

Transboundary water issues in a macro-regional context: the Danube basin

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Sediment issues and consequences in the Danube river

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Content

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2. Danube River – pressures and impacts
3. Up-to-date technologies for sediment transport and morphodynamics monitoring
4. Ideas for the common implementation of the Danube Strategy
 - Ongoing CBC projects (e.g. SEDDON, DuReFlood)
 - On basin-wide projects initiations (DREAM, Post-SEE)

Danube Basin

Catchment area: 801.463 km²

Length: 2.857 km

Mean discharge: 6.500 m³ s⁻¹

UPPER DANUBE

DANUBE DELTA

MIDDLE DANUBE

LOWER DANUBE

Legende

- Hydraulic Structures
- Danube
- Tributaries
- Country border



0 50 100 200 300 400 Kilometer

Existing Situation

Basin-wide driving forces and impacts



→ Hydropower plants

→ Flood protection

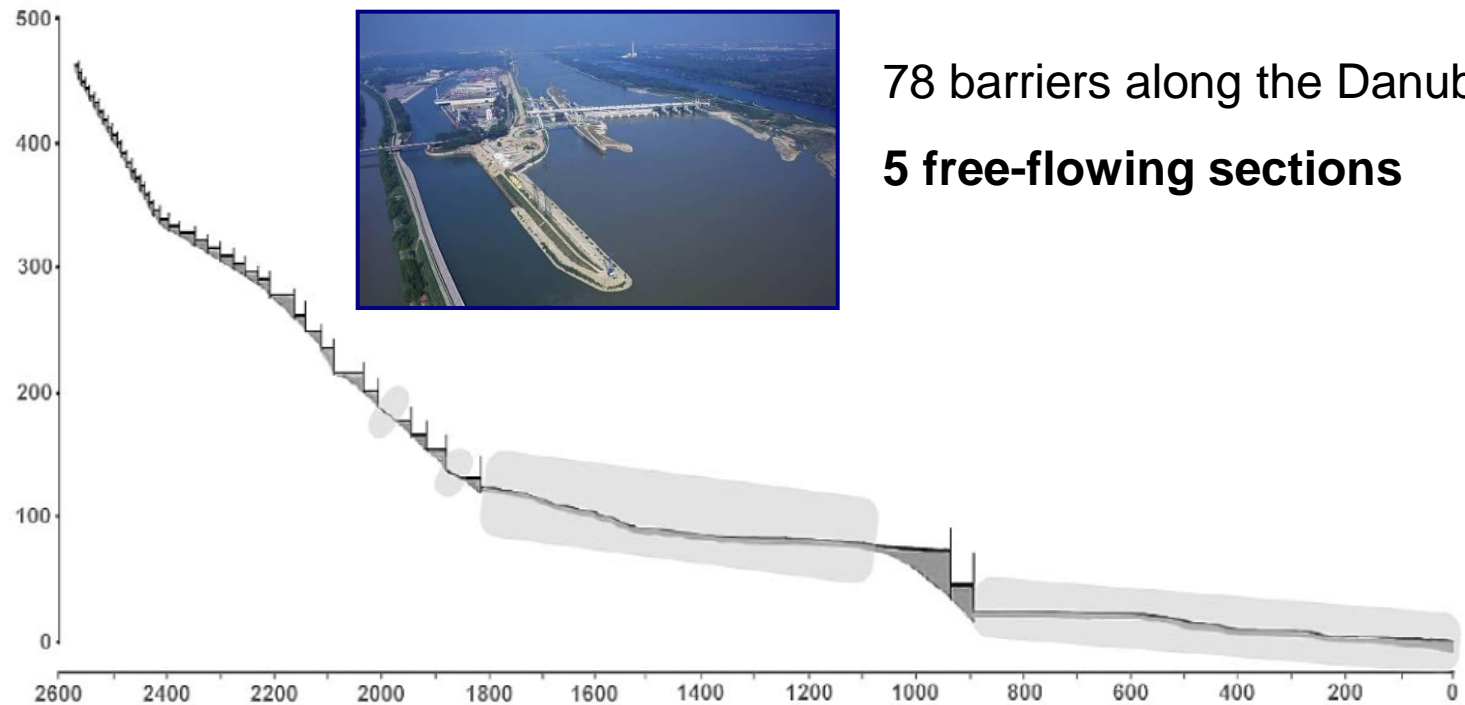
→ Navigation

→ Climate change

→ Changes in land use

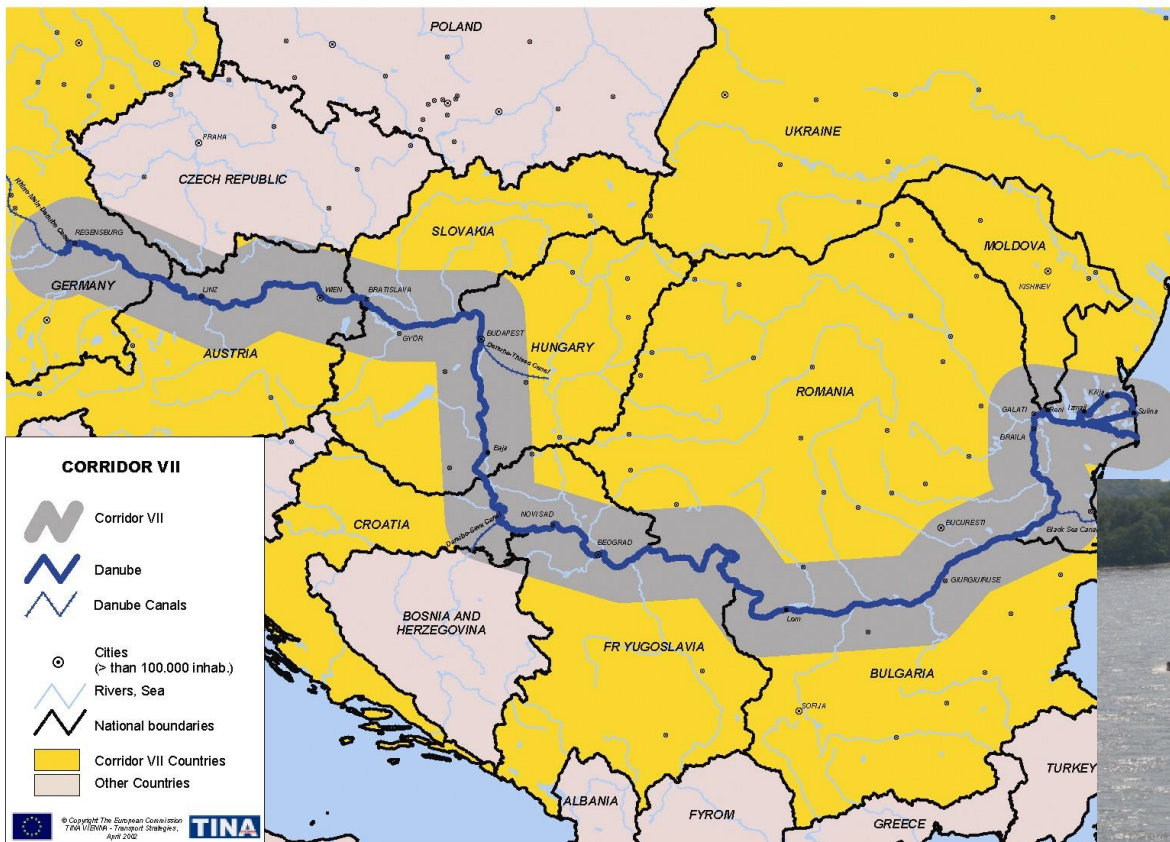
→ Point and diffuse source pollution

Hydropower-based Energy



International Waterway

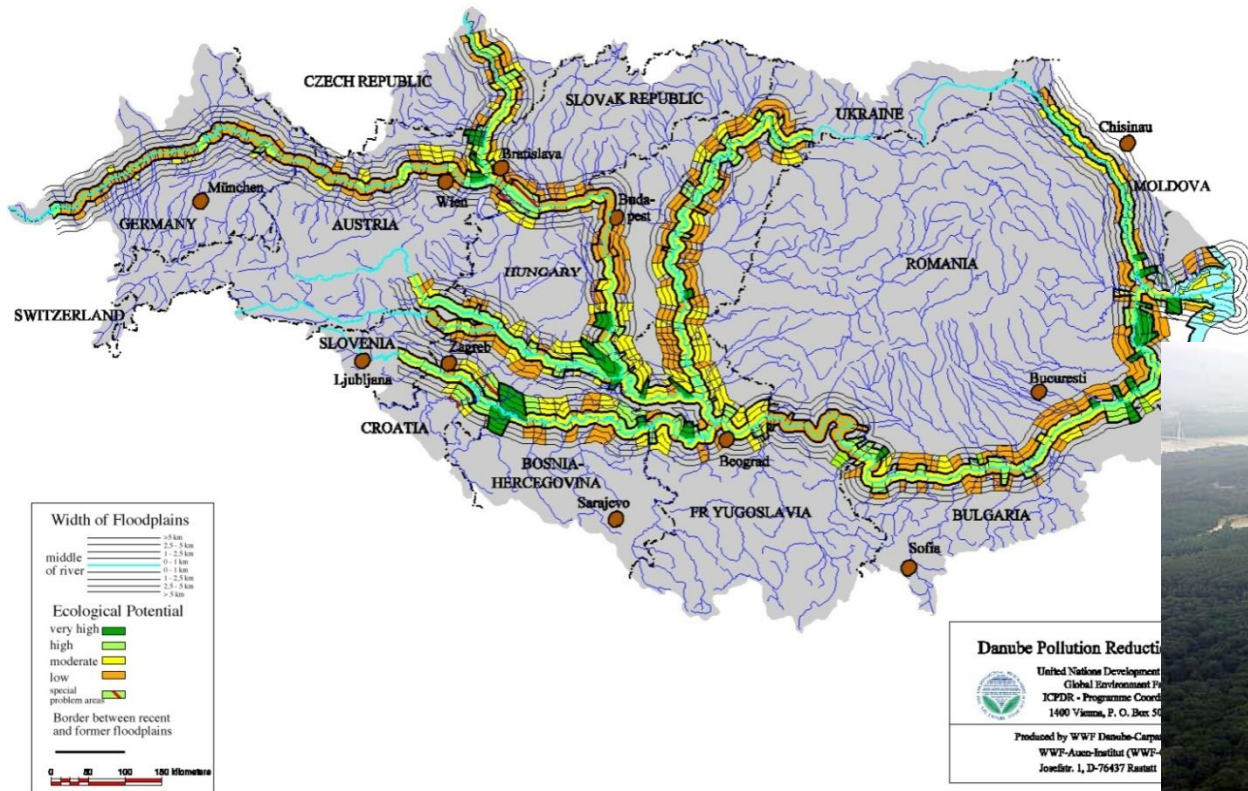
2411 km navigable
(Sulina-Kelheim)



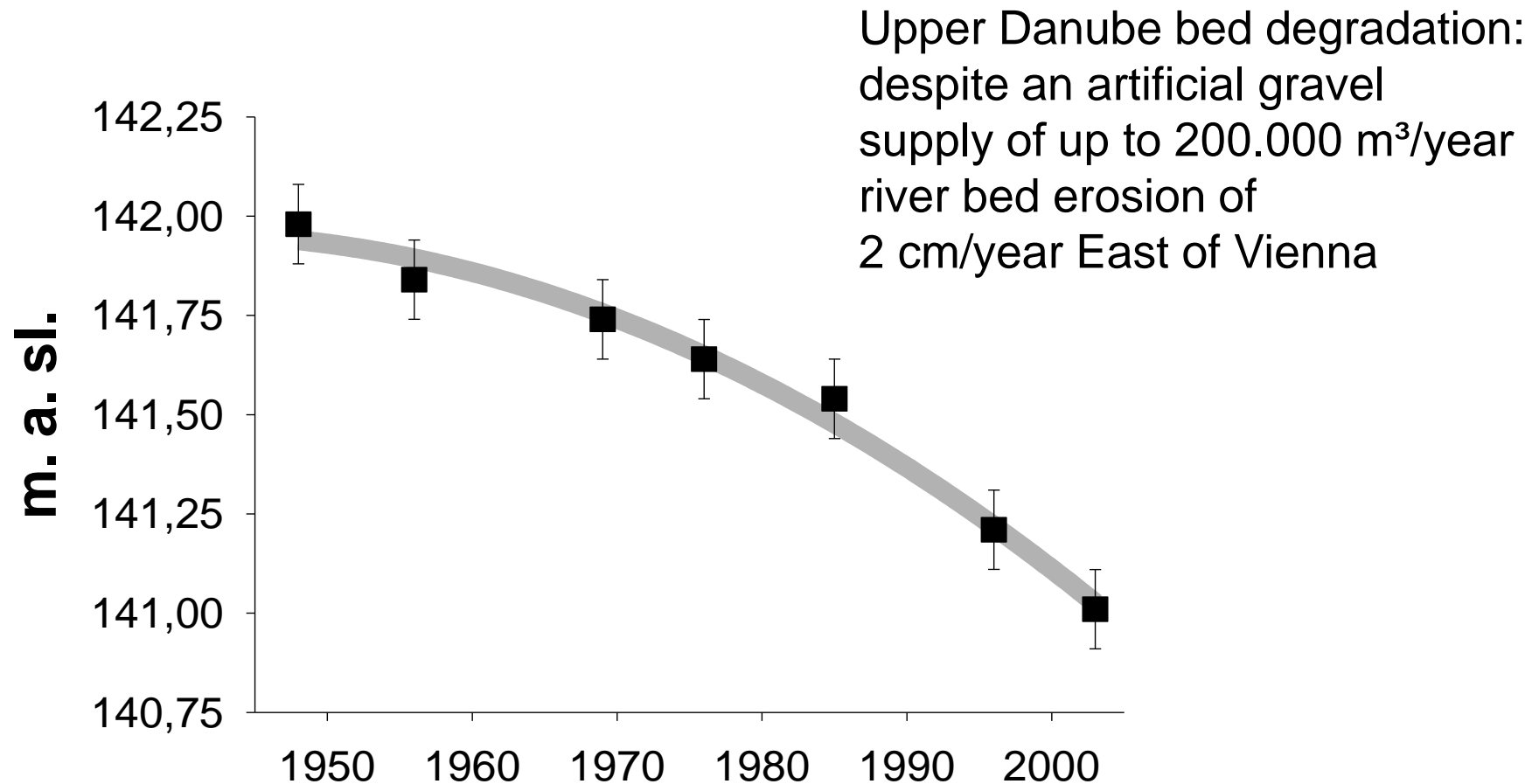
Flood protection, risk management

Ecological potential of floodplains in the Danube River Basin

Loss of 80 % of
the original
floodplain area

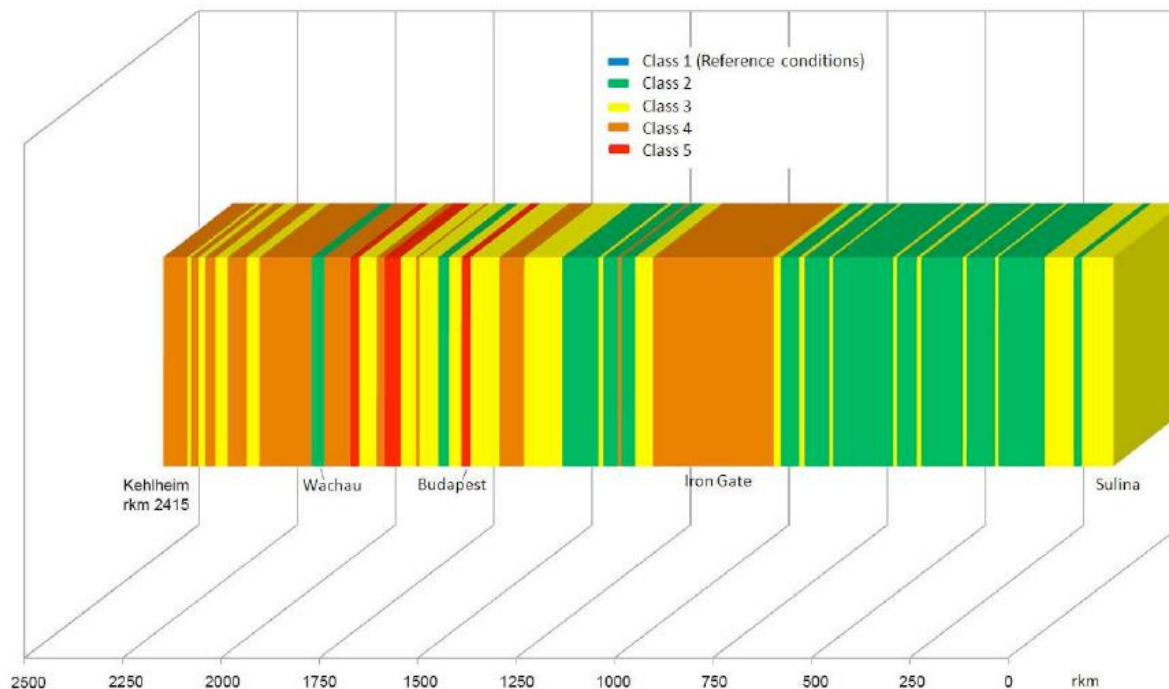


Consequences in the upper and also the middle Danube: **River Bed Degradation**



River Morphology

Overall hydromorphological assessment in five classes – longitudinal visualisation



