



# Pre- & Postprocessing in QGIS BASEmesh 2.0

Stephan Kammerer, Leonhard Seidelmann, VAW

BASEMENT Users Meeting

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## Content

- Preprocessing (Leonhard)
  - Grid generation QGIS 3.x
  - BASEmesh 2.0
  
- Update on recent developments (Stephan)
  - Postprocessing in QGIS 3.x





## Grid generation QGIS 3.x

### Issues with BASEmesh v1.4.5

- Mesh data stored via «\_nodes» and «\_elements» Shapefile
- Separate workflows depending on BASEMENT version
  - Regular workflow for BASEMENT v2.8
  - Large Mesh Dialog for BASEMENT v3.x
- Poor performance scaling for large meshes
- Grown codebase
  - Tackling performance issues or adding features is non-trivial



Grid generation QGIS 3.x

## Issues with BASEmesh v1.4.5

- Major restructuring of the codebase required

→ **BASEmesh v2.0 released August 2020**



# BASEmesh



# BASEmesh 2

## Overview

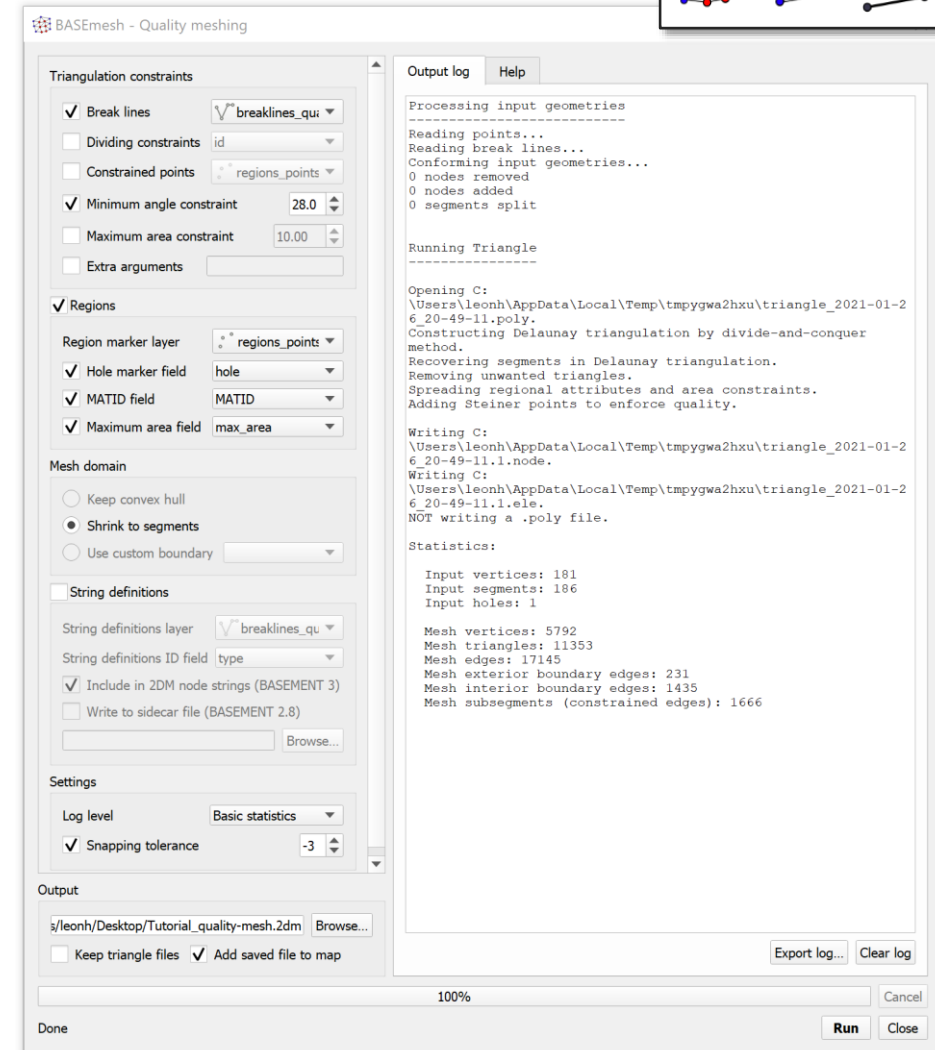
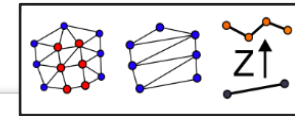
- Completely rewritten code base
  - Focus on modularity and ease-of-maintenance
  - Separation of core functionality and plugin frontend
- Support for new QGIS features
  - New input formats (ShapeFile, AutoCAD DXF, GeoPackage, etc.)
  - 2DM mesh format used for QM and EM
- Optional C extensions for increased performance
  - Platform-specific reimplementations of expensive operations
  - Pure-Python alternative always available for portability



