	8GB GDDR5	256-bit @ 243 GB/s	2017
RTX A4000 (Desktop)	6,144 @ 735 MHz	16GB GDDR6	256-bit @ 448 GB/s	2021
RTX 4090 (Desktop)	16,384 @ 2,235 MHz	24GB GDDR6X	384-bit @ 1000 GB/s	2022

Sediment Case:

10 river miles Rio Grande
8 sediment sizes
107,471 cells (50 hrs cpu)







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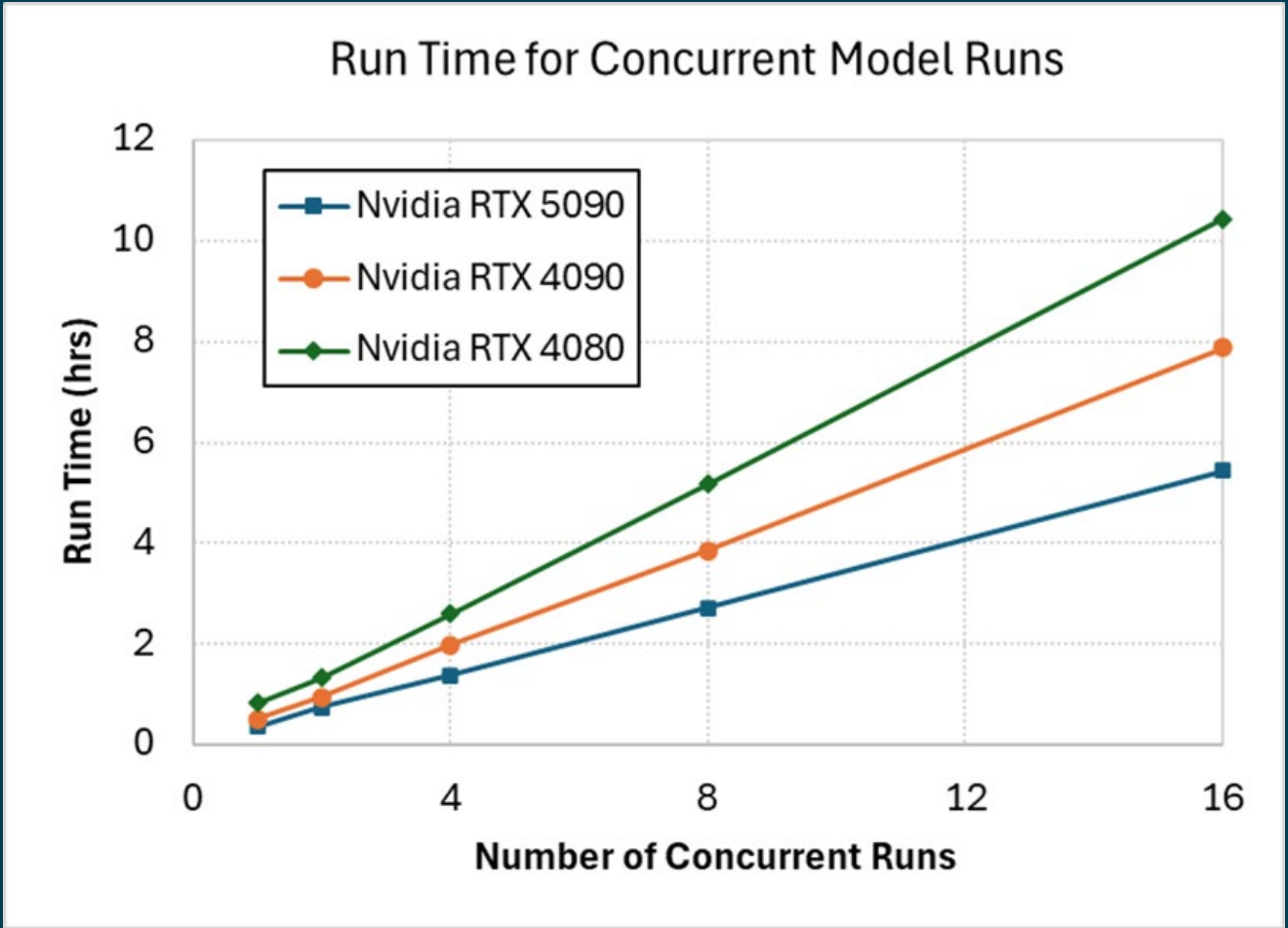
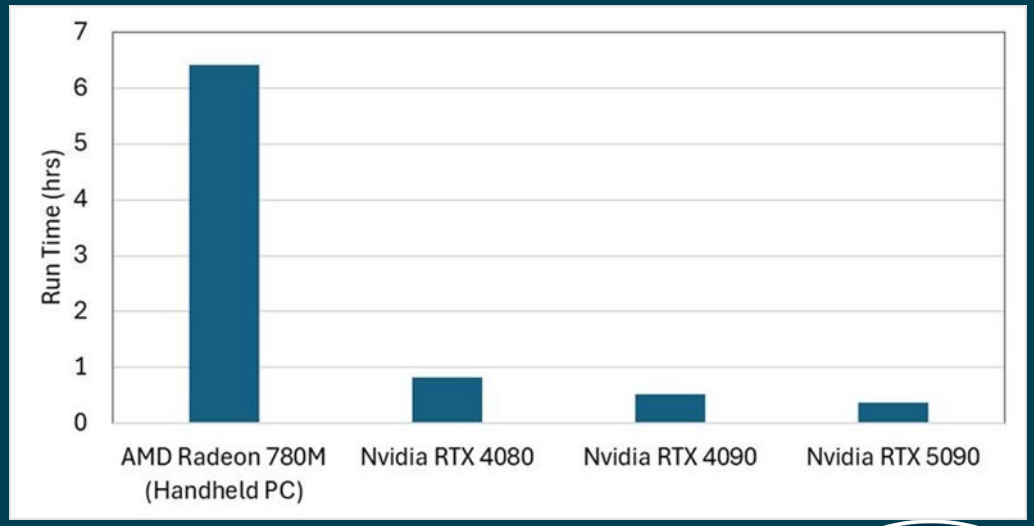
Concurrent GPU?