1/3 good
hydromorphological
conditions

1/3 strongly altered

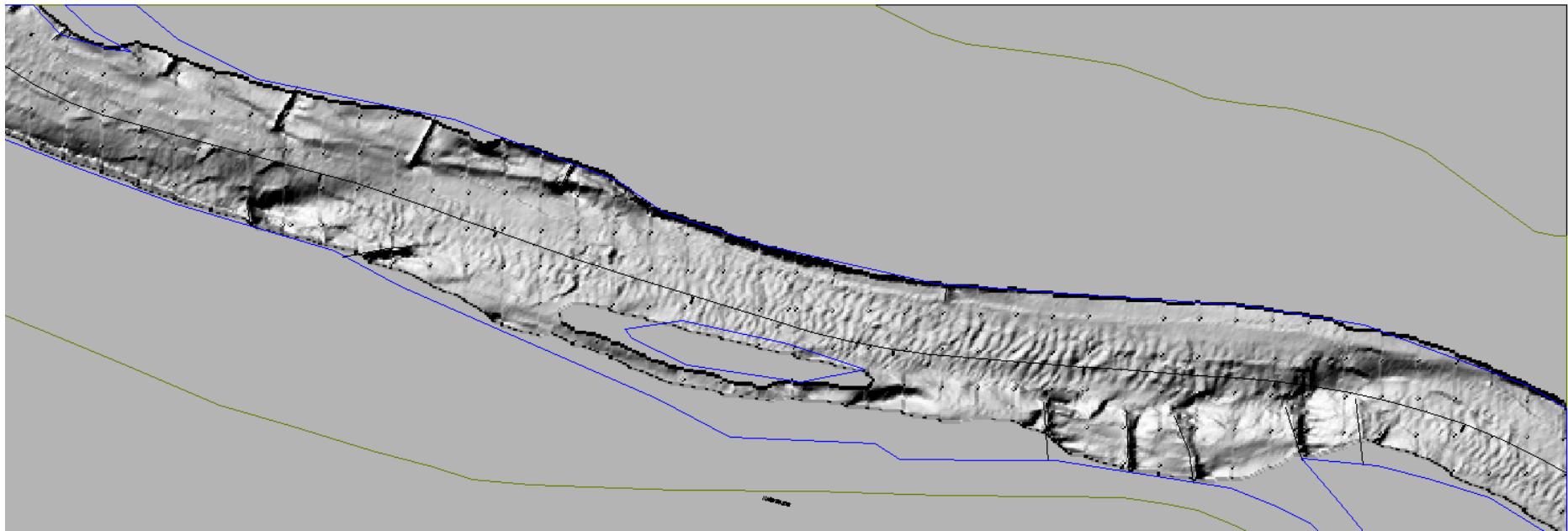
Upper Danube -
most affected by
significant
hydromorphological
changes

On the up-to-date technologies to reveal morphology and monitor its dynamic changes

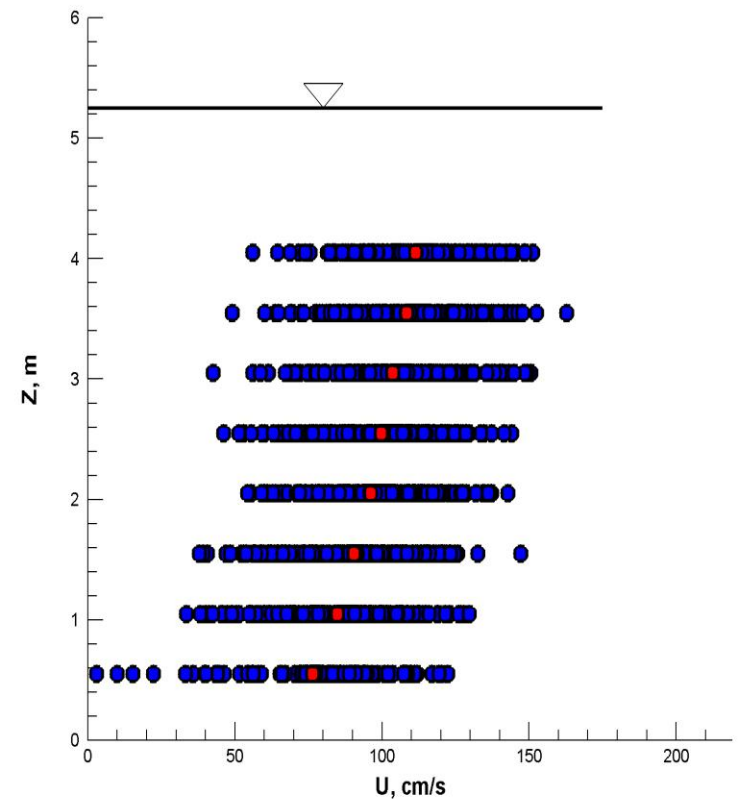
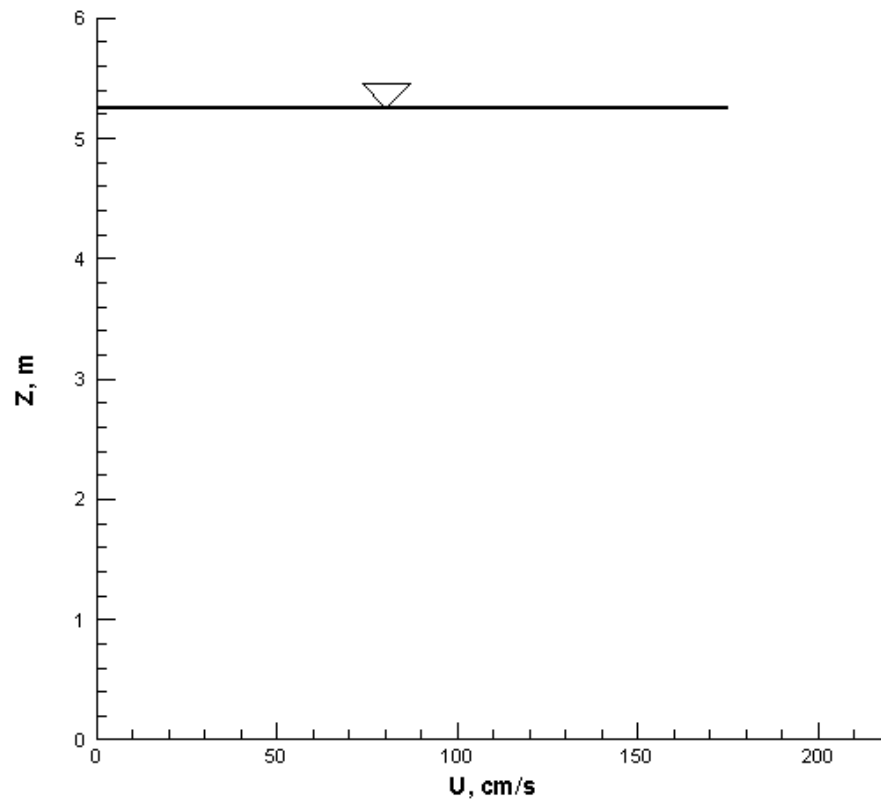
Main channel of River Danube between 1802-1792 rkm

Multi-Beam Echo Sounder to scan the bed surface
Part of the high resolution digital bed elevation model

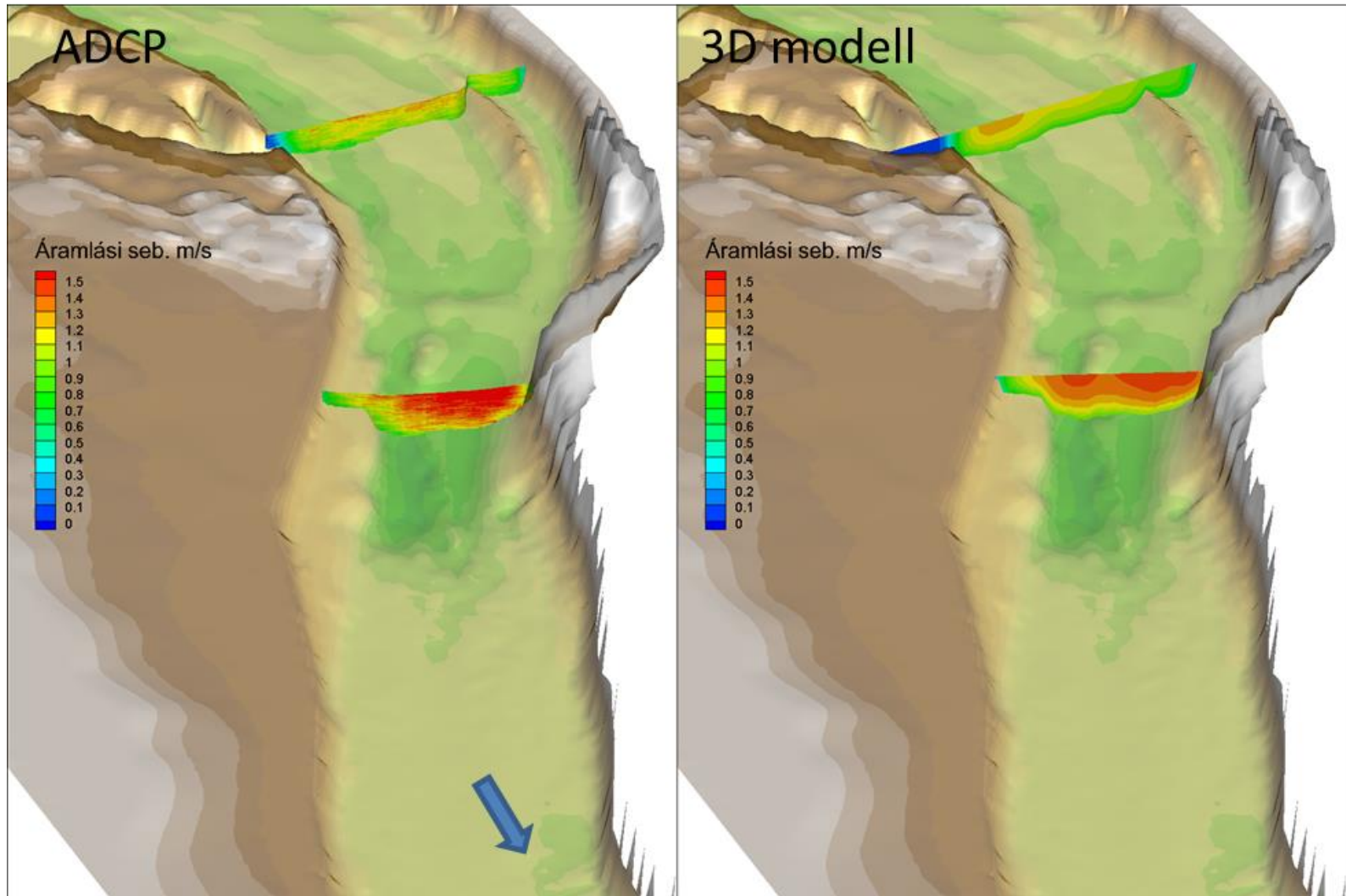
See complexity!