# BASEmesh 2

## Mesh Generation

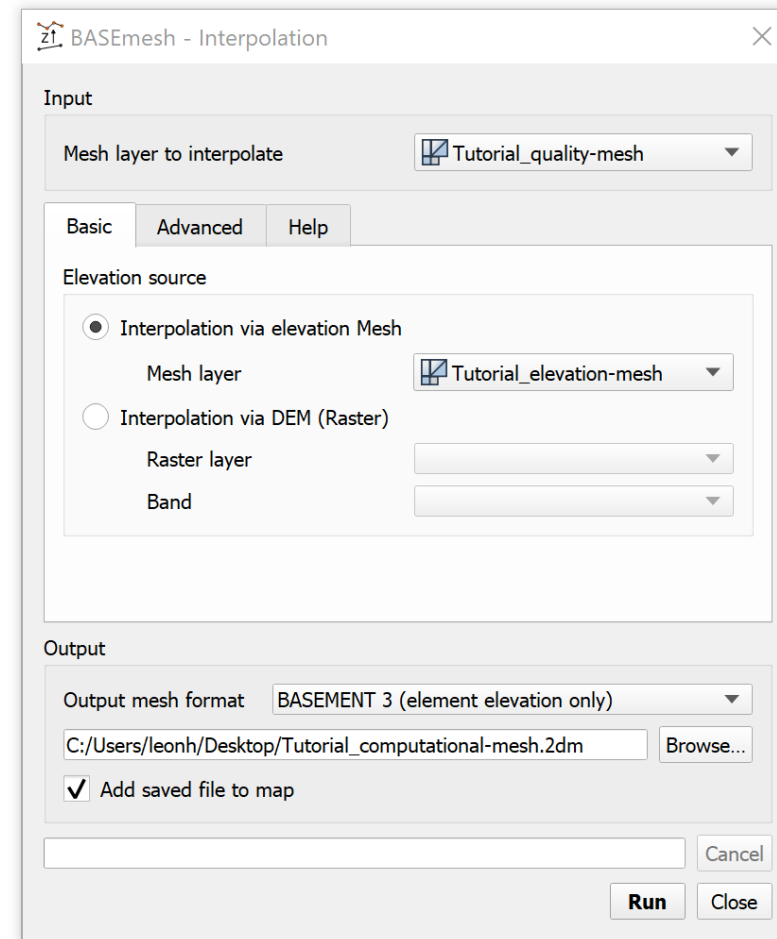
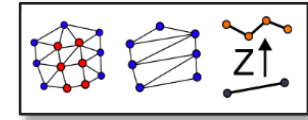
- Known workflow still valid
- Support for QGIS 3D geometries
  - 3D points/lines required for Elevation Meshing
  - Converter for 2D geometries with elevation attribute available in processing toolbox
- Convex hull option for model boundary
- Generated mesh output as 2DM
  - Mesh Layer



