

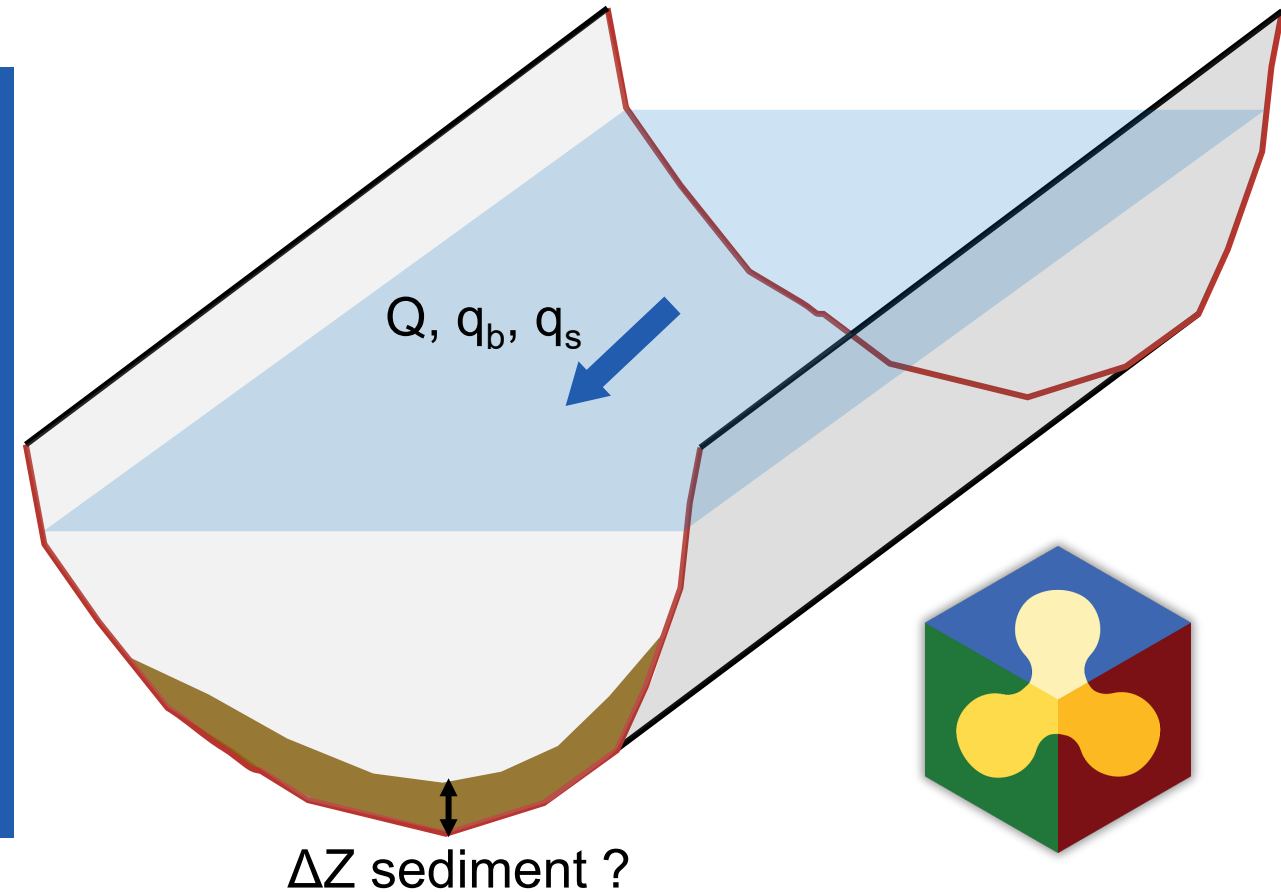
Dynamic sediment distribution in 1D cross-sections

