

BASEchange – A New Channel Generator

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BASEMENT User Meeting 2022

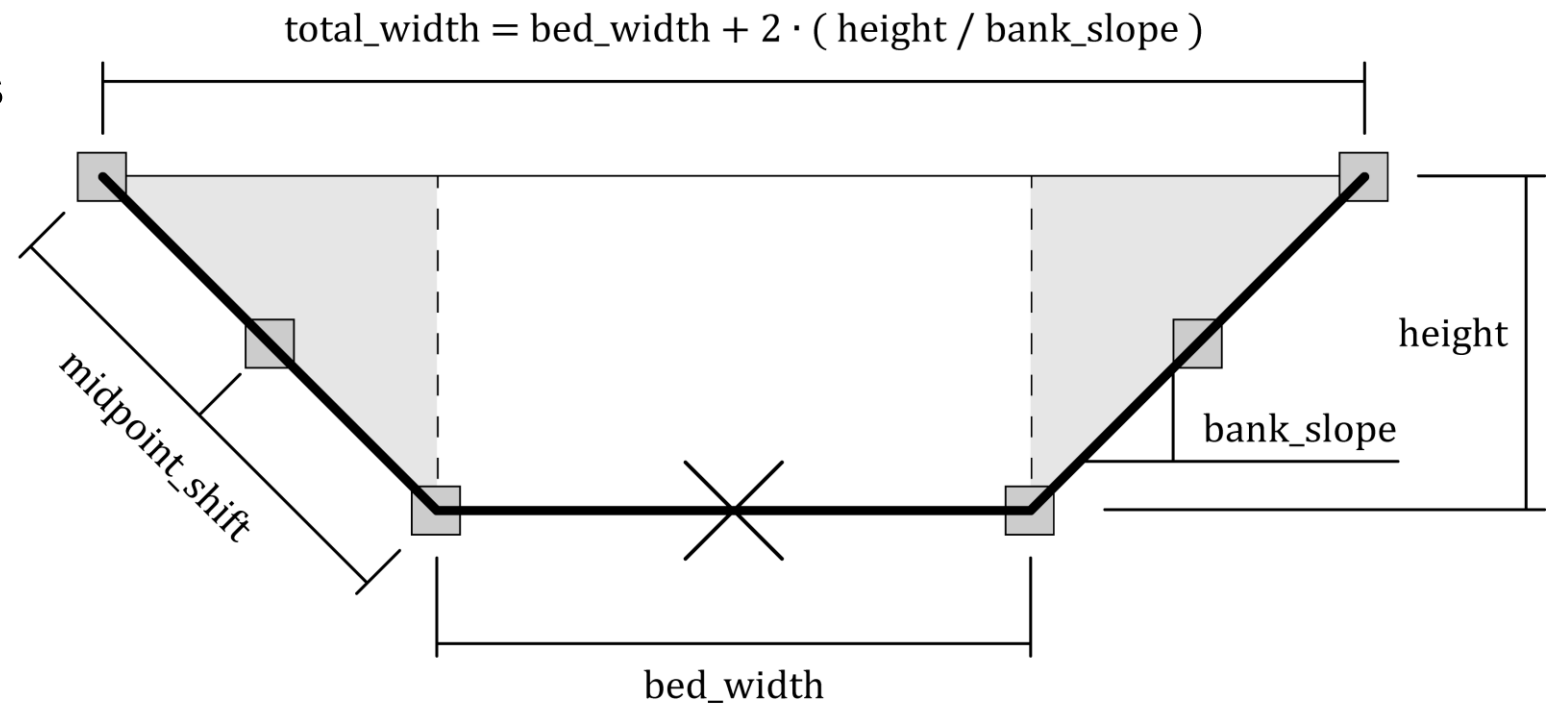
03.02.2022

BASEchange Overview

- BASEchange: **BASEMENT channel generator**
- Command line utility integrated with BASEmesh
- Output formats
 - Default: 1D (BASEchain format: *.BMG & *.BMC)
 - Optional: 2D (*.2DM format)

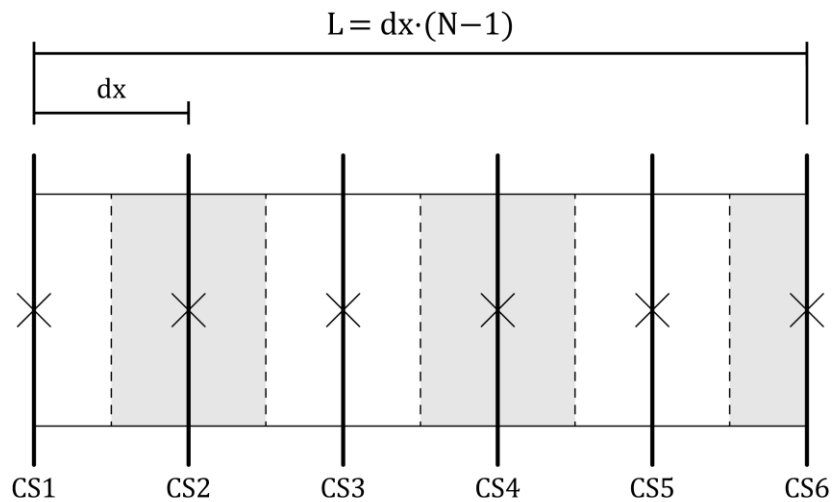
BASEchange Command Line Parameters

- Number of cross sections
- Distance between cross sections
- Slope
- Channel bed width
- Channel height
- Bank slope
- Bank friction
- Bed friction