# BASEmesh 2

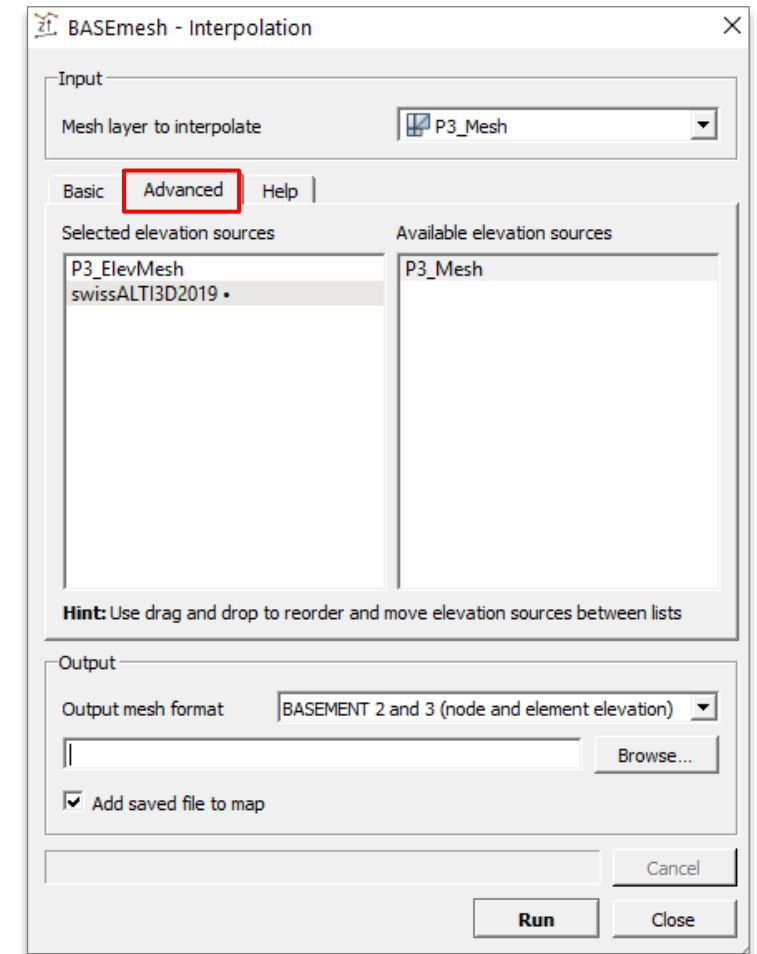
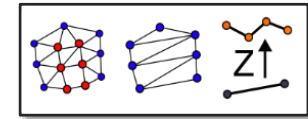
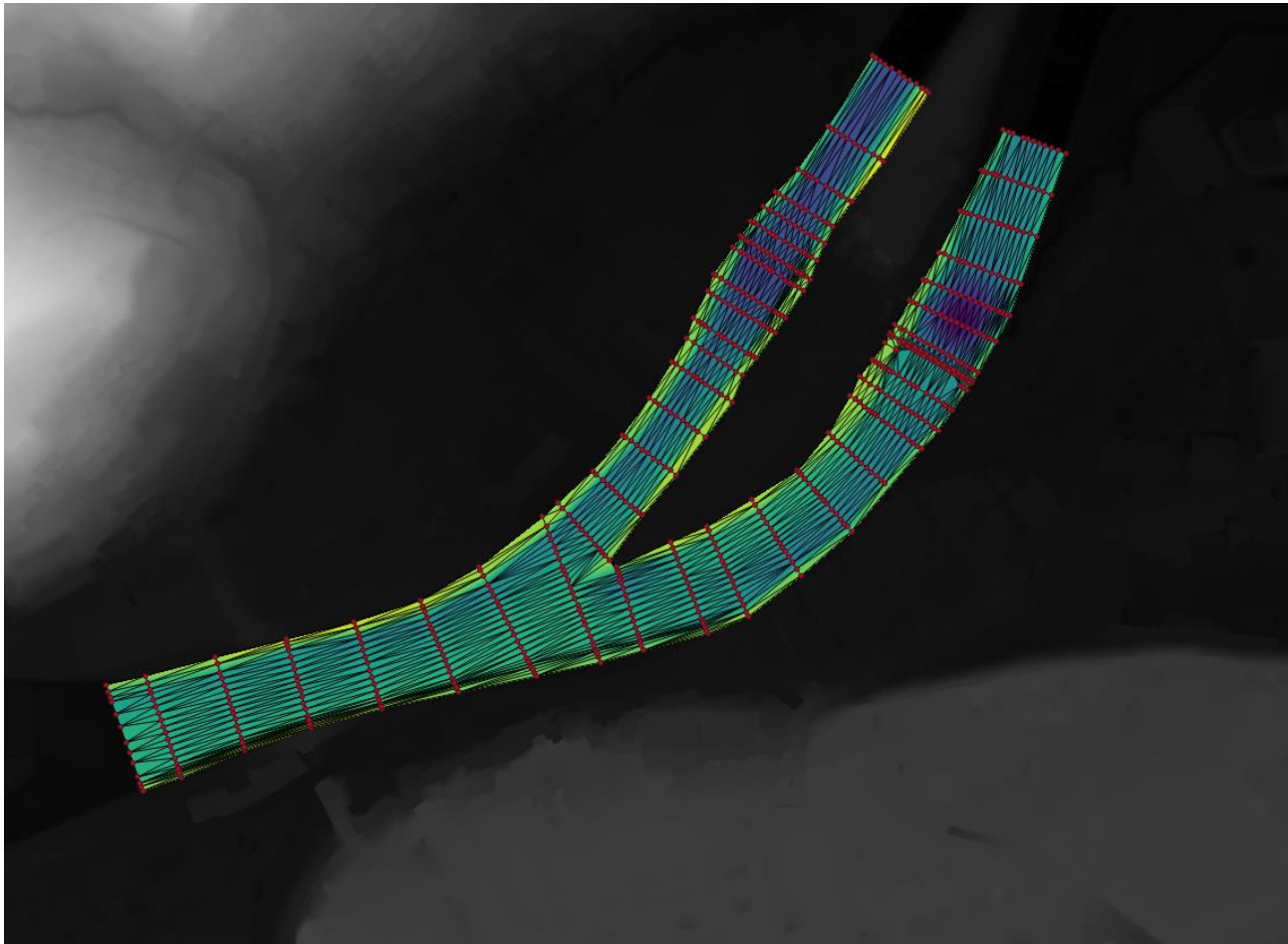
## Mesh Interpolation

- Significantly improved performance for large meshes
- Mesh format selection for BASEMENT v2.8, v3.0, or both
- Support for multiple elevation sources (e.g. TIN and raster DEM)