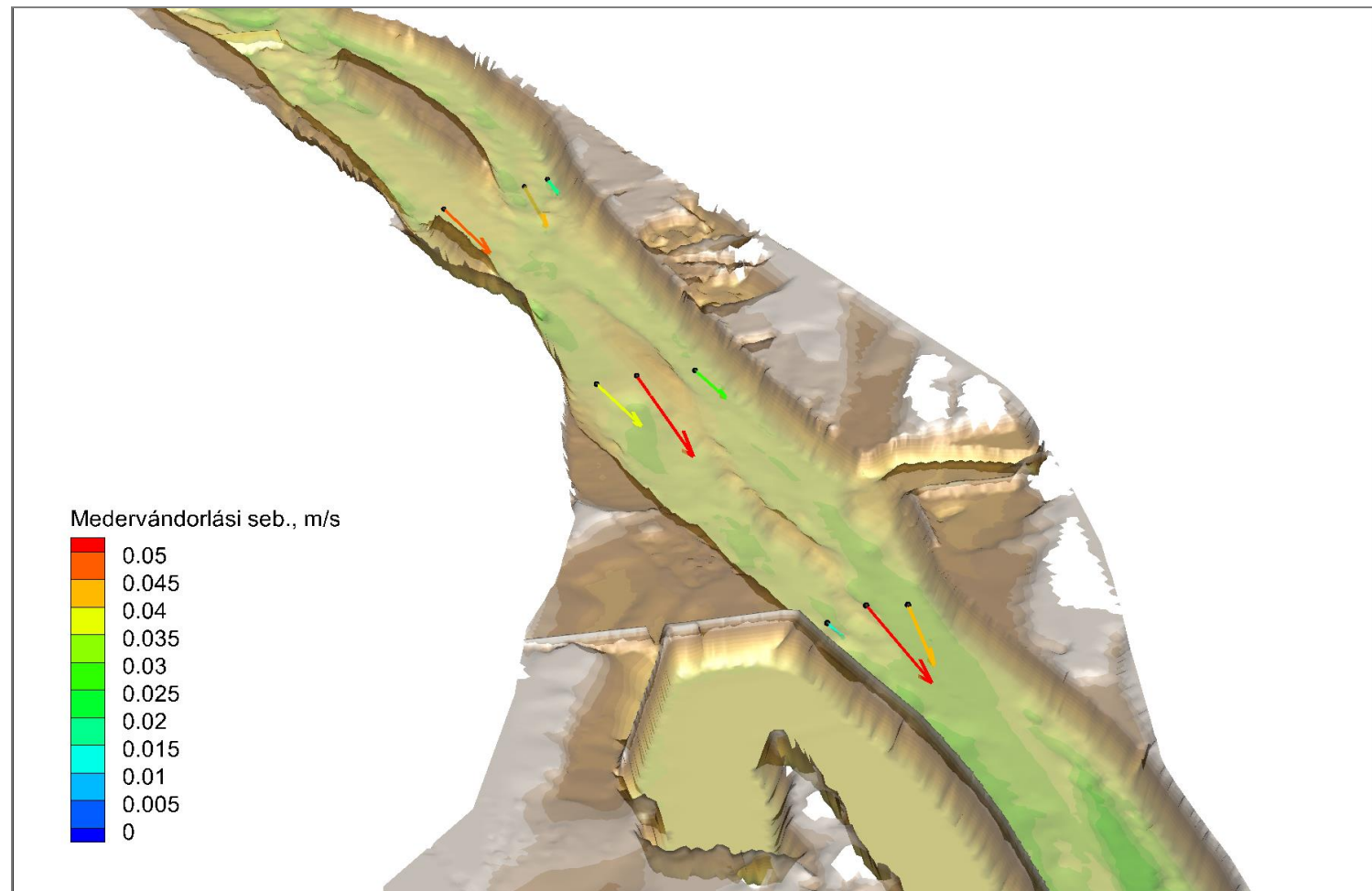
ADCP to measure velocity distribution and estimate bottom shear



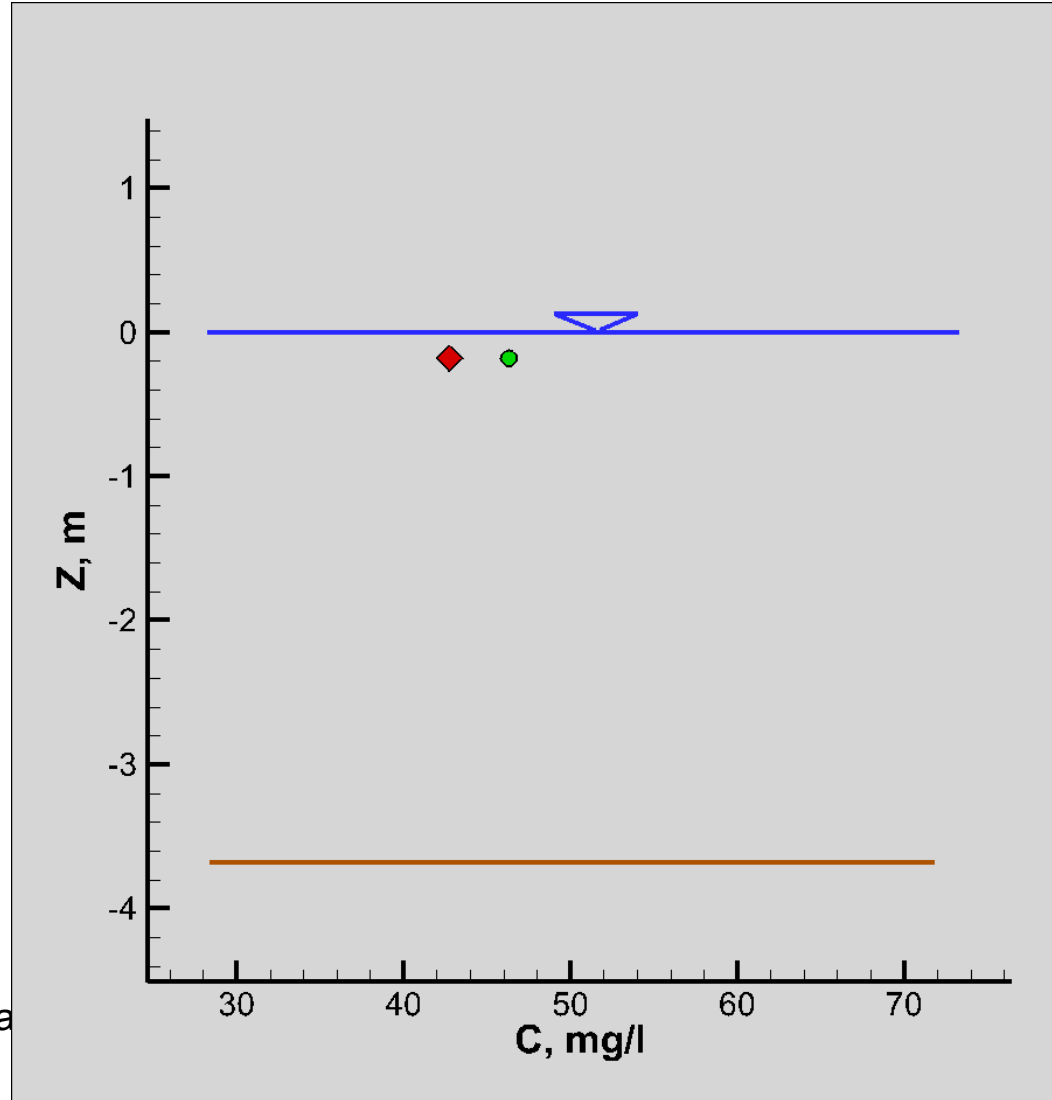
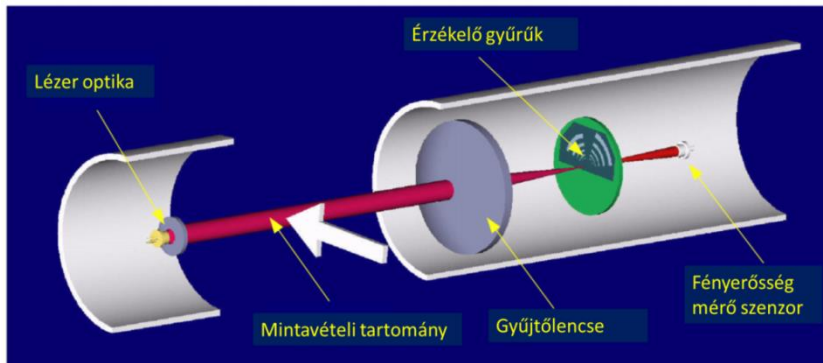
ADCP data used for 3D flow model calibration



