

Master Thesis - Presentation 2

Development of an Overland Flow Model Emulator

Februar 07, 2018

Sebastiano Rusca

Eawag: Swiss Federal Institute of Aquatic Science and Technology

This work is licensed under a Creative Commons “Attribution-ShareAlike 4.0 International” license.

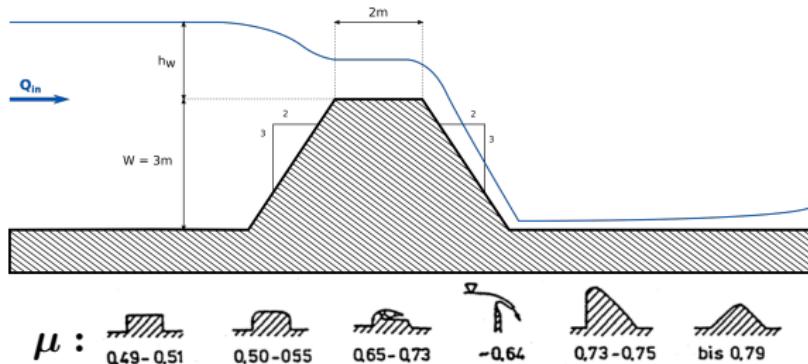


Outline

- **Task 1:** channel flow simulations
 - derivation of the weir equation from numerical simulations
- **Preparation:** learning of different interpolation techniques
- **Task 2:** hydrological simulations
 - run simulations
 - extract outputs
 - build emulator (inputs – outputs)

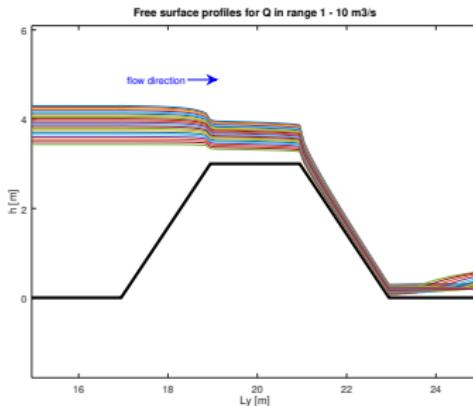
Task 1 - Learning the weir equation

$$Q = \frac{2}{3} \mu B_w \sqrt{2g} h_{\ddot{u}}^a, \quad \text{usu. } a = 3/2$$



source: Boes, Robert. "Wasserbau - Vorlesungsmanuskript." ETH Zürich - VAW, 2016.

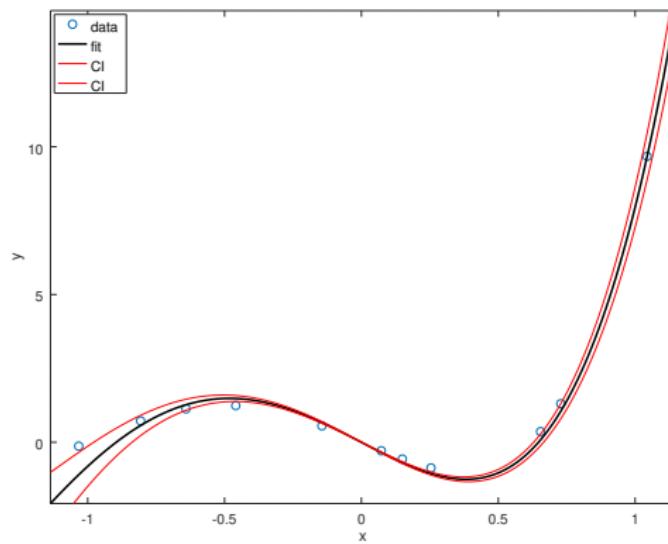
Task 1 - Results



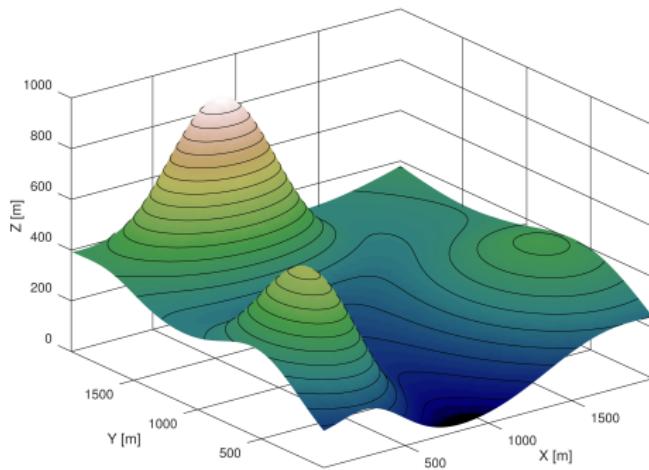
img/points_interpolations-eps-converted-to.p