## BASEmesh 2

## Mesh Interpolation – multiple elevation sources



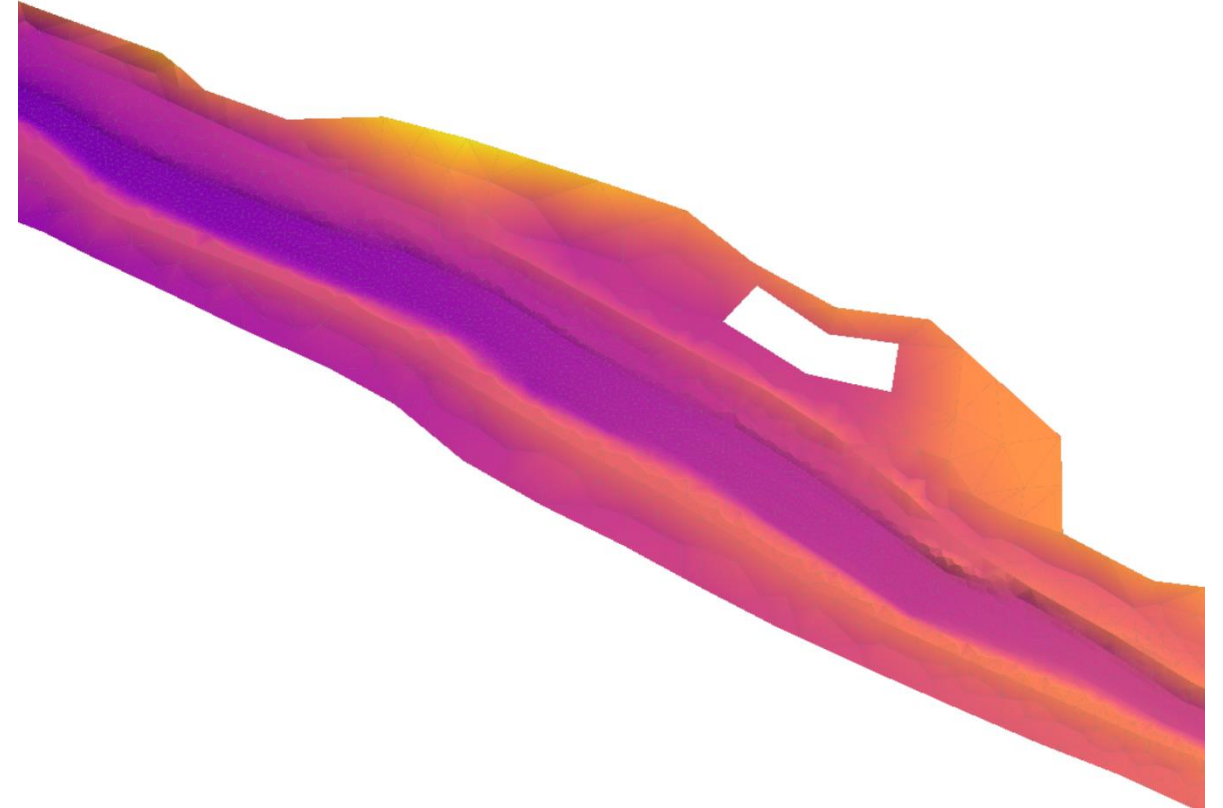
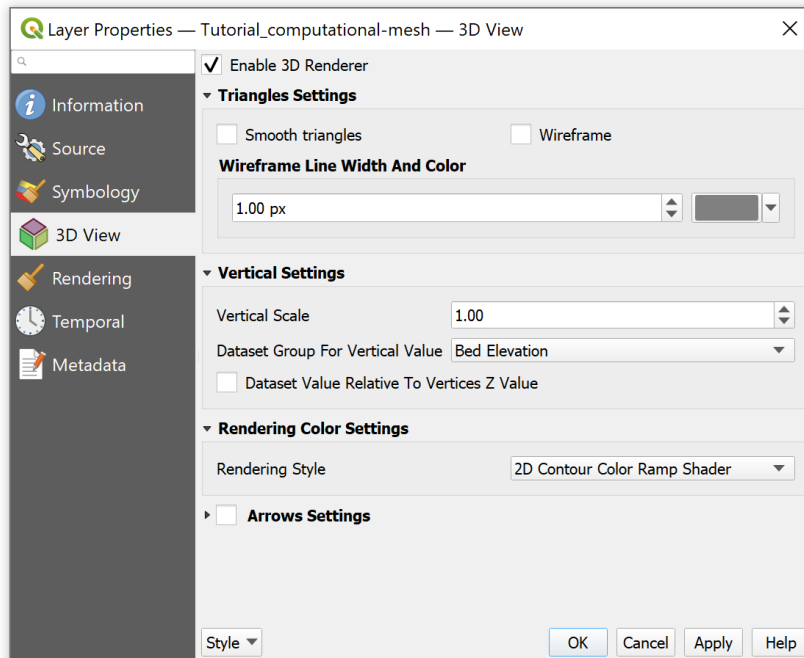