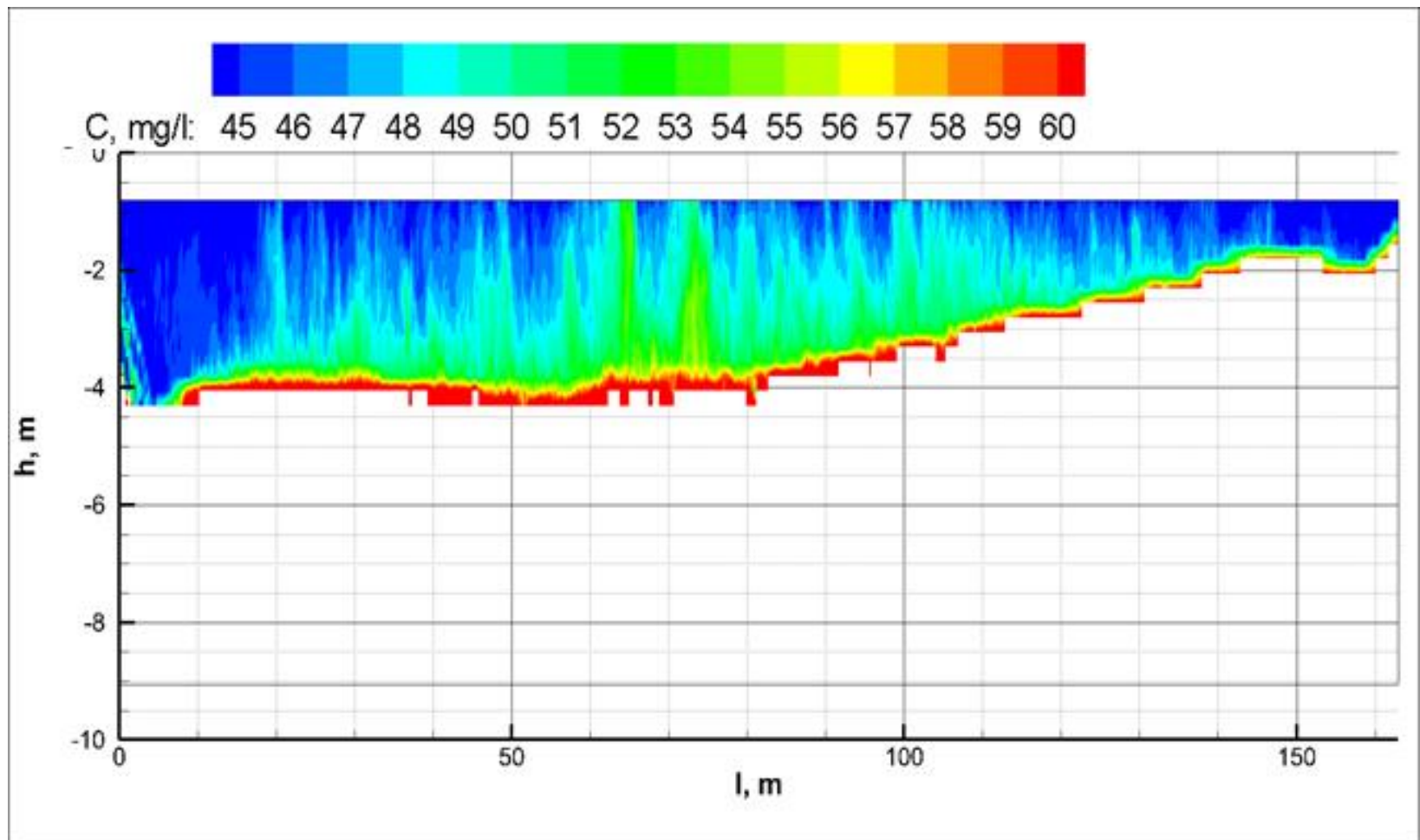
ADCP data to estimate bed surface sediment velocity



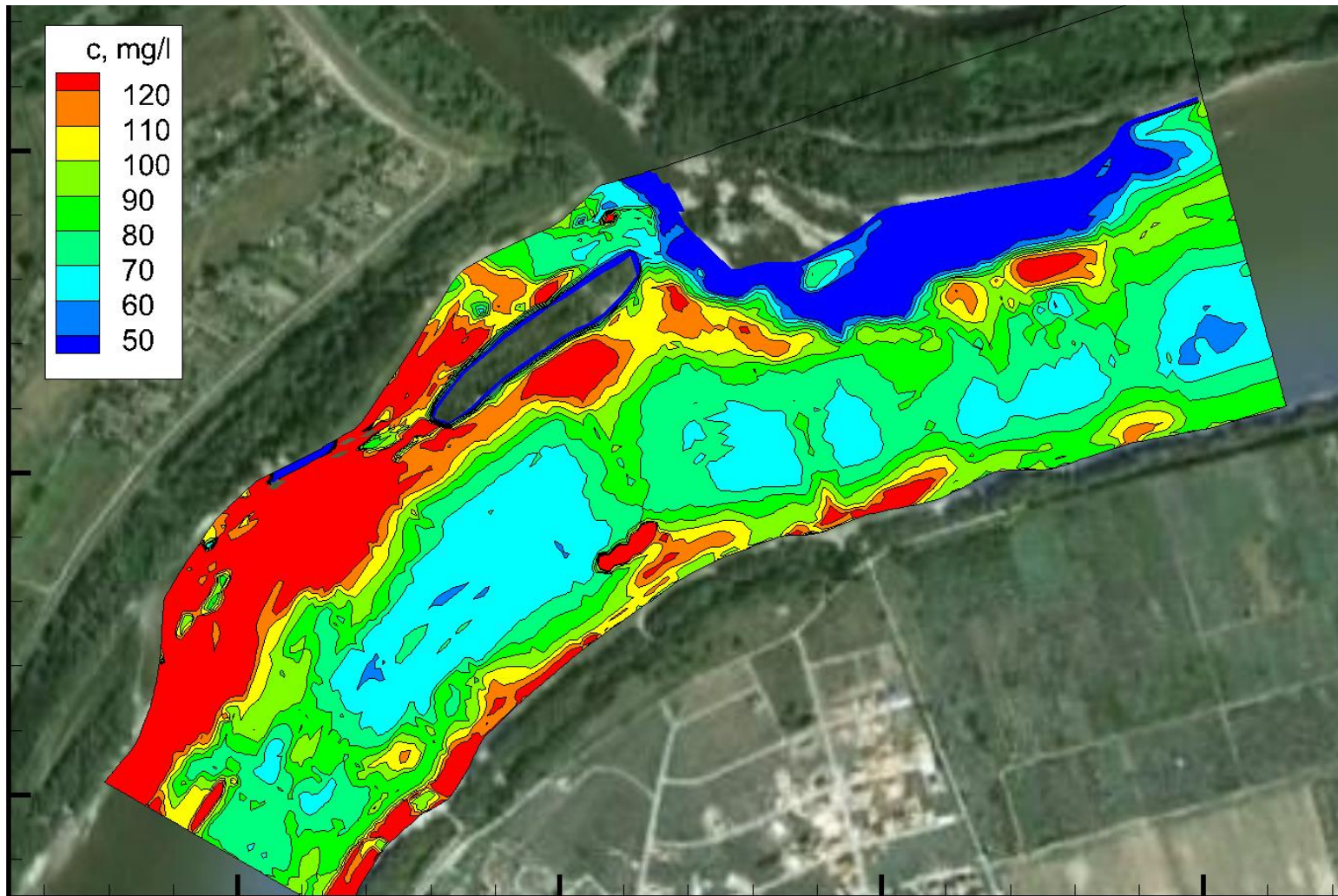
Laser-based technology to measure SSC



Laser-based estimation of the cross-sectional SSC field



Areal mapping suspended sediment distribution



Sampling the bed surface by freezer plates to see the undisturbed bottom composition