Mobile Hand-Held Computing? (iGPU)

AMD Radeon 780M




THANK YOU
QUESTIONS ?
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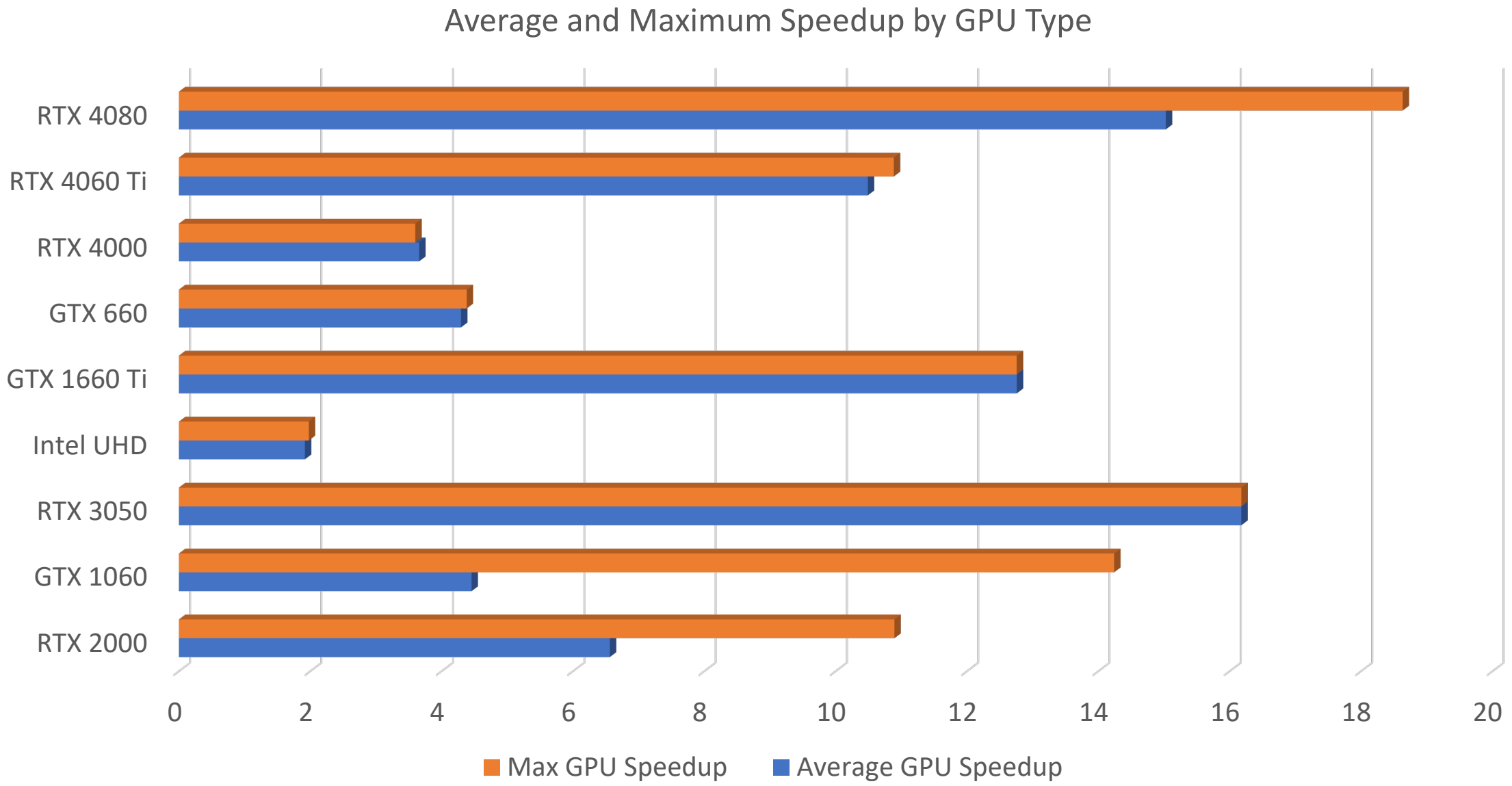
RECLAMATION

