Take it to the Limit:
What We Have Learned Using 2D RAS in Hungary for Various Applications

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Outline

• Information regarding the Tisza
• History of the Tisza models
• Review of the modeling efforts with RASv5 beta
• Lessons learned
• What is next?
Where is the Tisza?
Geography
By the Numbers

Main data of the Tisza I.

- **Basin**: 157,200 km²
- **Distribution of the basin**:
  - Abroad: 110,040 km² (~70%)
  - Home/inland: 47,160 km² (~30%)
History of the 1D Tisza Model

2002-2003: Building the 1D Tisza model with HEC-RAS

Summary of Project

Length of Rivers 1,500 km

Rivers 16
Reaches 27
Cross Sections 2083
Bridges 103
Storage Areas 17
History of the 1D Tisza Model


Adding the Upper-Tisza model (Ukraine)

Summary of Project

- Length of Rivers: 720 km
- Rivers: 8
- Reaches: 15
- Cross Sections: 2569
- Bridges: 37
- Storage Areas: 11
Ongoing work: Connecting the Danube and Tisza

1D HEC-RAS model in Serbia
Modeling with FLO-2D

- Successful projects since 2010
- Used for flood risk evaluation
- Emergency reservoir inundation mapping
- Basin hydrology and flood inundation studies
Modeling with FLO-2D

Jászteleki Reservoir

10 million m³ (8,170 aft) storage

50 – 60 m³/sec
1,800 – 2,100 cfs
Max. inflow
Modeling with FLO-2D

Barsóhalmi Reservoir

15 million m³ (12,200 aft) storage

50 – 60 m³/sec
1,800 – 2,100 cfs
Max. inflow
Modeling with FLO-2D

Tiszaroffi Reservoir
56 million m$^3$ (45,600 aft) storage

210 – 220 m$^3$/sec
6,500 – 7,100 cfs
Max. inflow

Outlet structure
Modeling with FLO-2D

Hanyi Channel and Basin

Modeled rainfall and runoff on 50 x 50 meter grid
Modeling with FLO-2D

VÍZHOZAMOK A HANYIPUSZTAI HÍD FELETT I.

VÍZHOZAMOK A HANYIPUSZTAI HÍD FELETT II.

VÍZHOZAMOK A HANYIPUSZTAI HÍD SZELVÉNYÉBEN
Modeling with FLO-2D

Basin 2.49

Flooding from Zagyva

33,000 acre-feet of inundation through the breach
Modeling with FLO-2D

Basin 2.37

410,000 acre-feet of inundation through the breach

Flooding from Zagyva
Modeling with FLO-2D

Basin 2.37

Flooding from Tisza

1,200,000 acre-feet of inundation through the breach
Modeling with FLO-2D

Flooding from Tisza

Basin 2.82

1,200,000 acre-feet of inundation through the breach

Model area 1,200 mi²

Grid elements 100*100 m

Number of elements 300,340
Modeling with River FLO-2D
Modeling with River FLO-2D

Kisköre Lock and Dam
Modeling with River FLO-2D

Grid density:
- 50 m floodplain
- 25 m river main channel
- 10 m around structures
Modeling with River FLO-2D
Modeling with River FLO-2D

Q = 2,900 m$^3$/s
Modeling with River FLO-2D

Q = 1,700 m³/s
Modeling with River FLO-2D

303 – 324 fkm

Bivalytó

303 fkm

324 fkm
Bivalytó
2006 conditions
Bivalytó
2010 conditions

Levee removed

New levee alignment

Levee segment left in place
Modeling with River FLO-2D

Grid density:
30 m floodplain
15 m main channel
Modeling with River FLO-2D
Modeling with River FLO-2D

Bivalytó
2006 conditions
Modeling with River FLO-2D

Bivalytó
2010 conditions
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
MIDDLE-TISZA WATER RESERVOIRS

247 million m³

2009.
97 million m³

Marc. 2013.
99 million m³
Modeling with RAS 5.0 Beta

Szamos- Kraszna Reservoir

Outlet structure

Intake structure
Modeling with RAS 5.0 Beta

Szamos- Kraszna Reservoir
Modeling with RAS 5.0 Beta

Tiszaroff Reservoir
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta

Jásztelek Reservoir
Modeling with RAS 5.0 Beta

Hanyi-Tiszasüly Reservoir
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
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Modeling with RAS 5.0 Beta
Modeling with RAS 5.0 Beta
What is Next for the Tisza

- Finishing the connection with the Danube
- Connecting all emergency basins using RAS v5 for system optimization
- Develop HEC-RTS for Zagyva
- Develop HEC-RTS for the entire Tisza watershed
Lessons Learned

• Working with early beta versions… Why?
• Providing feedback can be rewarding/frustrating
• Great potential
• Looking forward for the final version release
Thank You and I am Ready for Questions!
I think…