Fine gravel



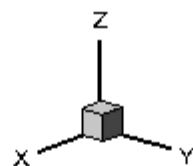
Mixed sediment



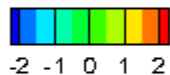
Armoured surface



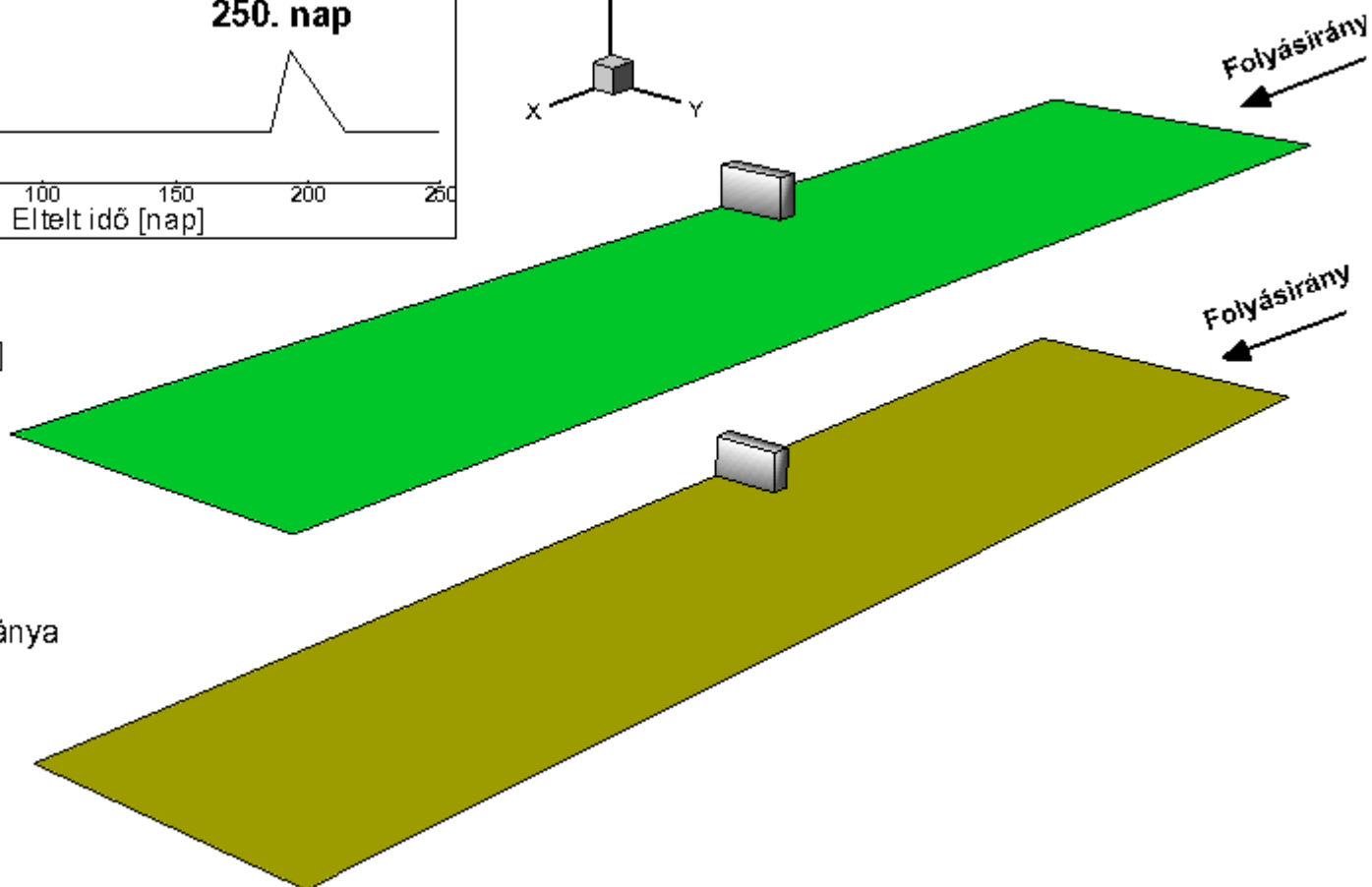
3D modelling of bed armouring and break-up processes



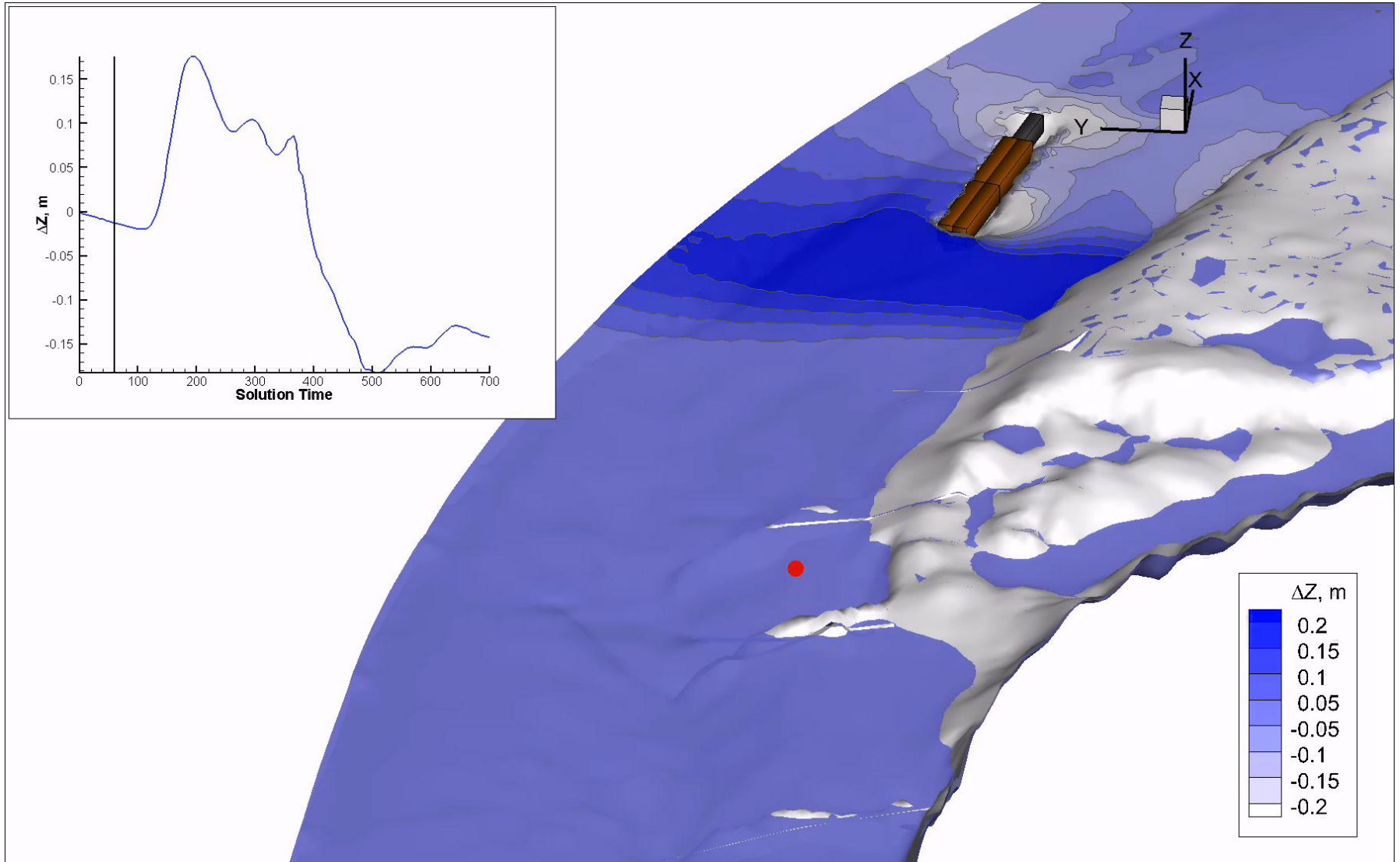
Mederváltozás [m]