BASEMENT Users Meeting 2025

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30th Jan 2025



Sediment distribution in Standard Version

Terminology

Bottom Range

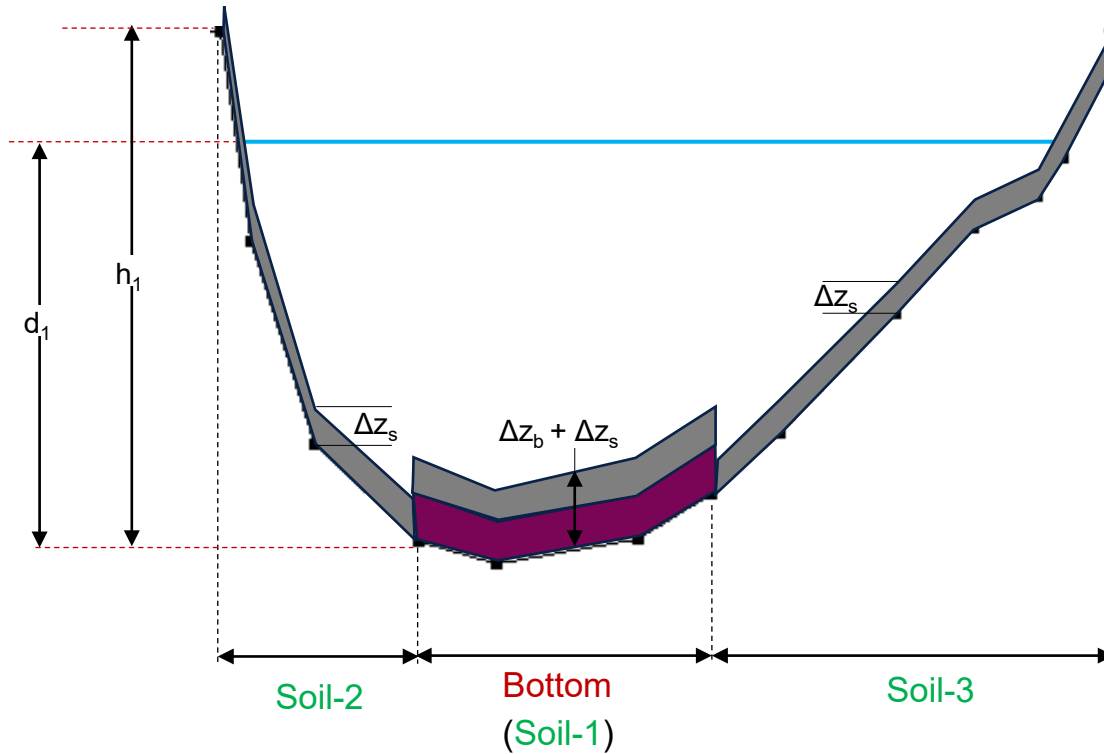
- Fixed range for bedload sediment distribution

Soil Ranges

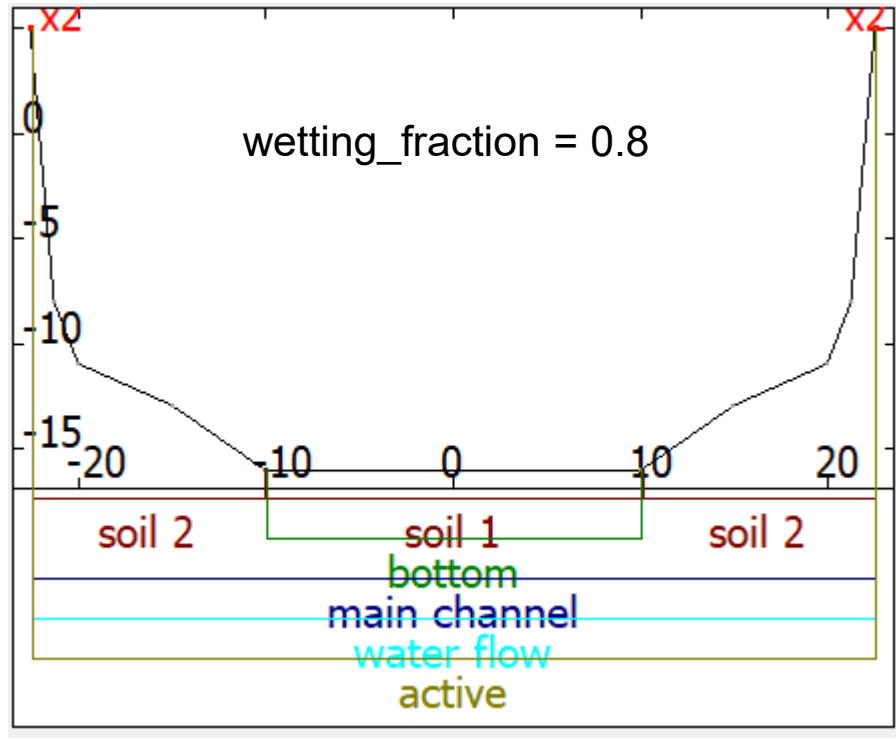
- initial sediment thickness
- initial sediment composition
- fixed range for suspended sediment distribution depending on wetting_fraction