# BASEmesh 2

## Visualisation

- Native 3D Visualisation Support in QGIS 3.10

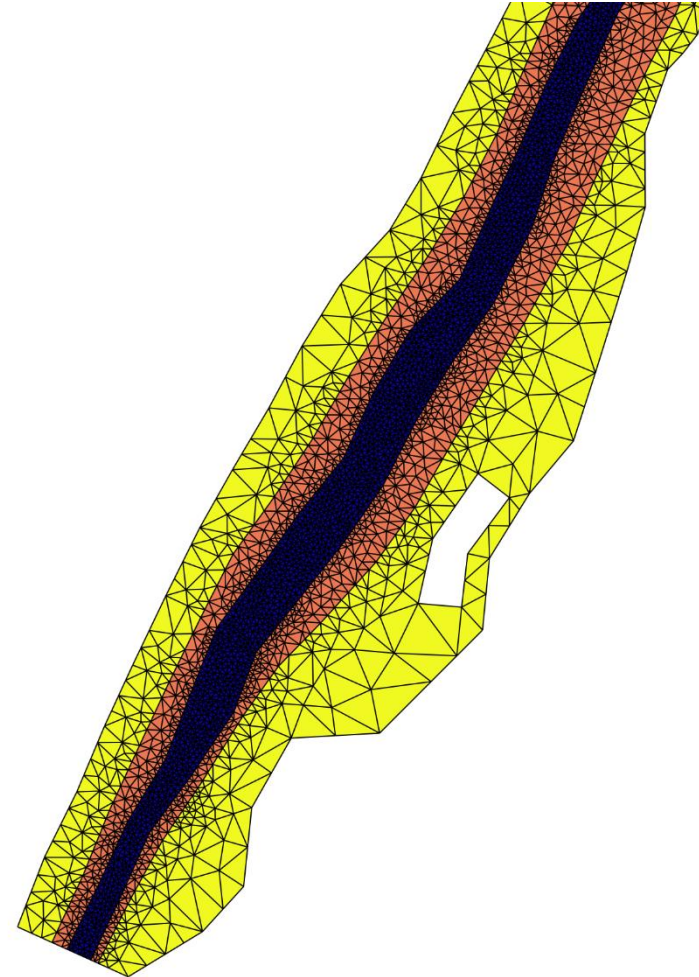
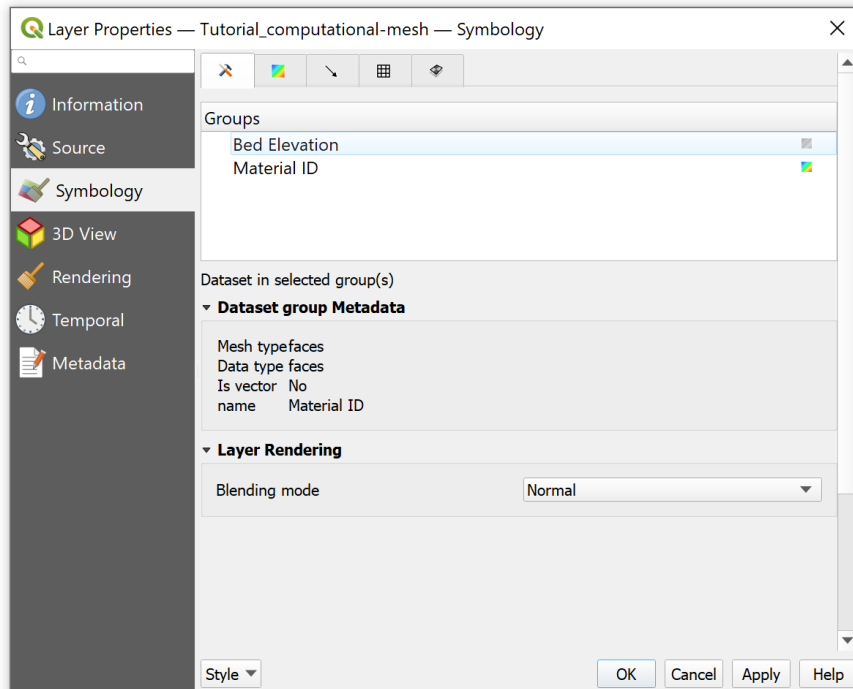