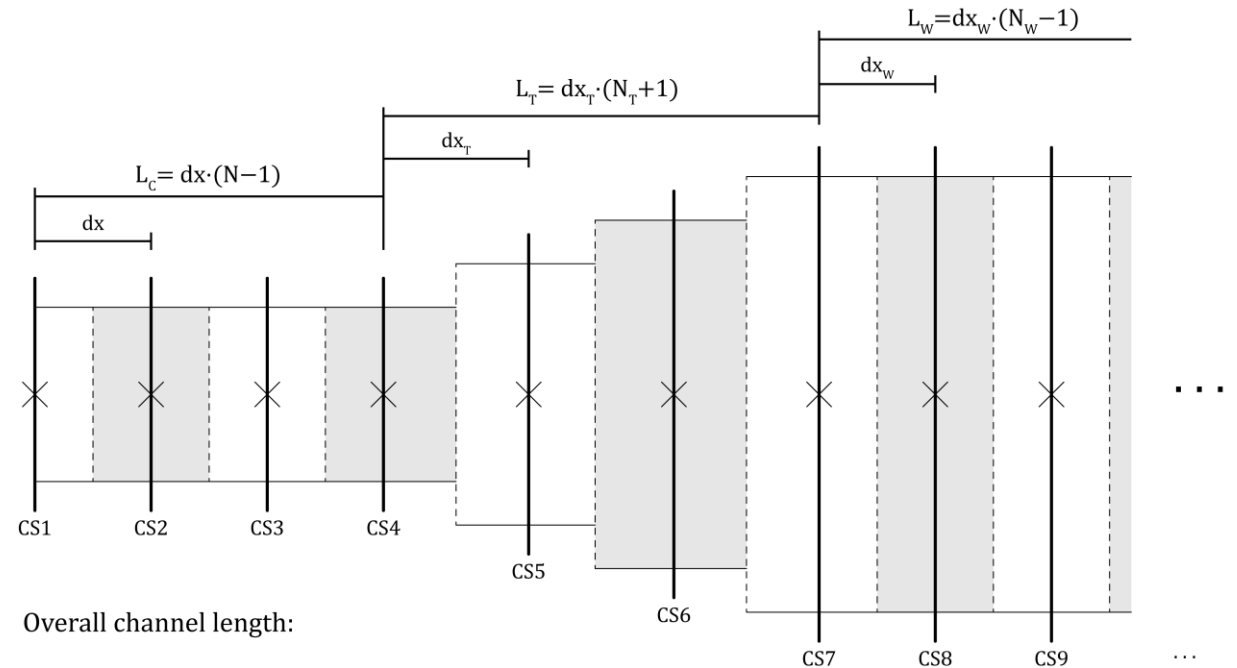


BASEchange Command Line Generators

- Straight trapezoidal channel



- Trapezoidal channel with widening



Overall channel length:

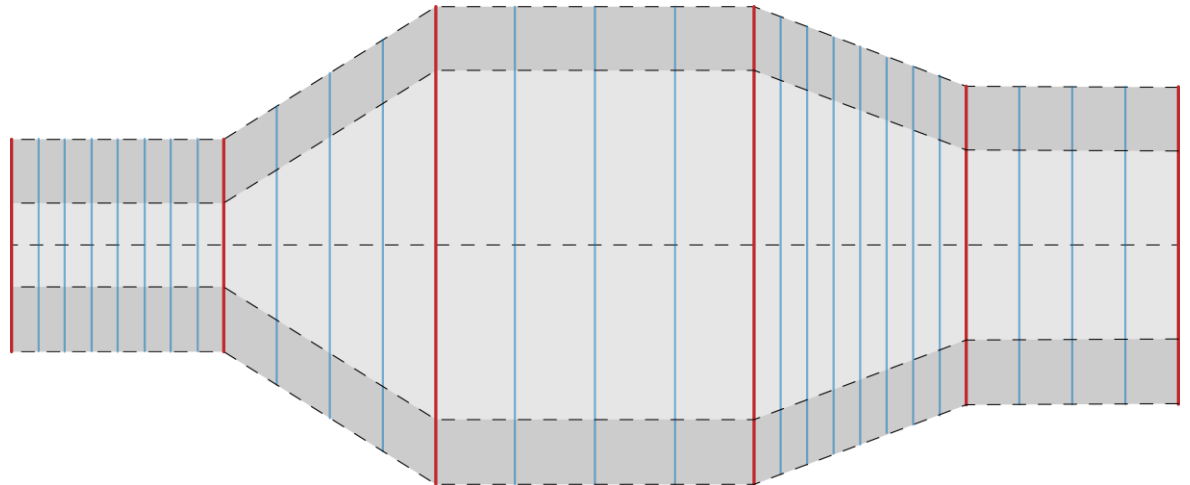
$$L = L_c + L_r + L_w + L_r + L_c$$

$$L = 2 \cdot dx \cdot (N - 1) + 2 \cdot dx_r \cdot (N_r + 1) + dx_w \cdot (N_w - 1)$$

BASEchange CSV Input Format

- Highly customizable channel geometry
- Fixed cross sections (red)
 - Specified via CSV
 - Define channel envelope
- Interpolated cross sections (blue)
 - Inserted according to “num_cs” parameter
 - Linear interpolation of channel properties

km,	bed_width,	num_cs,	ks,	ksb
0,	20,	0,	30,	20,
0.02,	20,	9,	30,	20,
0.04,	45,	4,	40,	20,
0.07,	45,	4,	40,	20,
0.09,	30,	9,	30,	20,
0.11,	30,	4,	30,	20,