wetting_fraction

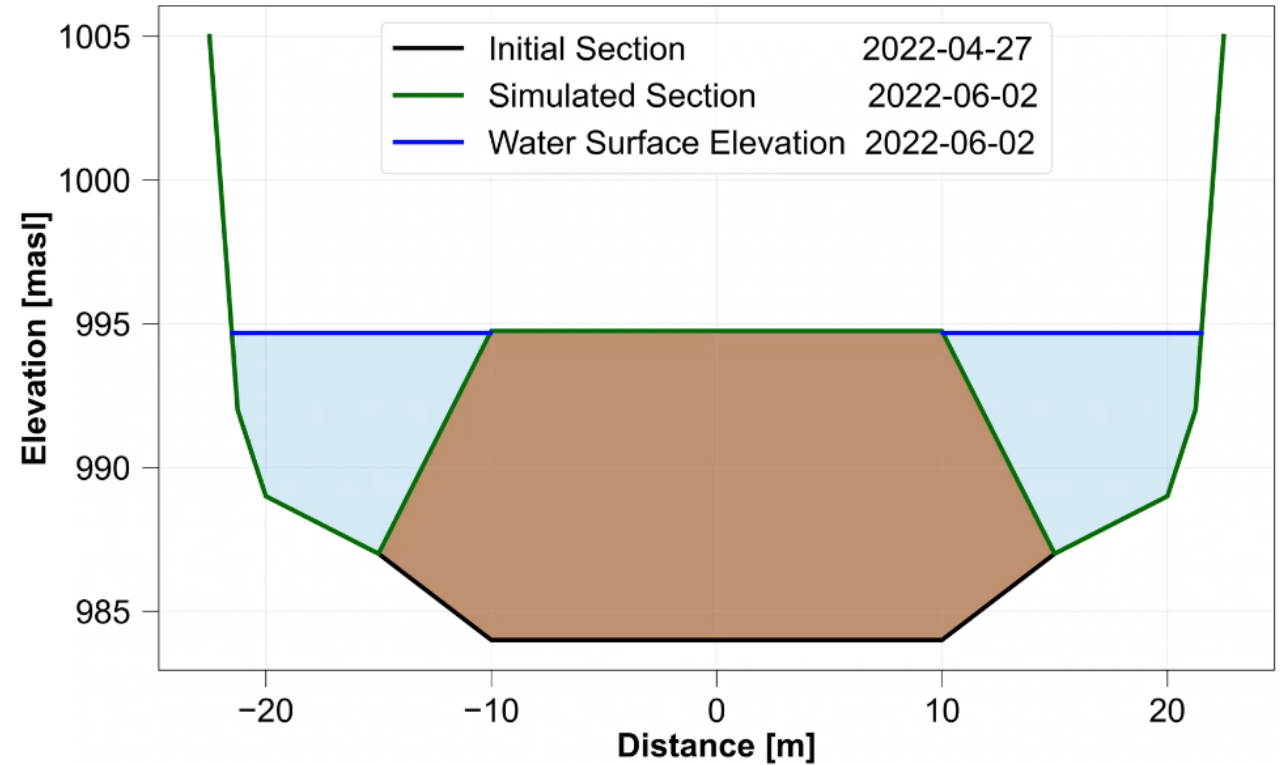
if $\frac{d_1}{h_1} > \text{wetting_fraction} \rightarrow \text{Soil} - 1 \text{ is } \text{wet}$
else $\rightarrow \text{Soil} - 1 \text{ is } \text{dry}$