# BASEmesh 2

## Visualisation

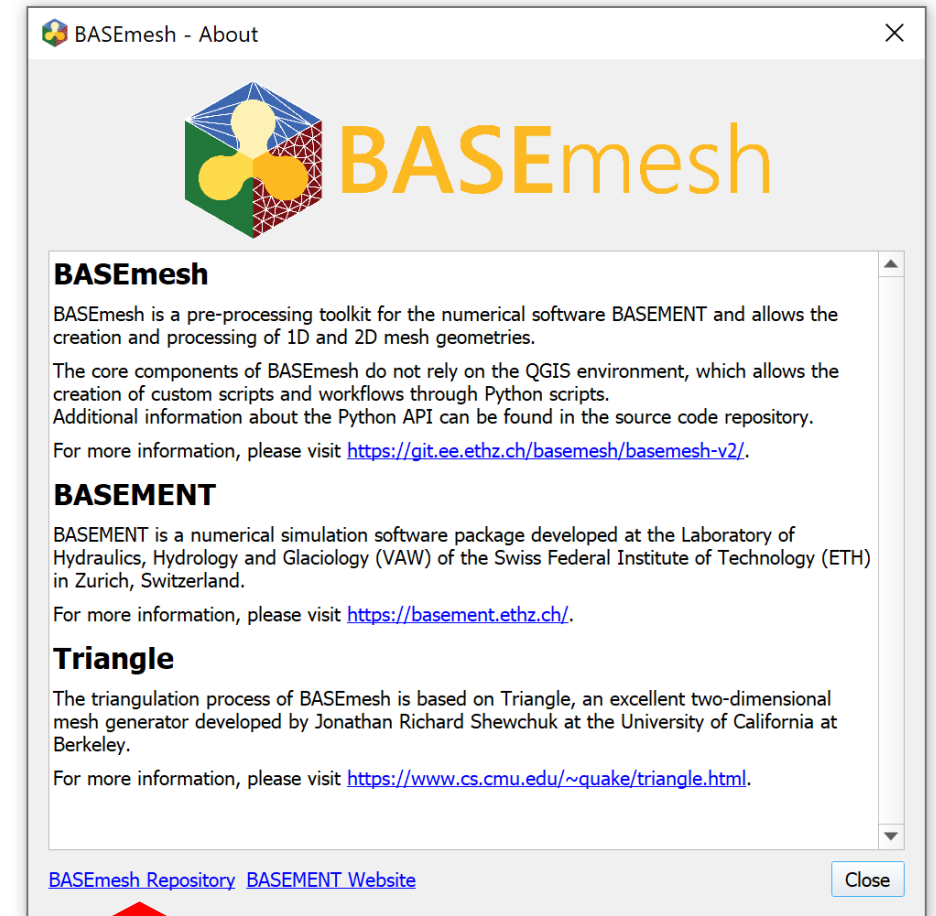
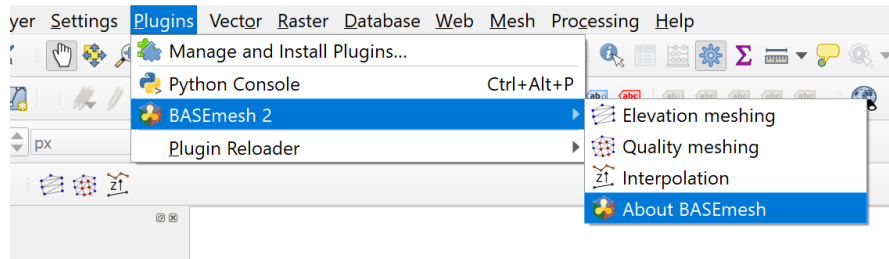
- Support for MATID visualisation layer in QGIS 3.16+



# BASEmesh 2

## Getting started with BASEmesh 2

- BASEmesh 2.0 is the default version starting with QGIS v3.10 LTR
- Migration Guide available in Repository Wiki





## BASEmesh 2 – Outlook Python Module

- BASEmesh 2 separates plugin-specific code from core implementation
- BASEmesh back-end will be available as standalone Python package
  - Python v3.6+
  - Available via PyPI
- Provides command line versions of plugin utilities
- Includes additional features not available in QGIS (e.g. 1D channel generator)



## BASEmesh 2 – Outlook

### Module API

- Python API allows interfacing with BASEmesh components directly
- Enables development of custom workflows and utilities using BASEmesh functionality
- API scope and documentation are still being finalised
  - Completion expected for end of Q1 2021

→ **API specification will be released on BASEmesh repository**

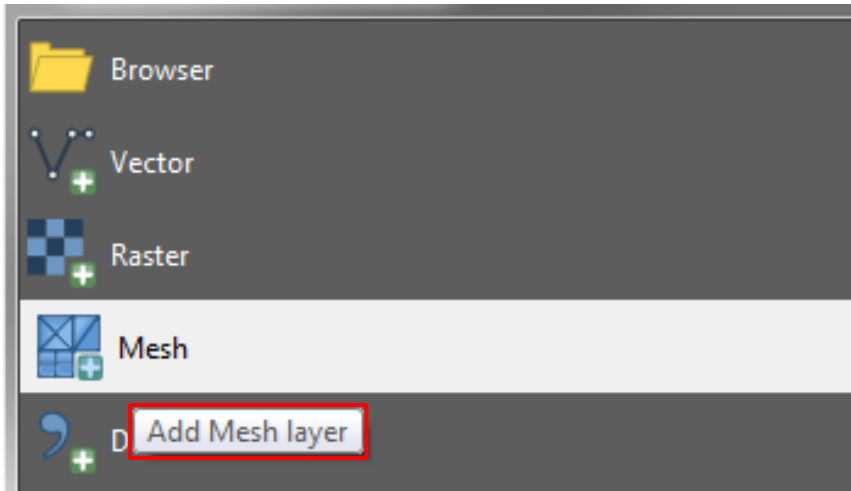


# Content

- Preprocessing (Leonhard)
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  - BASEmesh 2.0
- Update on recent developments (Stephan)
  - Postprocessing in QGIS 3.x





## Postprocessing in QGIS

QGIS 3.x  BASEMENT 2.8 & BASEMENT 3.x**QGIS Enhancement:  
Unstructured Mesh Layer**

- 2dm files
- simulation results

- QGIS 3.x & Crayfish 3.x, C++ library replaced by [MDAL](#)\*
- Crayfish simple python plugin (no platform specific libraries)
- Make use of QGIS [Unstructured Mesh Layer](#)

 **QGIS 3.x**

- 2dm (Bed elevation)
- els/nds results
  - \*.xdmf 
  - \*.sol 
- mesh calculator
- 3D view

 **Crayfish 3.x**

- plot/animation
- export mesh elements, vertices and edges (vector)
- export contours
- rasterize