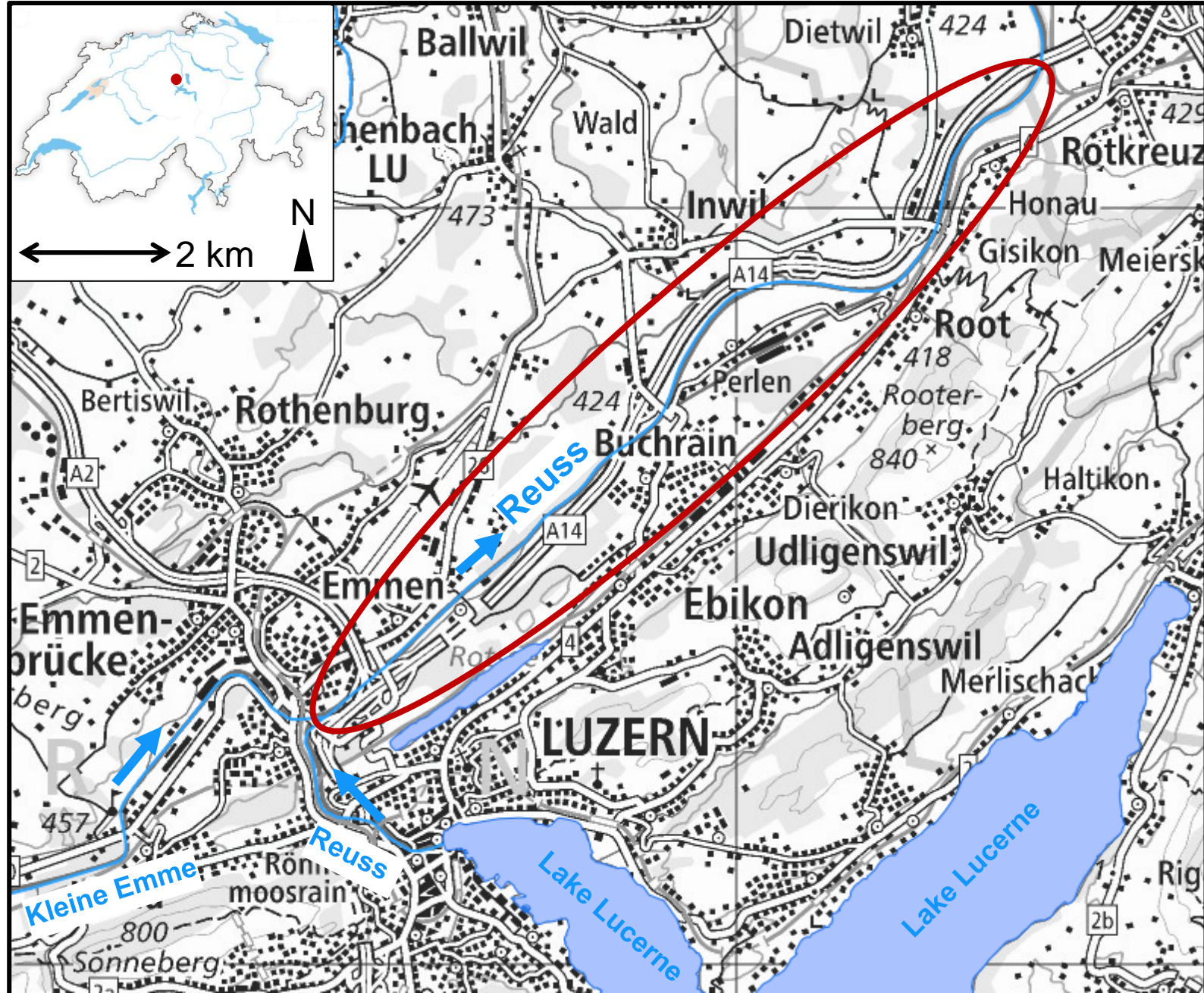
BASEchange Input Files

Interpolation modes

- Linear interpolation by default
 - Channel slope & bank slopes: inherited from downstream fixed cross section
- Interpolation strategies are customisable, not yet available in the CLI