Testcase-I : Sediment distribution in Standard Version

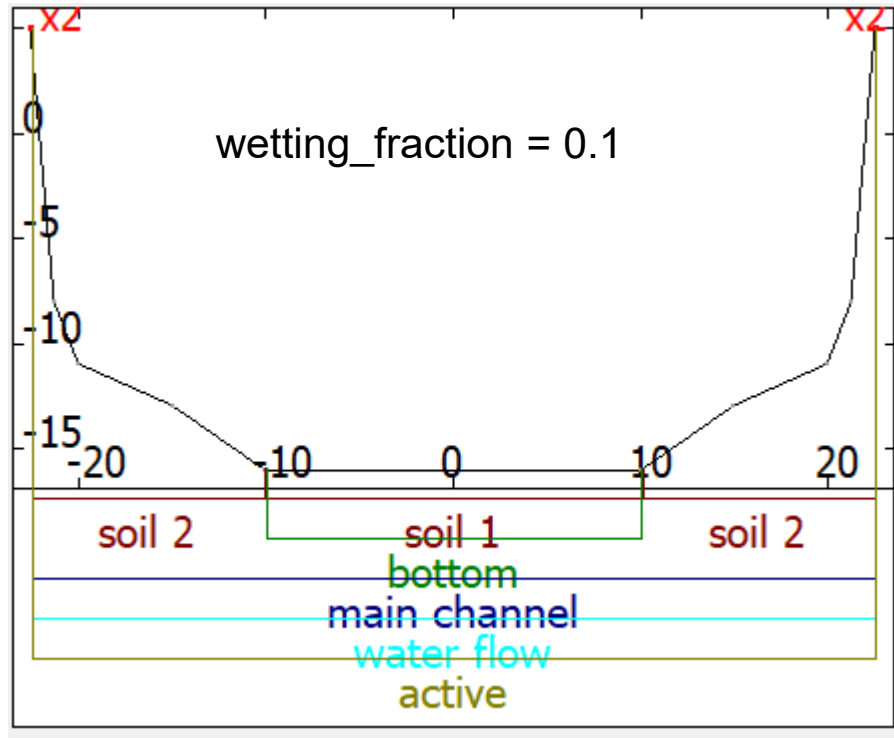


Setup

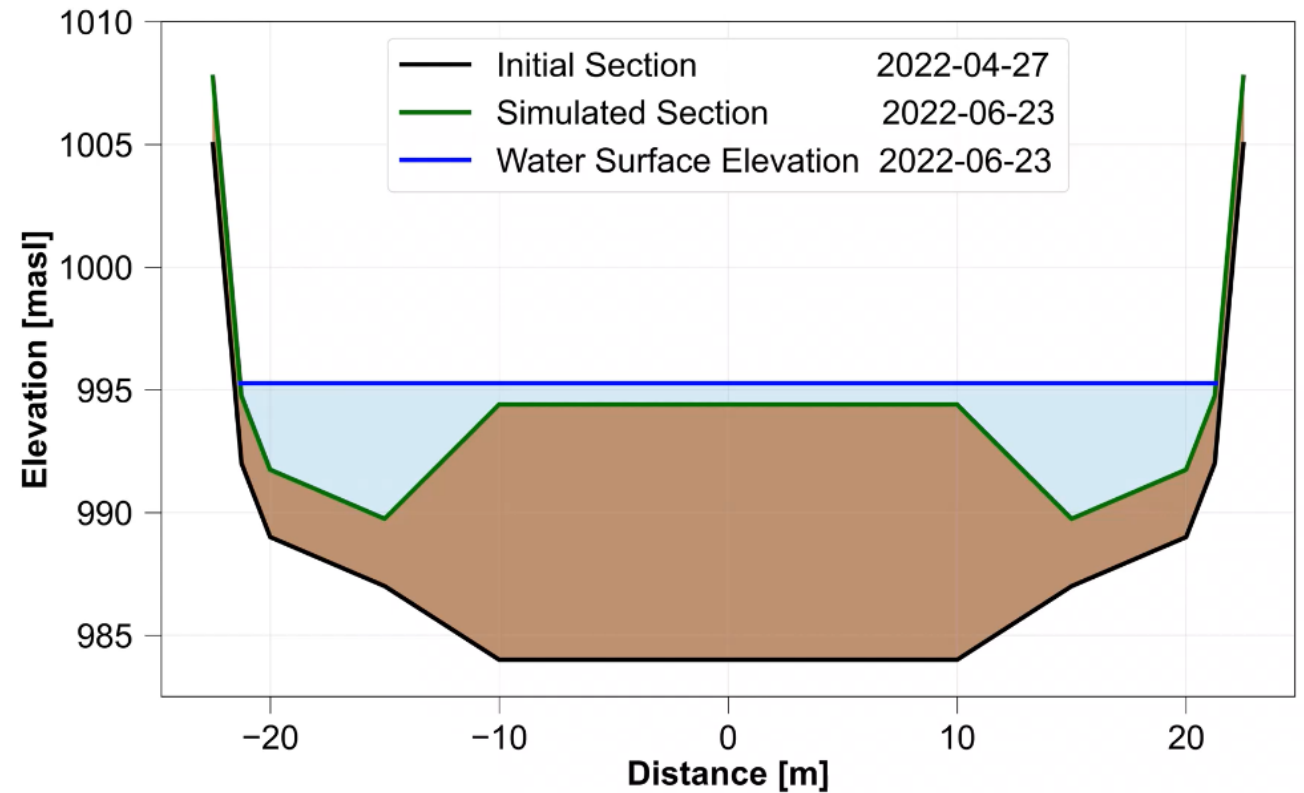


Result

Testcase-II : Sediment distribution in Standard Version



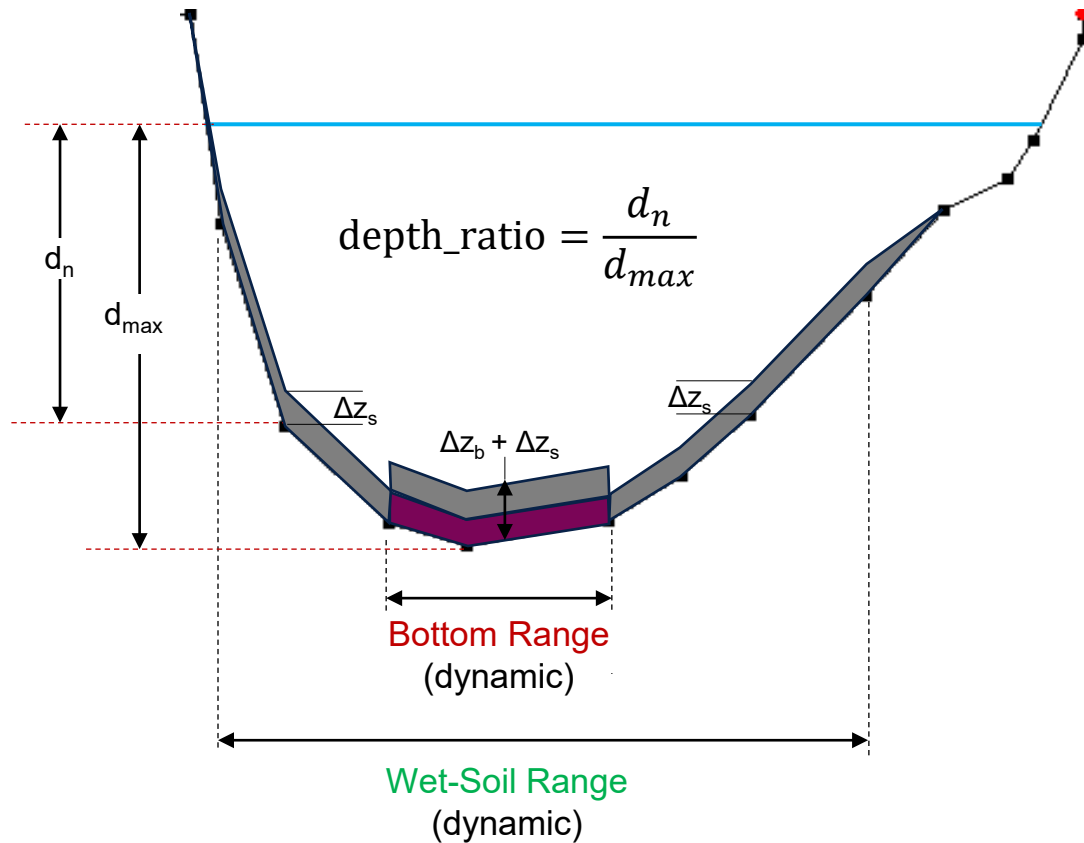
Setup



Result