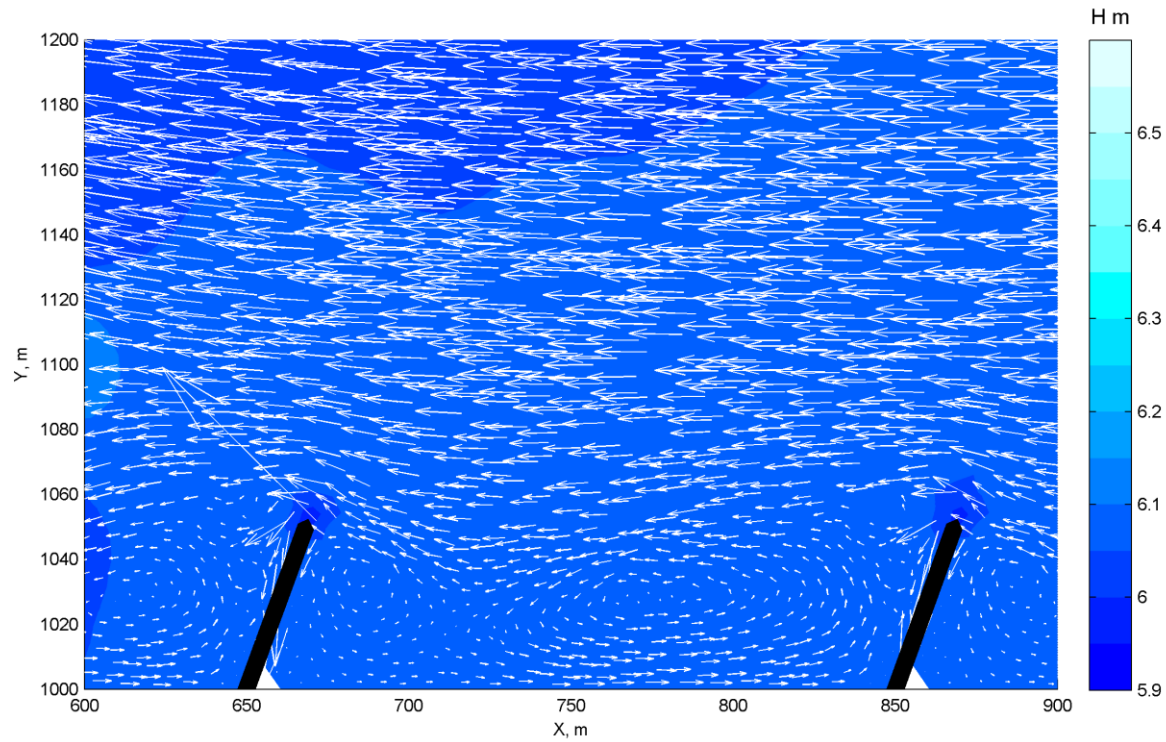
Kavicsfrakció részaránya



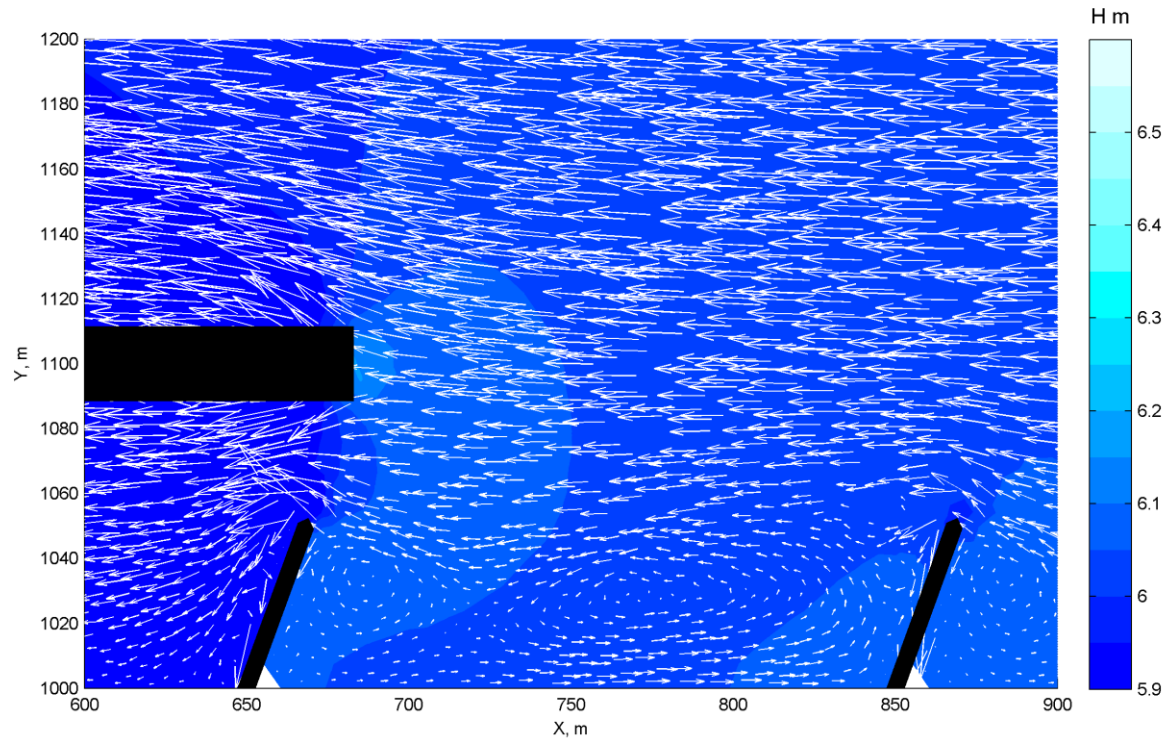
2D modelling bank erosion due to navigation (also affecting the near-shore habitat conditions)



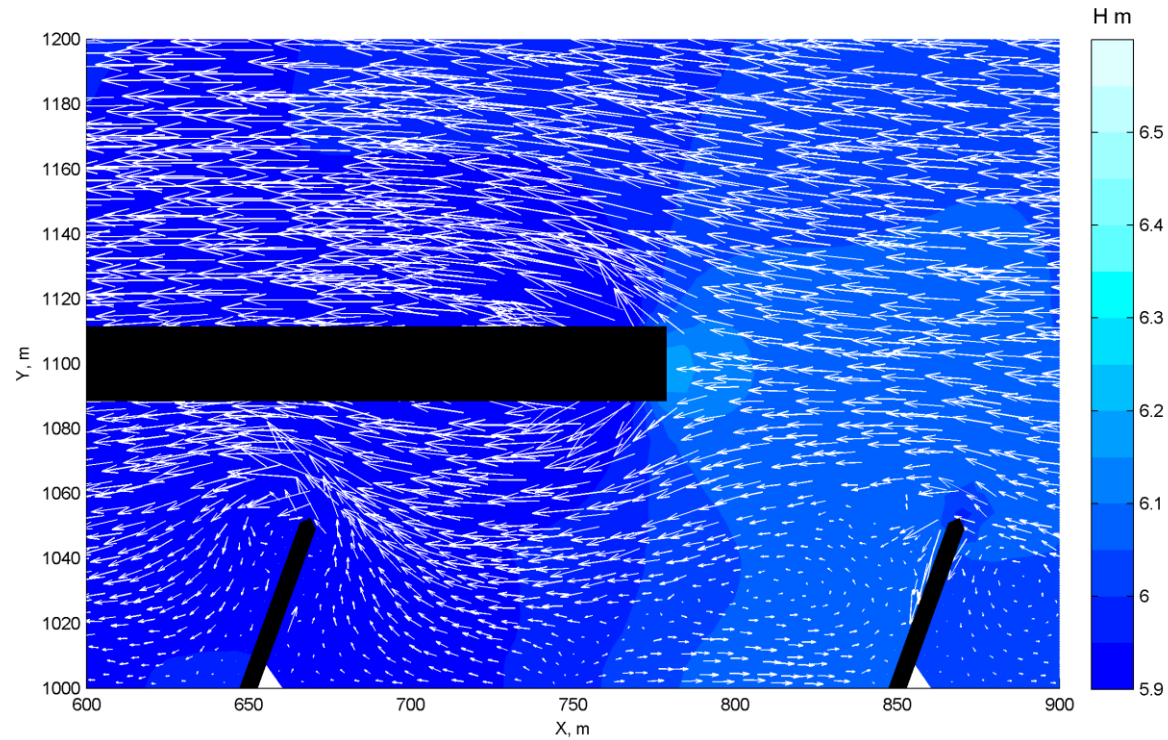
Impact on groyne field flushing and sedimentation



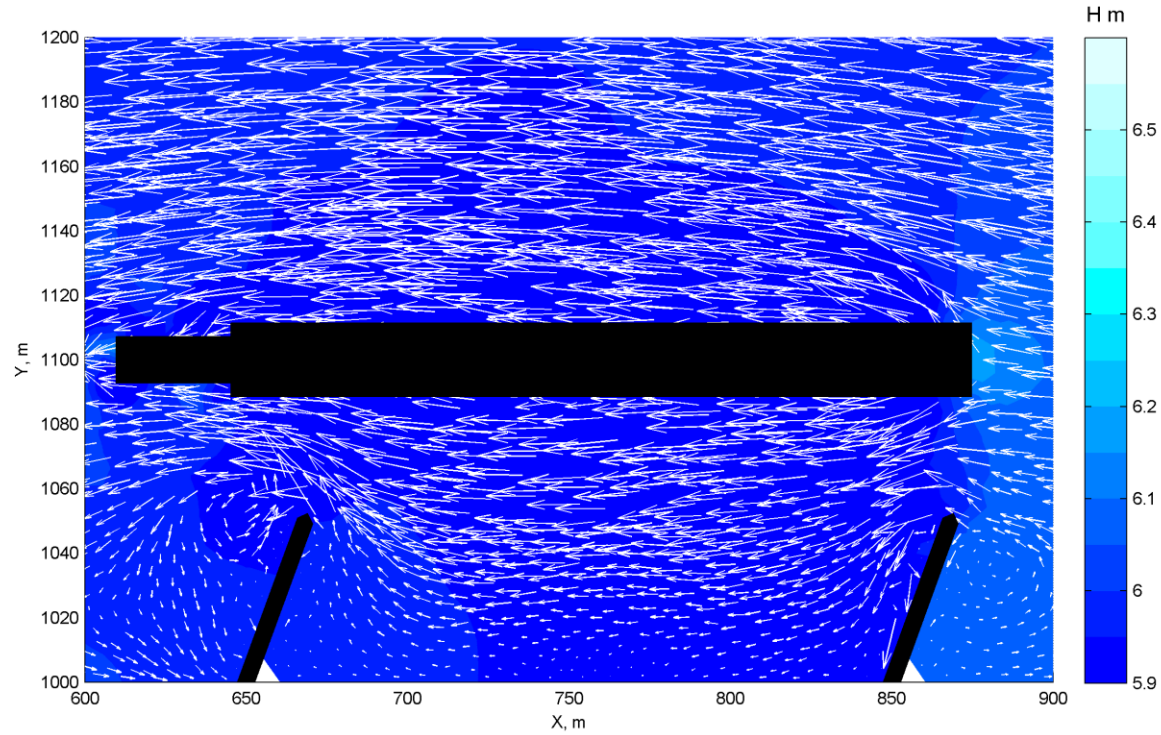
Impact on groyne field flushing and sedimentation