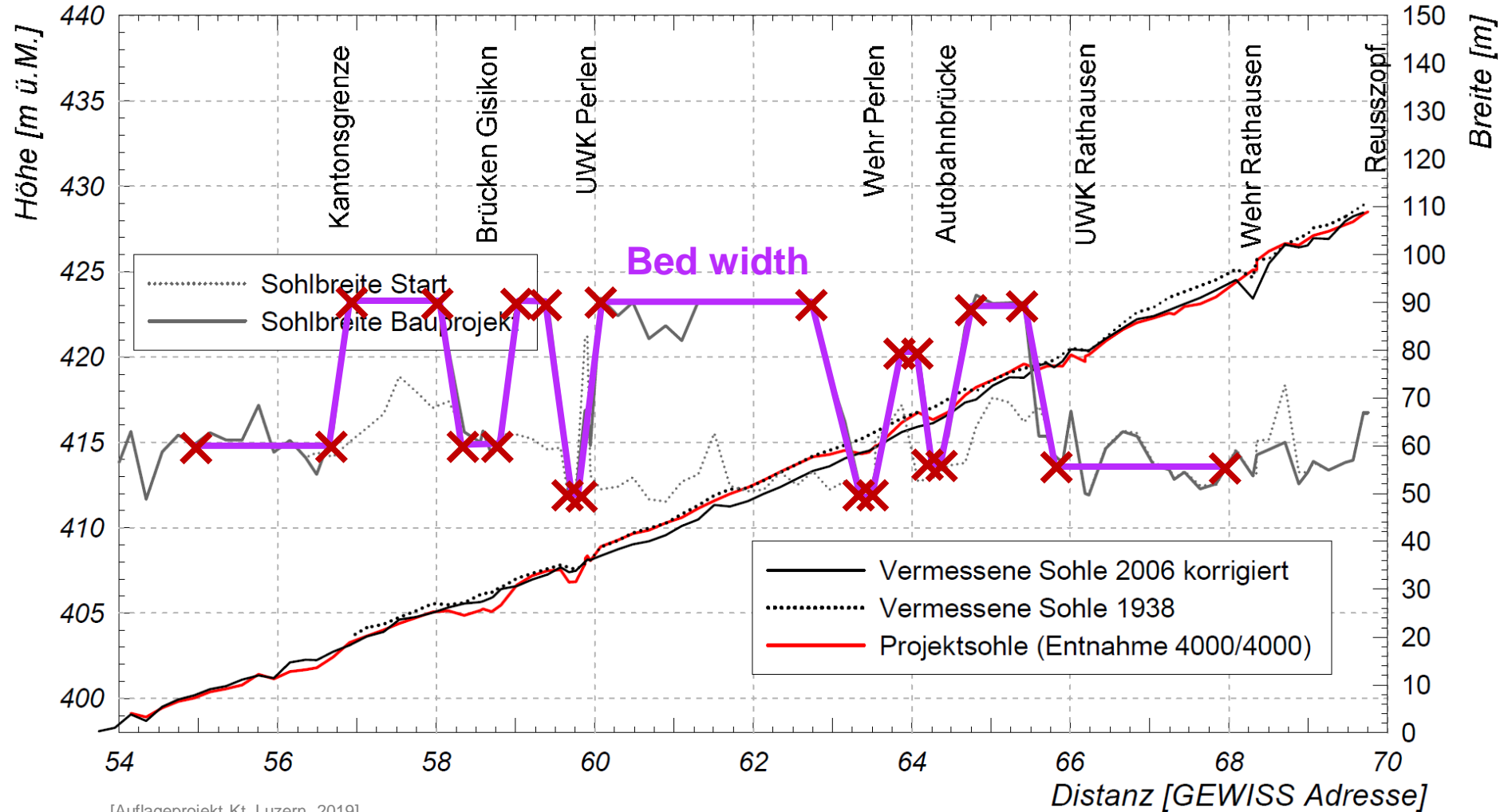
BASEchange Project example

- Slope
- Bed width
- Channel height
- Bank slope
- Bank & bed friction



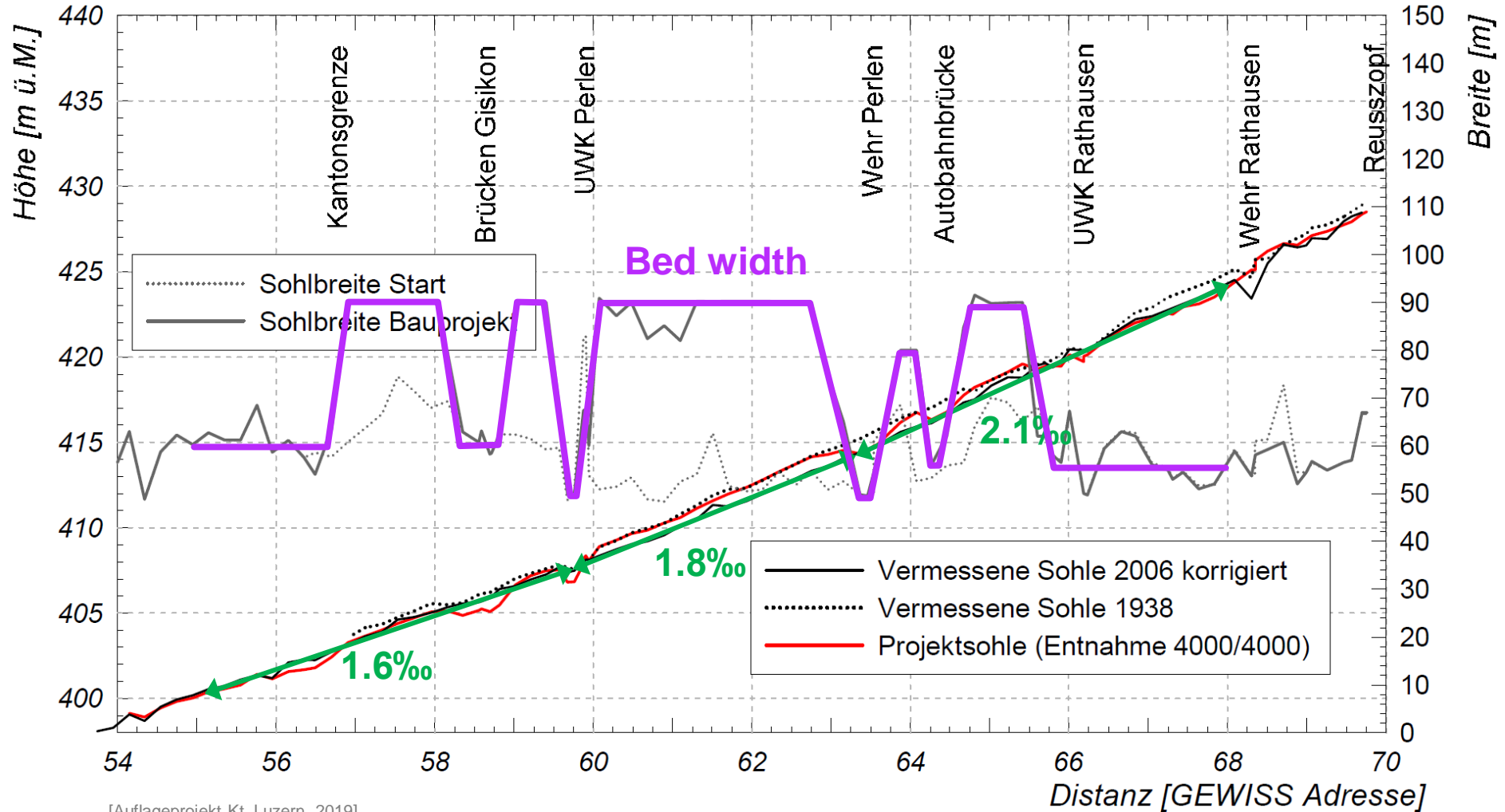
BASEchange Fixed cross sections Bed width