Sediment distribution in Revised Version (Basis)

Terminologies



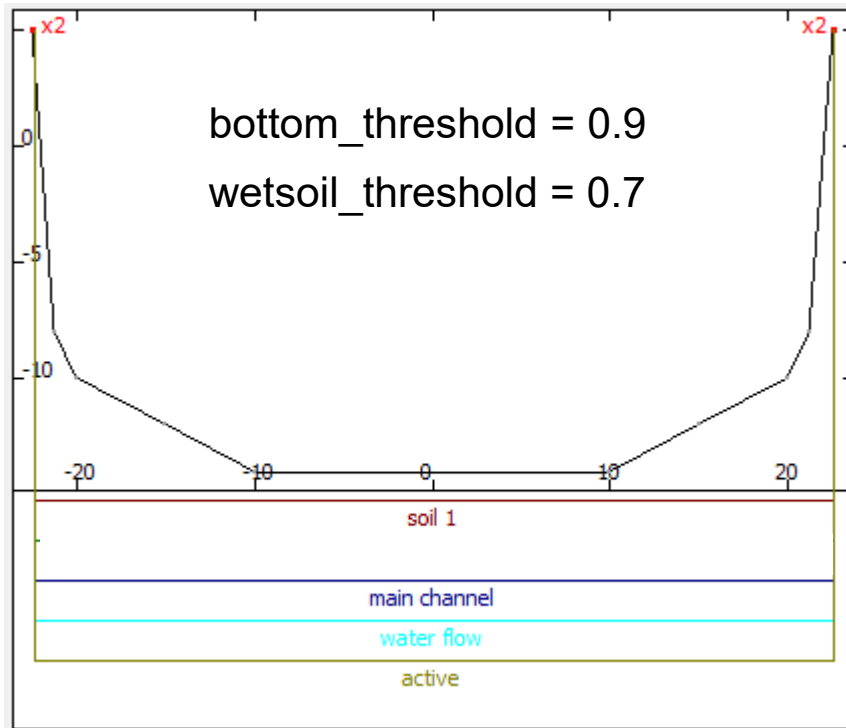
Bottom Range

- Bedload sediment is distributed within this range
- Dynamically updated during simulation
- If $depth_ratio > bottom_threshold$: node n belongs to bottom range