SRH-2D GPU Performance Evaluation

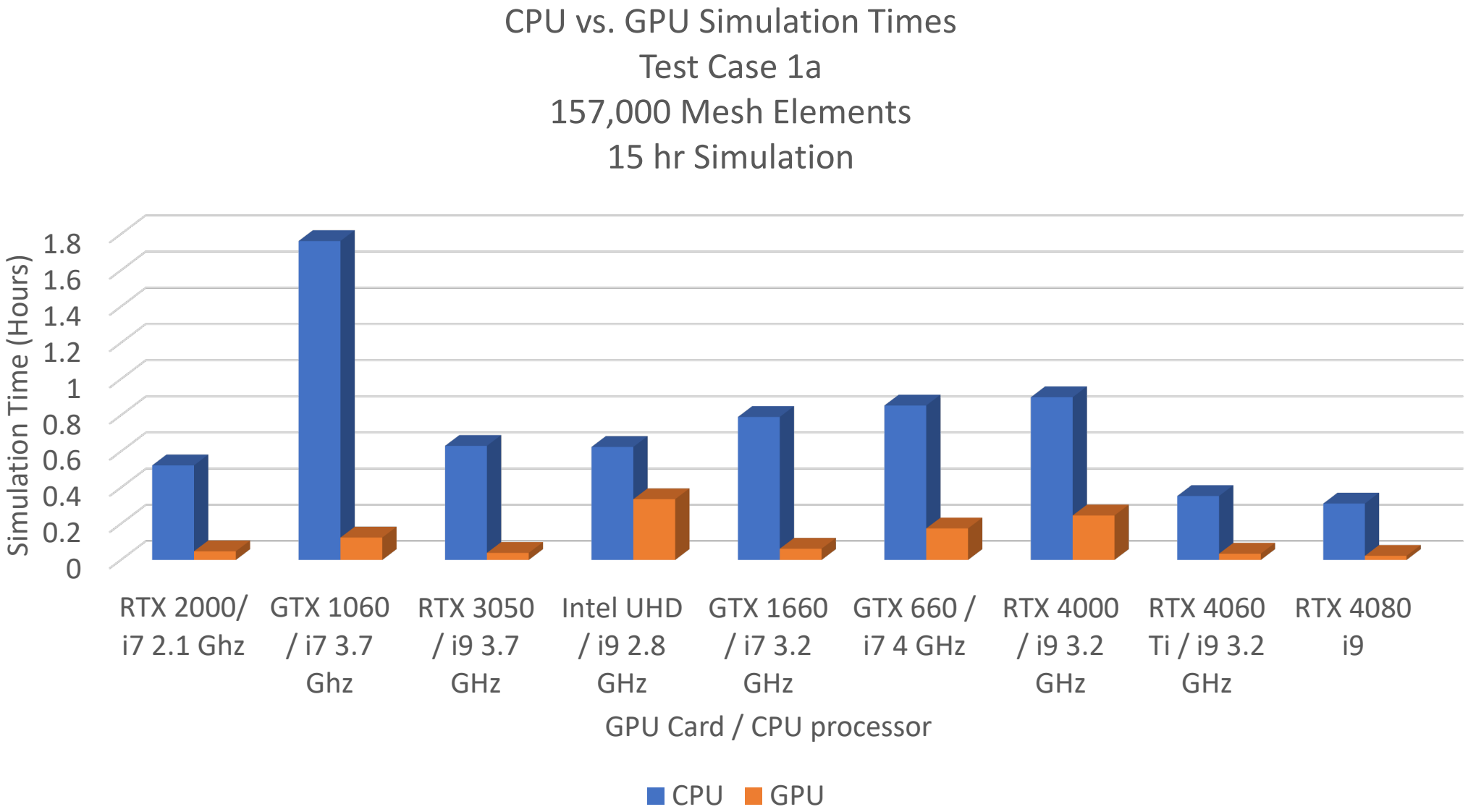
Key Findings

- Observed GPU acceleration ranged from approximately 0x to 18.6x.
- Average speedup across valid test cases was approximately 7.7x (median 6.1x).
- Highest acceleration factors were observed on newer RTX 4080 and RTX 4060 Ti hardware.
- Lower-end or older GPUs provided smaller gains and in isolated cases showed little or no benefit.
- Performance gains varied substantially by model size, wet element count, and problem complexity.
- GPU acceleration appears most valuable for large production models and long-duration simulations.

GPU Testing by Aquaveo and THS



Test Case Comparison



Questions

THANK YOU for participating!
Please contact us with any questions

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