✗ Fixed cross sections



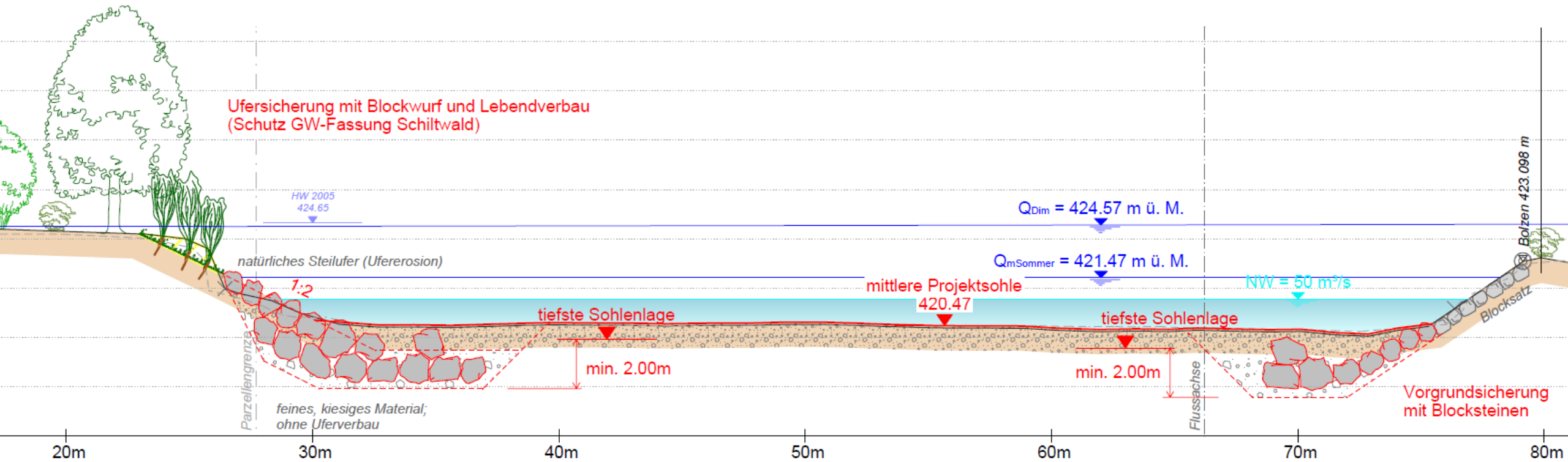
[Auflageprojekt Kt. Luzern, 2019]

BASEchange Slope



[Auflageprojekt Kt. Luzern, 2019]

BASEchange Bank slope, height and friction

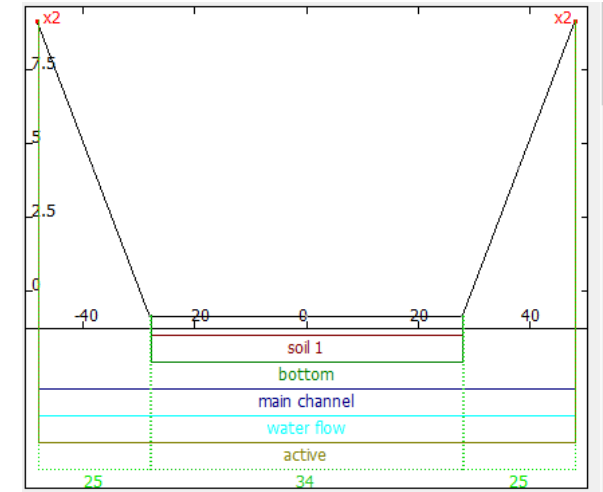


[Auflageprojekt Kt. Luzern, 2019]

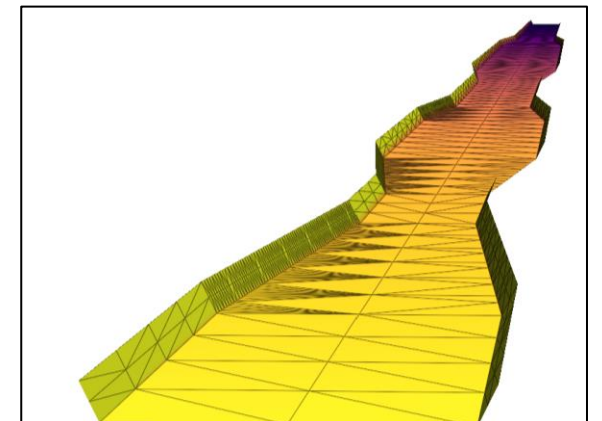
BASEchange CSV Input Format

km	bed_width	slope	num_cs	ks	ksb	bank_slope	height
0	56	0.0021	45	34	25	0.5	10
2.25	56	0.0021	45	34	25	0.5	10
2.6	90	0.0021	7	34	25	0.5	10
3.25	90	0.0021	13	34	25	0.5	10
3.6	56	0.0021	7	34	25	0.5	10
3.75	56	0.0021	3	34	25	0.5	10
3.9	80	0.0021	3	34	25	0.5	10
4.15	80	0.0021	5	34	25	0.5	10
4.5	49	0.0021	7	34	25	0.5	10
4.7	49	0.0021	4	34	25	0.5	10
5.25	90	0.0018	11	34	25	0.5	10
7.9	90	0.0018	53	34	25	0.5	10
8.2	50	0.0018	6	34	25	0.5	10
8.35	50	0.0018	3	34	25	0.5	10
8.6	90	0.0016	5	34	25	0.5	10
9	90	0.0016	8	34	25	0.5	10
9.2	61	0.0016	4	34	25	0.5	10
9.7	61	0.0016	10	34	25	0.5	10
10	90	0.0016	6	34	25	0.5	10
11.1	90	0.0016	22	34	25	0.5	10
11.4	61	0.0016	6	34	25	0.5	10
13	61	0.0016	32	34	25	0.5	10