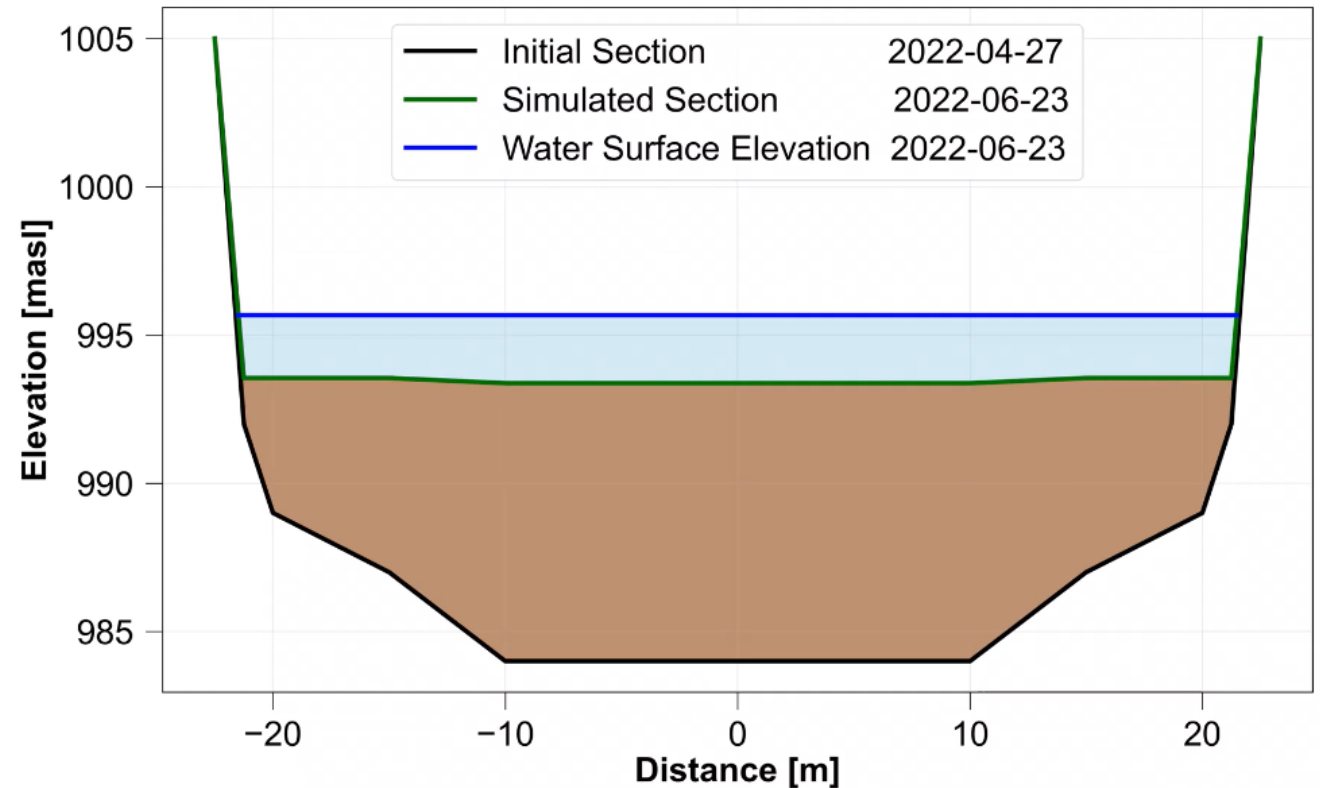
Wet-Soil Range

- Suspended sediment is distributed within this range
- Dynamically updated during simulation
- If $depth_ratio > wetsoil_threshold$: node n belongs to wet-soil range