Preparation - Interpolation methods

Polynomial interpolation

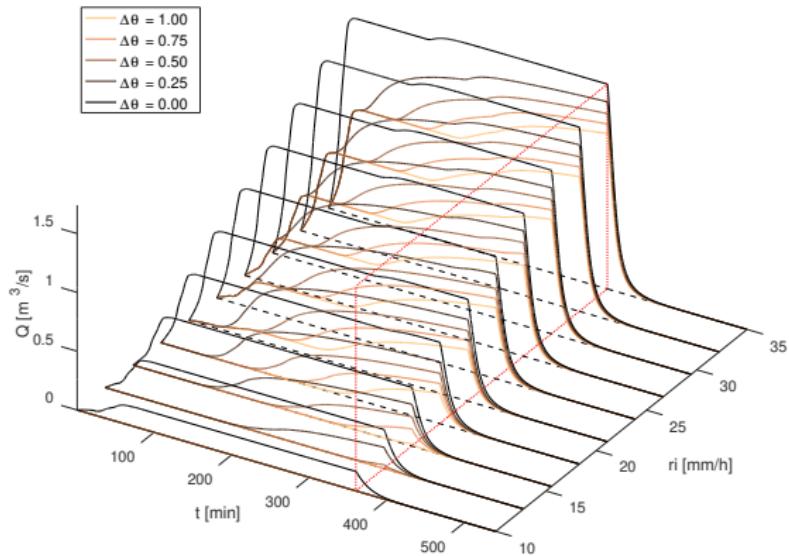


Task 2 - Set-up



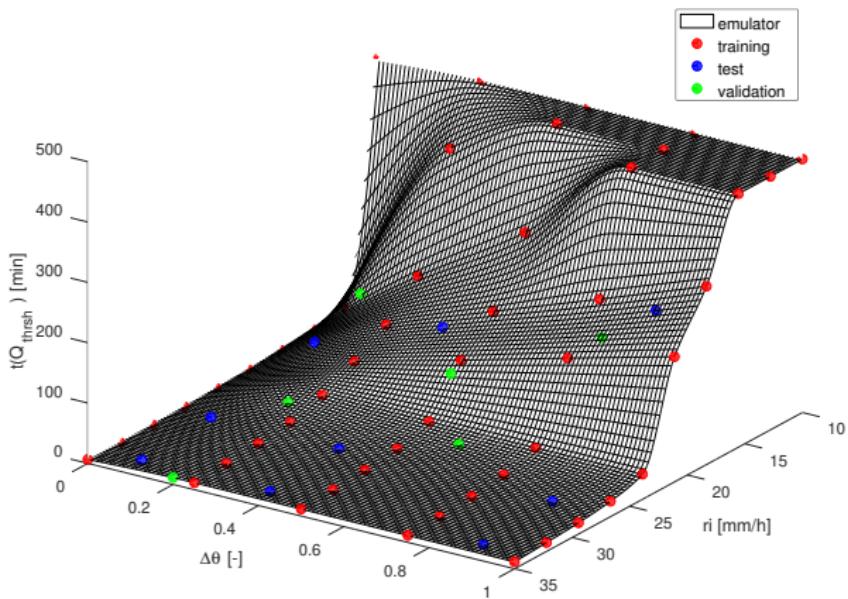
- rain duration: $6 [h]$
- rain intensity: $10 - 32 [mm/h]$
- soil initial saturation: $\theta_i [-]$

Task 2 - Simulations results



$$Q_{threshold} = 10\% \cdot Q_{max}$$

Task 2 - Emulation results



Task 2 - Emulation results

	MAE [min, %]	RMSE [min]
1: test	5.8, 27.0	2.89
2: validation	11.8, 11.6	5.73

speed-up factor: $1 \cdot 10^5$

THE END

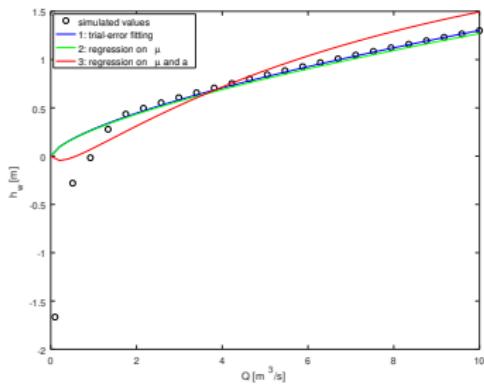
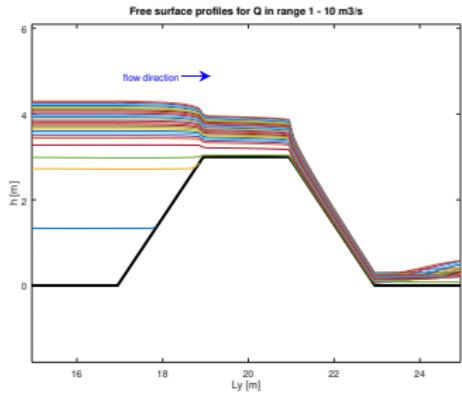
Links to my repositories

<https://bitbucket.org/binello7/fswof2d>

https://bitbucket.org/binello7/master_thesis

https://bitbucket.org/binello7/master_thesis/wiki/Home

Weir equation - All experiments



Emulation results: validation

$\Delta\theta [-]$	0.1	0.8	0.5	0.2	0.6	0.2
$ri [mm/h]$	15	20	22	25	25	35
emulator [s]	90.25	200.00	89.70	32.67	32.90	11.22
validation [s]	91.50	192.50	101.50	32.50	32.50	11.50

Next step