BASEchange
python™



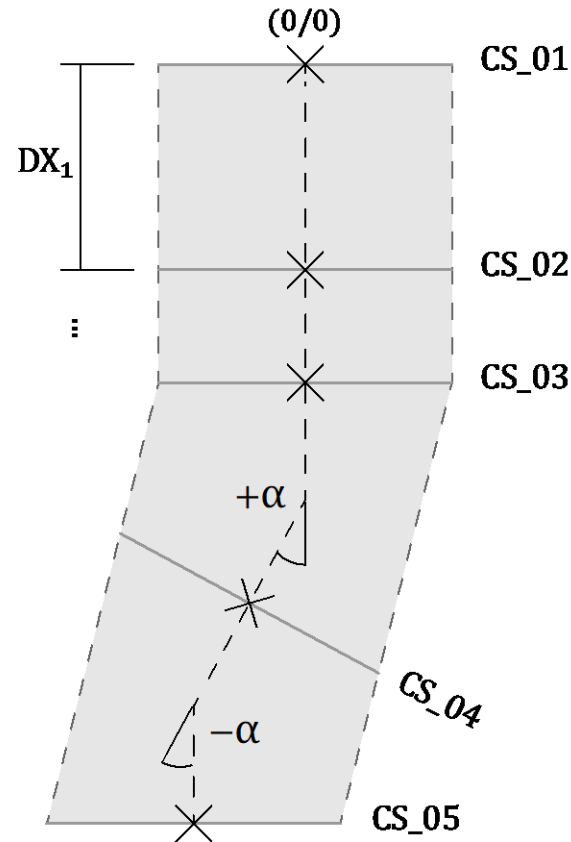
1D geometry (*.BMC)
or
2D geometry (*.2DM)



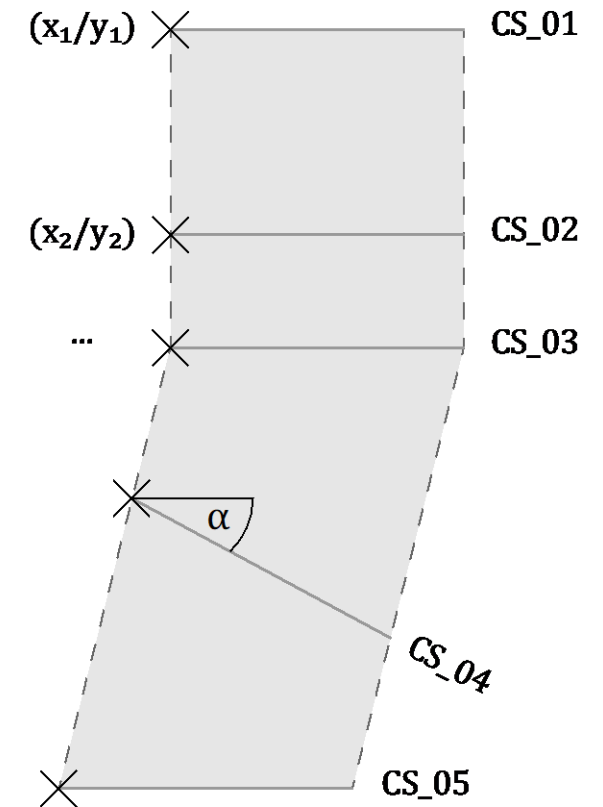
BASEchange API Data Structure

- Channel geometry defined via a list of cross sections
- Cross sections are positioned relative to their neighbours
- Optionally absolute positioning via anchor points

Relative positioning



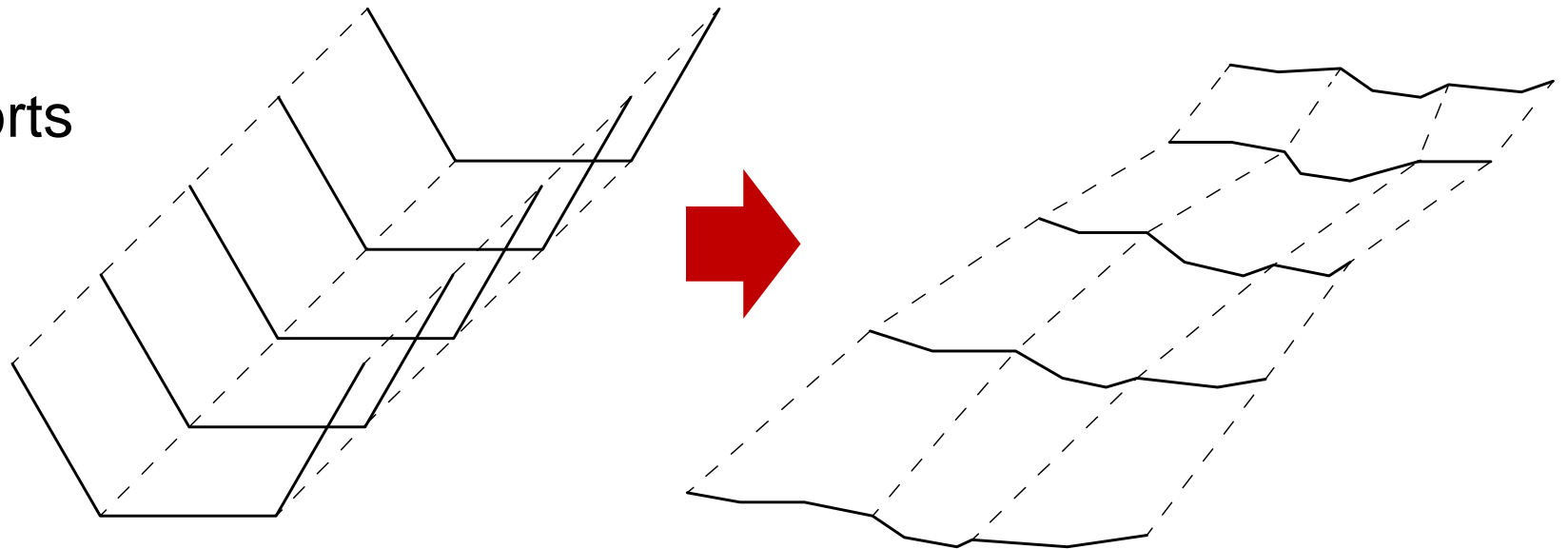
Absolute positioning



BASEchange API

Cross Section Complexity

- Trapezoidal channels are simplification for command line
- Internal data type supports arbitrary cross sections