Testcase: Sediment distribution in Revised Version



Setup

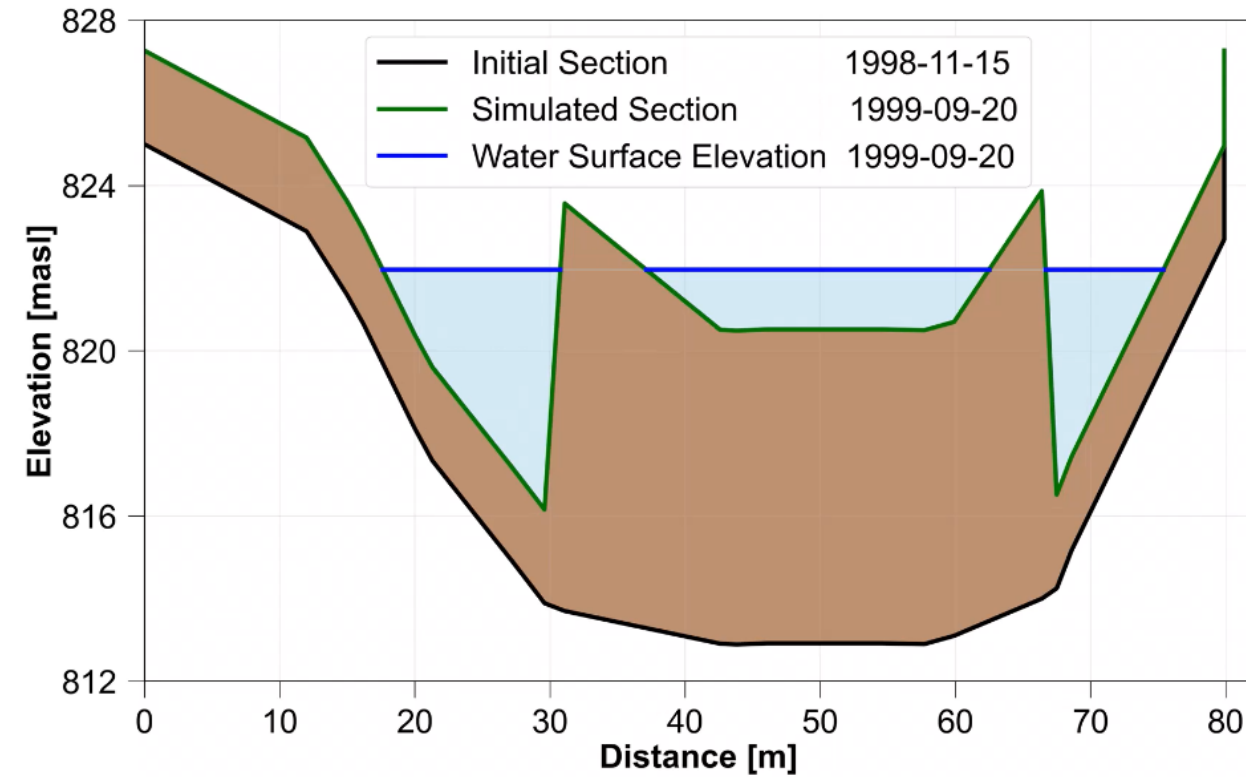


Result

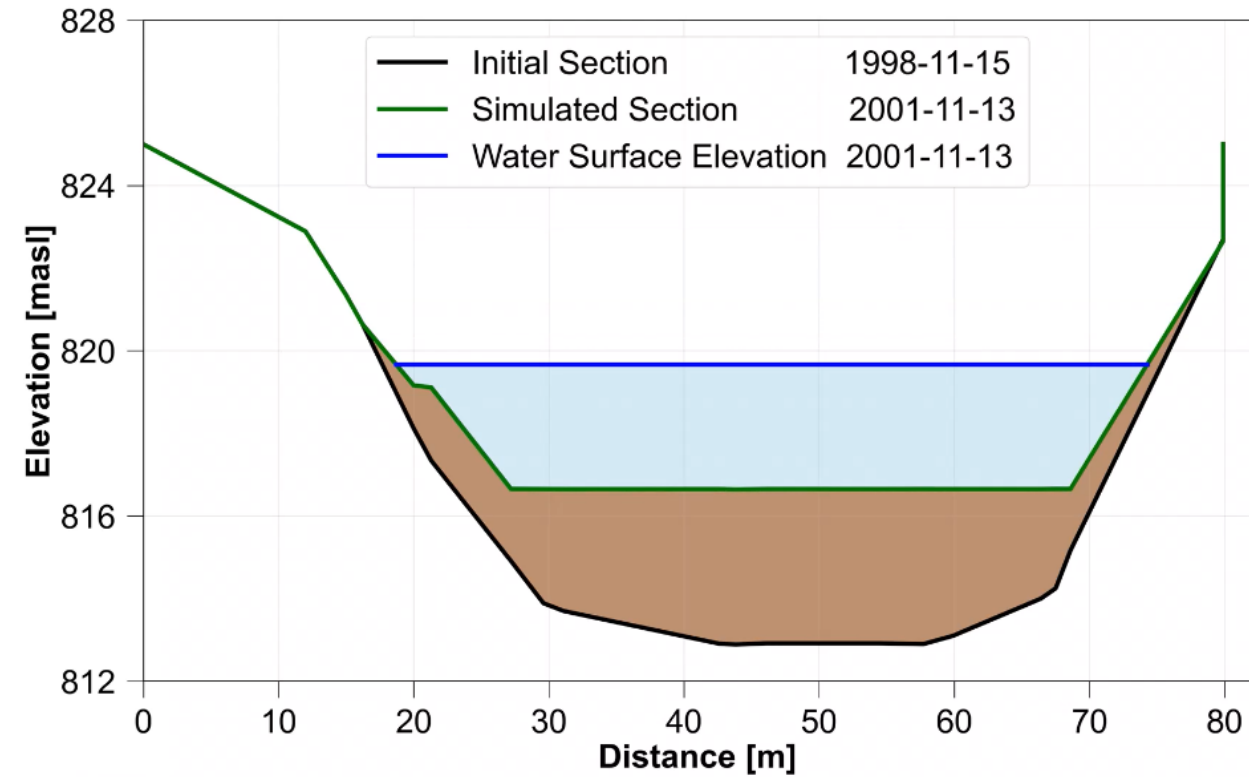
Summary

Process / Parameter	Standard Version	Revised Version
Bottom Range	Static range: not suitable for high amplitudes of deposition/erosion	Dynamic range: more realistic cross-section evolution under big deposition/erosion
Soil Range	Static range	Dynamic range
Deposition in dry nodes	Possible	Not possible
Deposition in left and right extreme nodes	Possible	Not possible
Mass conservation	Bedload is conserved; suspended load is not fully conserved	Both bedload and suspended load are fully conserved

