Morphological impacts on flood peak damping (assessment with the FEM-Method)

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Overview

1. Introduction and current situation
2. Objectives
3. Methods
4. Catchment area
5. Results
6. Discussion
7. Conclusion
Introduction and current situation

EU-floods directive → preservation and restoration of natural inundation areas

Daily consumption of land for construction and traffic

Percentage of construction and traffic areas of the potential permanent settlement area

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Objectives

- Testing and improving of a method to evaluate and compare floodplains.
- Qualitative assessment of floodplain retention effectiveness
- Support for land use planning
**FEM-Methode**

**HYDROLOGY**
- Parameter: Flood peak reduction ($\Delta Q$)
- Parameter: Flood wave translation ($\Delta t$)

**HYDRAULICS**
- Parameter: Waterlevel (WSP)
- Parameter: Flow velocity ($v$)
- Parameter: Shear stress ($\tau$)
- Parameter: Specific discharge

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Danube catchment

Investigation area

(Shannon, 2010)
Catchment area

Catchment area of the river Mur

Length: 300 KM
Catchment: 10,000 KM²

(Internationales Hochwasserprognosemodell Mur)

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Results Hydrologic effect

Floodplain map

\[ \Delta Q = 2.1 \, \text{m}^3/\text{sec} \]
\[ \Delta T = 34 \, \text{min} \]

\[ \Delta Q = 0.3 \, \text{m}^3/\text{sec} \]
\[ \Delta T = 11 \, \text{min} \]
Results Hydrologic effect DQ

Absolute peak reduction [m³/s]

Positioning at the river [KM]

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Results Hydrologic effect DQ
Results Hydrologic effect DQ

Percentage of the cumulative effect of peak discharge

95% of the cumulative effect
5% of the cumulative effect

Positioning at the river [KM]
Results Hydrologic effect Dt

Flood wave translation

Discharge

Time

15 min threshold


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Results Hydraulic effect

Floodplain map
Results Hydraulic effect

Water level difference

Positioning at the river [KM]

W. l. difference [m]

10 cm boundary
Intersection of Hydrological and Hydraulic parameters

<table>
<thead>
<tr>
<th>Hydrology</th>
<th>Hydrologic</th>
<th>W - Level</th>
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The „better“ parameter decides

Should be preserved

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Intersection of Hydrological und Hydraulic parameters

<table>
<thead>
<tr>
<th>Positioning at the river</th>
<th>Peak dis. Reduction</th>
<th>Temporal translation</th>
<th>Water level change</th>
<th>Assessment</th>
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<td>$\Delta t$</td>
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Discussion

**Floodplain size**

**Relative peak discharge reduction**

**Floodplain 395_01L**

**Floodplain 358_01L**

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Conclusion

• The method can be used in everyday practice
• Qualitative assessment of floodplain retention effectiveness
• Support for land use planning
Thank you for your attention!
Daniel Haspel

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Discussion