\*Mesh Data Abstraction Library

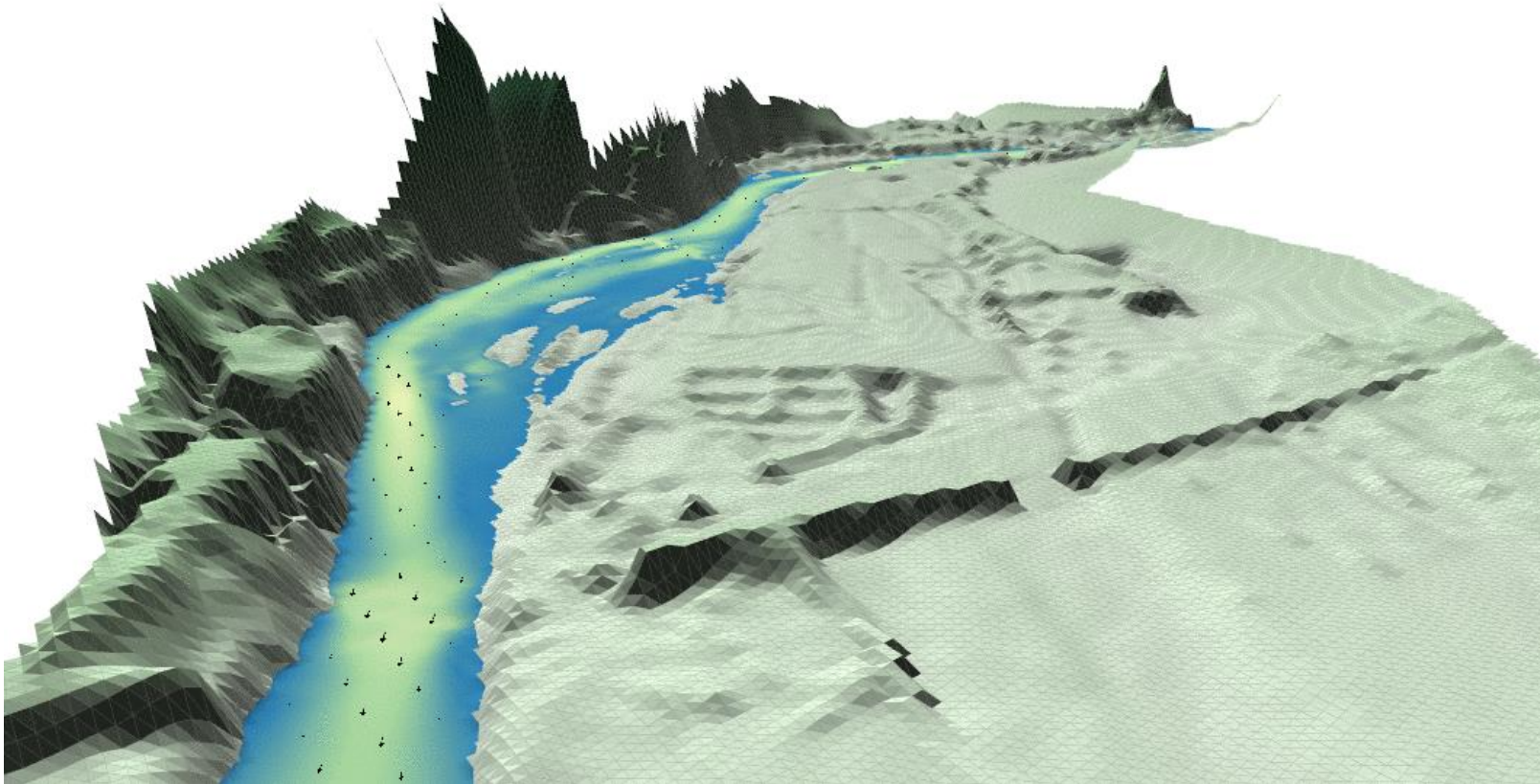




## Postprocessing in QGIS

**QGIS 3.x**  **BASEMENT 2.8 & BASEMENT 3.x**

- 3D visualisation of simulation results



source: [www.lutraconsulting.co.uk/blog/2020/06/17/crayfish-3-4-4/](http://www.lutraconsulting.co.uk/blog/2020/06/17/crayfish-3-4-4/)