Case study: Solis reservoir sedimentation (x-section evolution at delta)

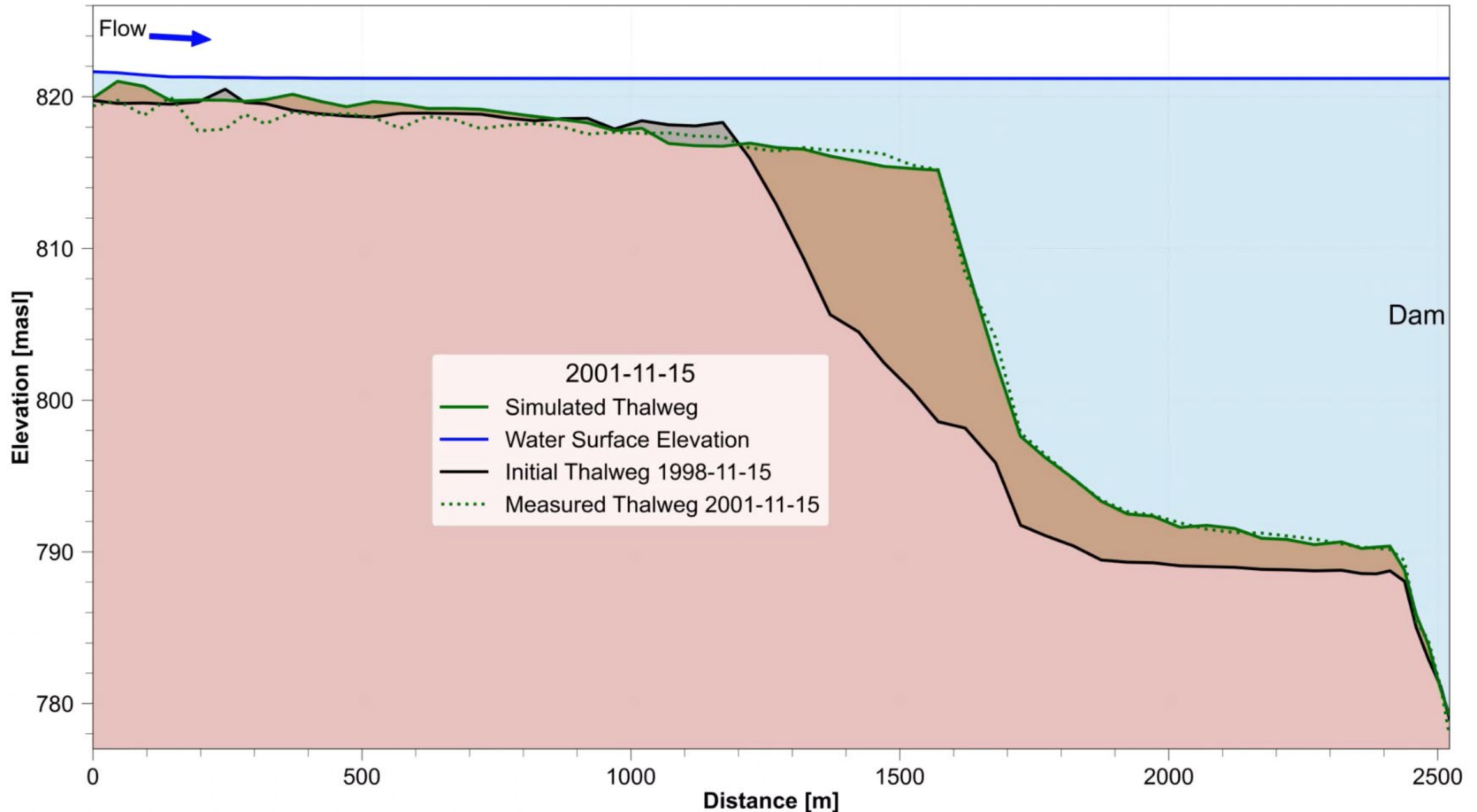


Standard Version
(wetting_fraction = 0.5)



Revised Version
(bottom_threshold = 0.1, wetsoil_threshold = 0.7)

Case study: Solis reservoir sedimentation (L-profile evolution)



Challenges and more improvements needed

- Sensitive to number of nodes in the cross-section
- Bottom_range may be too narrow that may cause sharp spikes of erosion/deposition
- Small perturbations may divide channel into multiple bottom_ranges

Thank you for your attention!



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