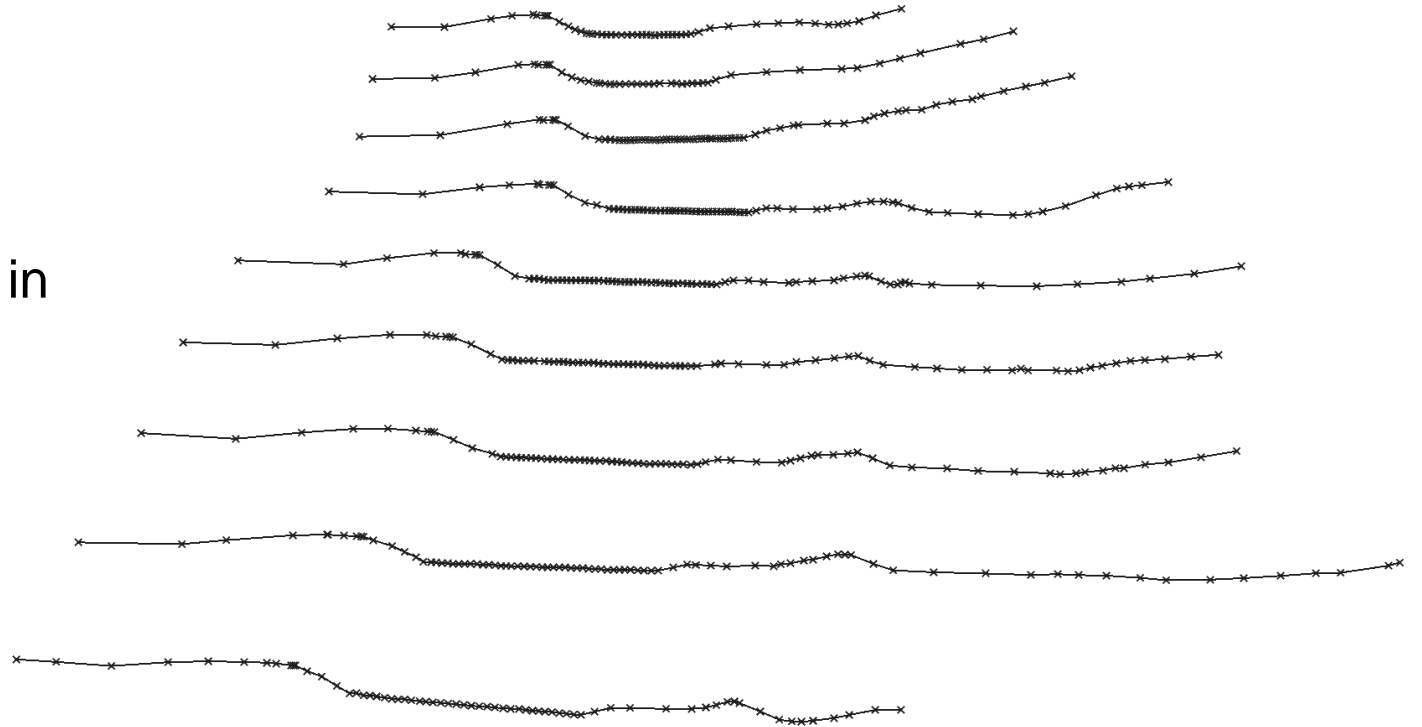


BASEchange API

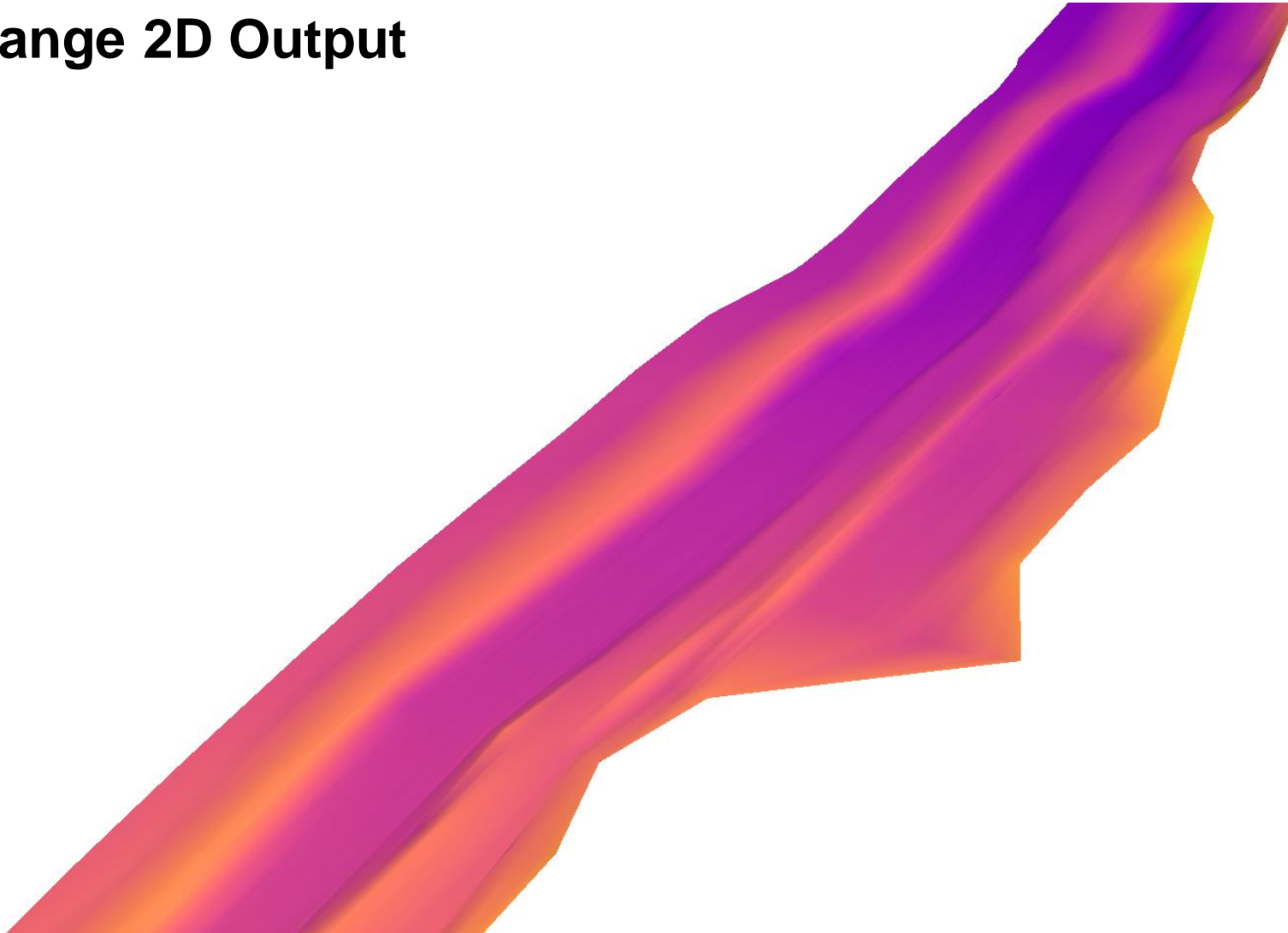
Real-world Cross Sections

- Cross sections imported from BASEmesh Tutorial dataset
- Reinterpreted as 1D cross sections in BASEchange format

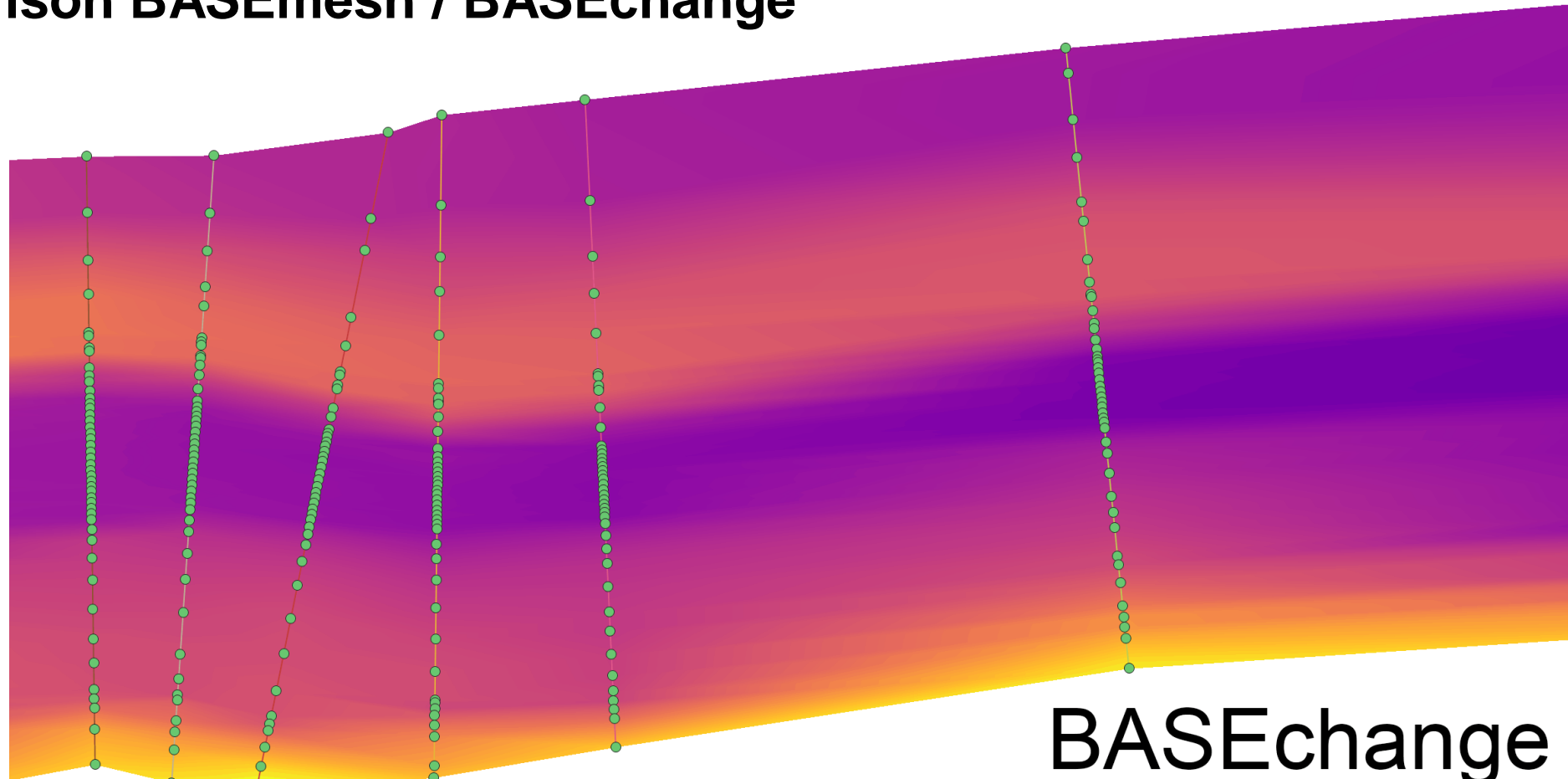
→ Does 2D conversion still work?



Preview: 1D to 2D Conversion BASEchange 2D Output



Preview: 1D to 2D Conversion Comparison BASEmesh / BASEchange



BASEchange
(automatic breaklines)

BASEchange Conclusion

- Easy and fast
- Different geometries for sensitivity analysis (e.g. spacing)
- 1D geometry and / or 2D elevation mesh

- BASEchange module & documentation in BASEmesh repo:
<https://gitlab.ethz.ch/vaw/public/basemesh-v2>