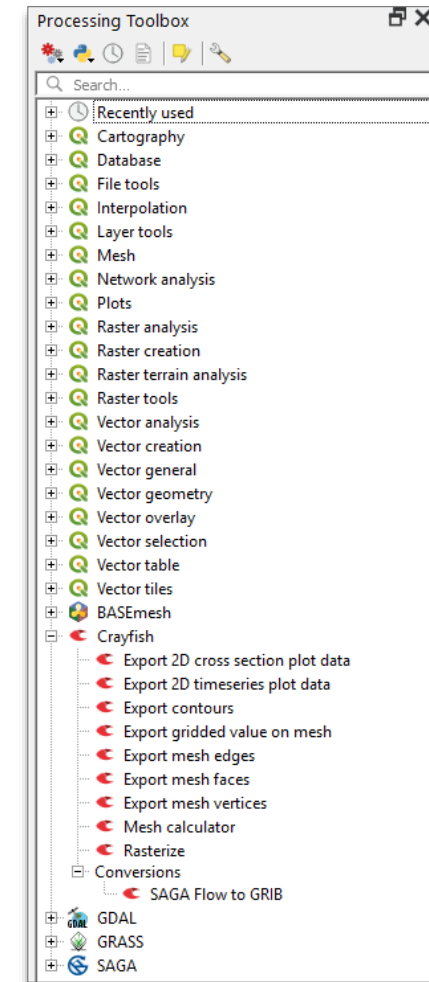
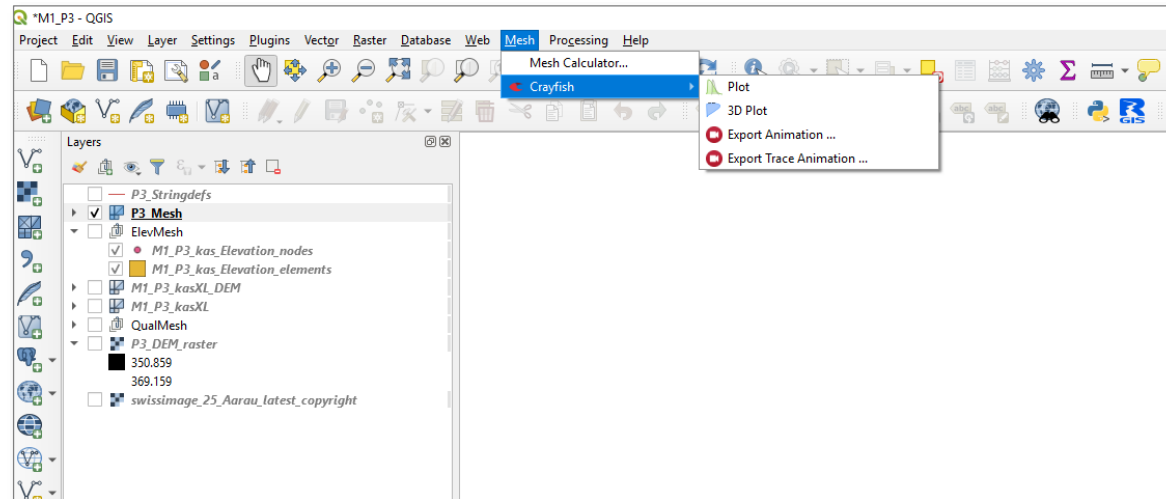




# Postprocessing in QGIS

## QGIS 3.x BASEMENT 2.8 & BASEMENT 3.x

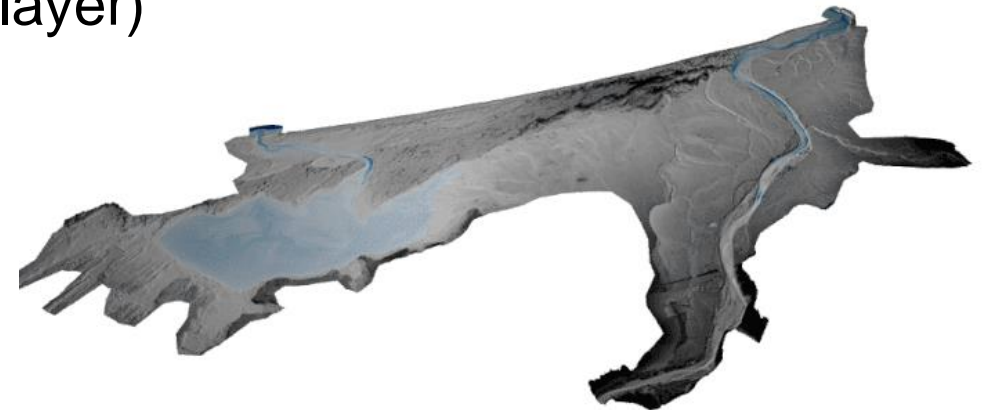
- Some documentation available from the [QGIS 3.x User Guide](#)
- Access Crayfish functions via:
  - Processing Toolbox
  - Menu Toolbar → Mesh





## Summary

- Preprocessing
  - BASEmesh version 2.0
  - Significantly improved performance for large meshes
  - Enhance interpolation feature
  - Making use of native OGIS functionalities (Mesh layer)
- Postprocessing
  - Result visualization for BASEMENT 2.8 and 3.x
  - All functionalities known of v2.18 available
  - Additional features and **further development**





## Contact information

ETH Zürich  
Stephan Kammerer  
Leonhard Seidelmann  
Versuchsanstalt für Wasserbau, Hydrologie und  
Glaziologie (VAW)  
Abteilung Numerische Modellierung

Hönggerberggring 26  
8093 Zürich

E-Mail: [kammerer@vaw.baug.ethz.ch](mailto:kammerer@vaw.baug.ethz.ch)  
[seidelmann@vaw.baug.ethz.ch](mailto:seidelmann@vaw.baug.ethz.ch)



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