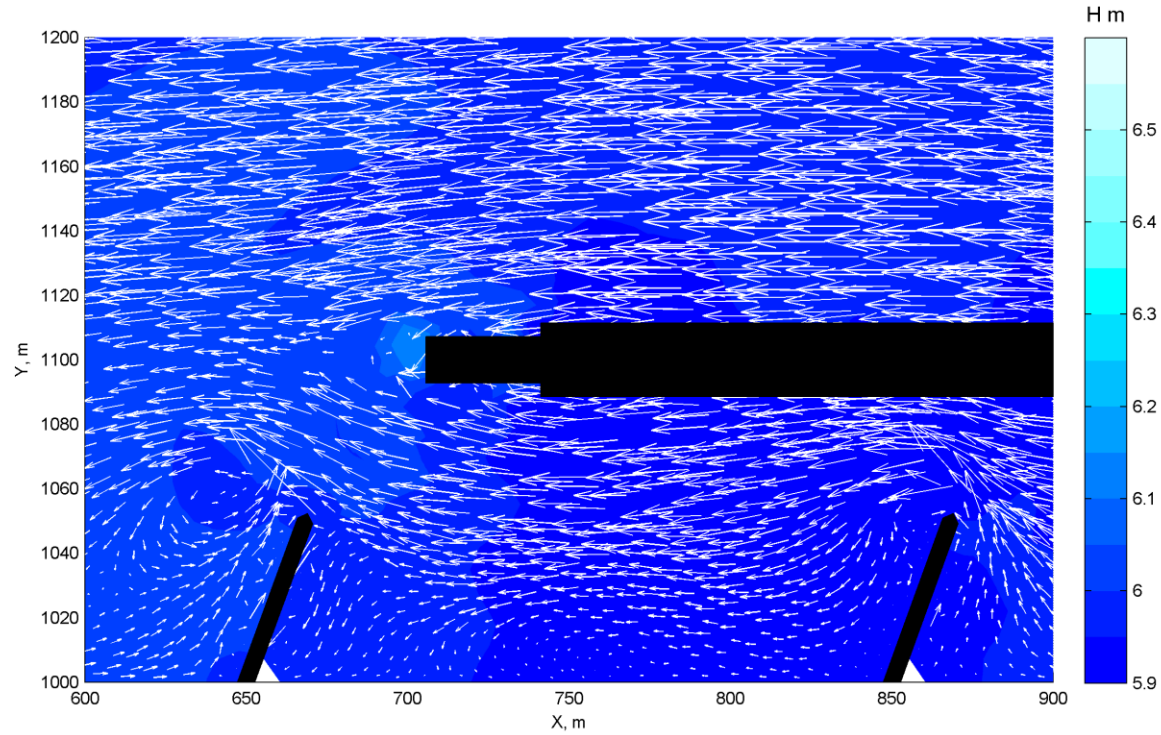
Impact on groyne field flushing and sedimentation



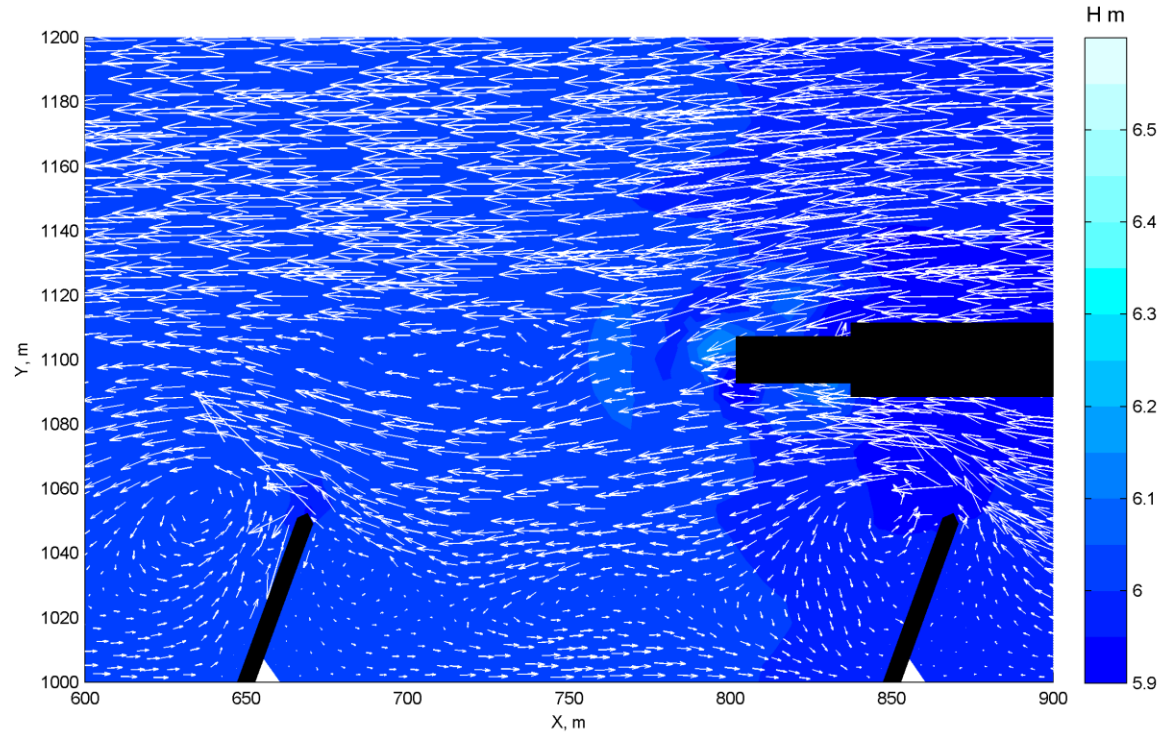
Impact on groyne field flushing and sedimentation



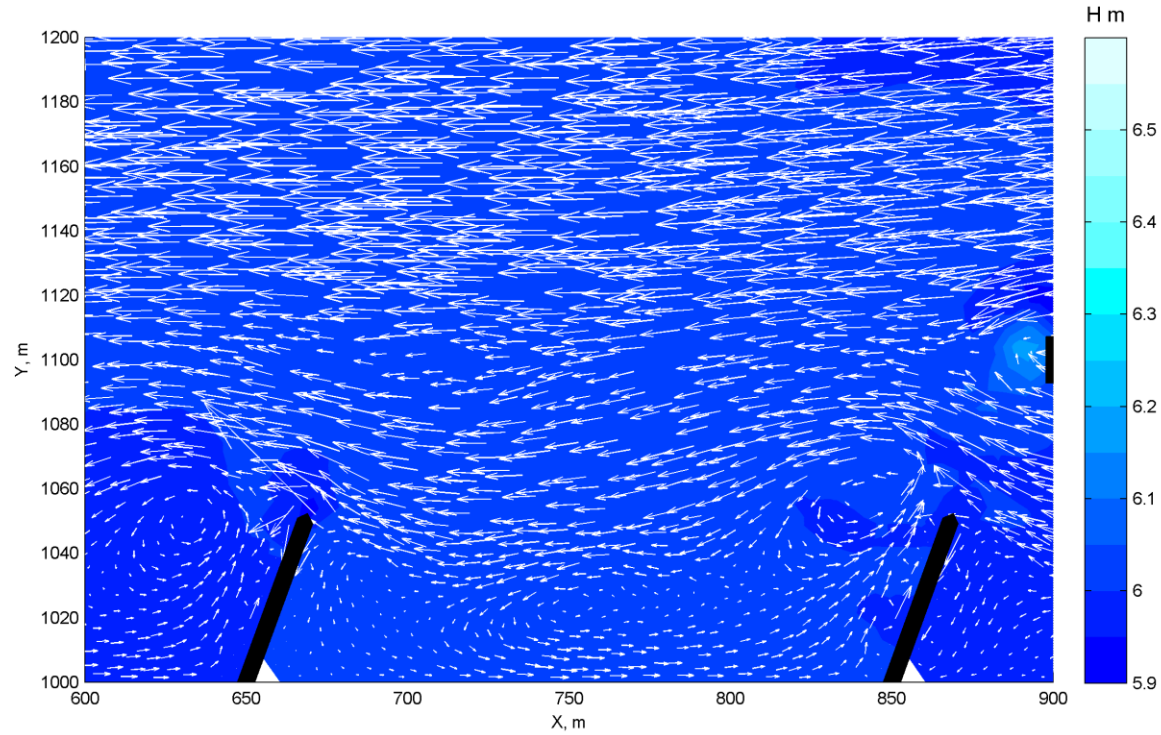
Impact on groyne field flushing and sedimentation



Impact on groyne field flushing and sedimentation



Impact on groyne field flushing and sedimentation



Some ongoing projects and future project initiations

SEDDON (Austro-Hungarian CBC)

DuReFlood (Hungaro-Slovakian CBC)

Future updating of the former SEE proposal (basin-wide)

Danube River REsearch And Management
DREAM (basin-wide)

Example: DREAM

Aims

- ➡ Building two adequate hydraulic laboratories, substantially improving existing laboratories
- ➡ Improving computer based simulations
- ➡ Establishing field study sites for model calibration and validation
- ➡ Improving scientific progress by building cooperation with research institutions along the Danube River
- ➡ Transferring Basic Research to Knowledge Society