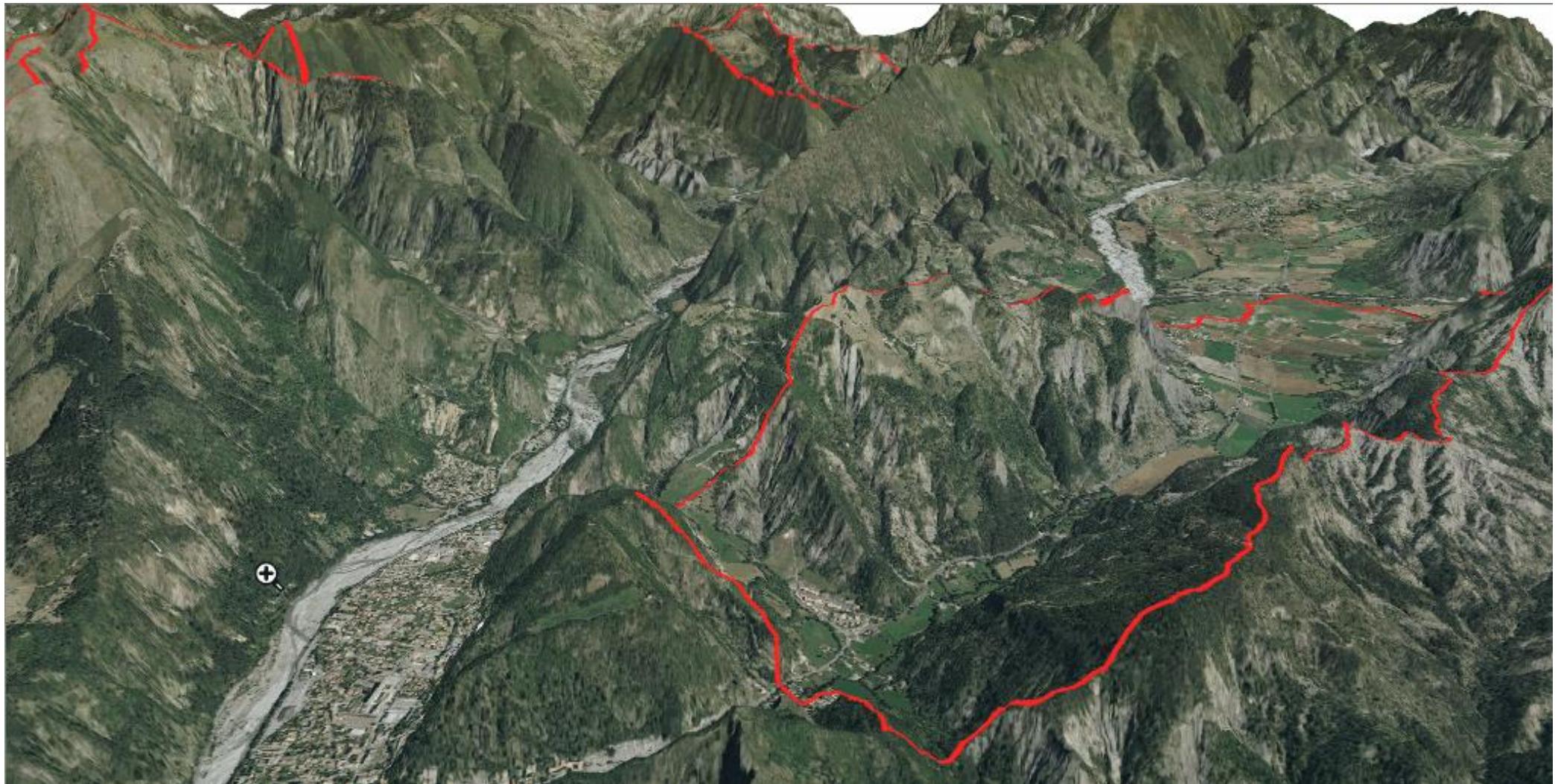


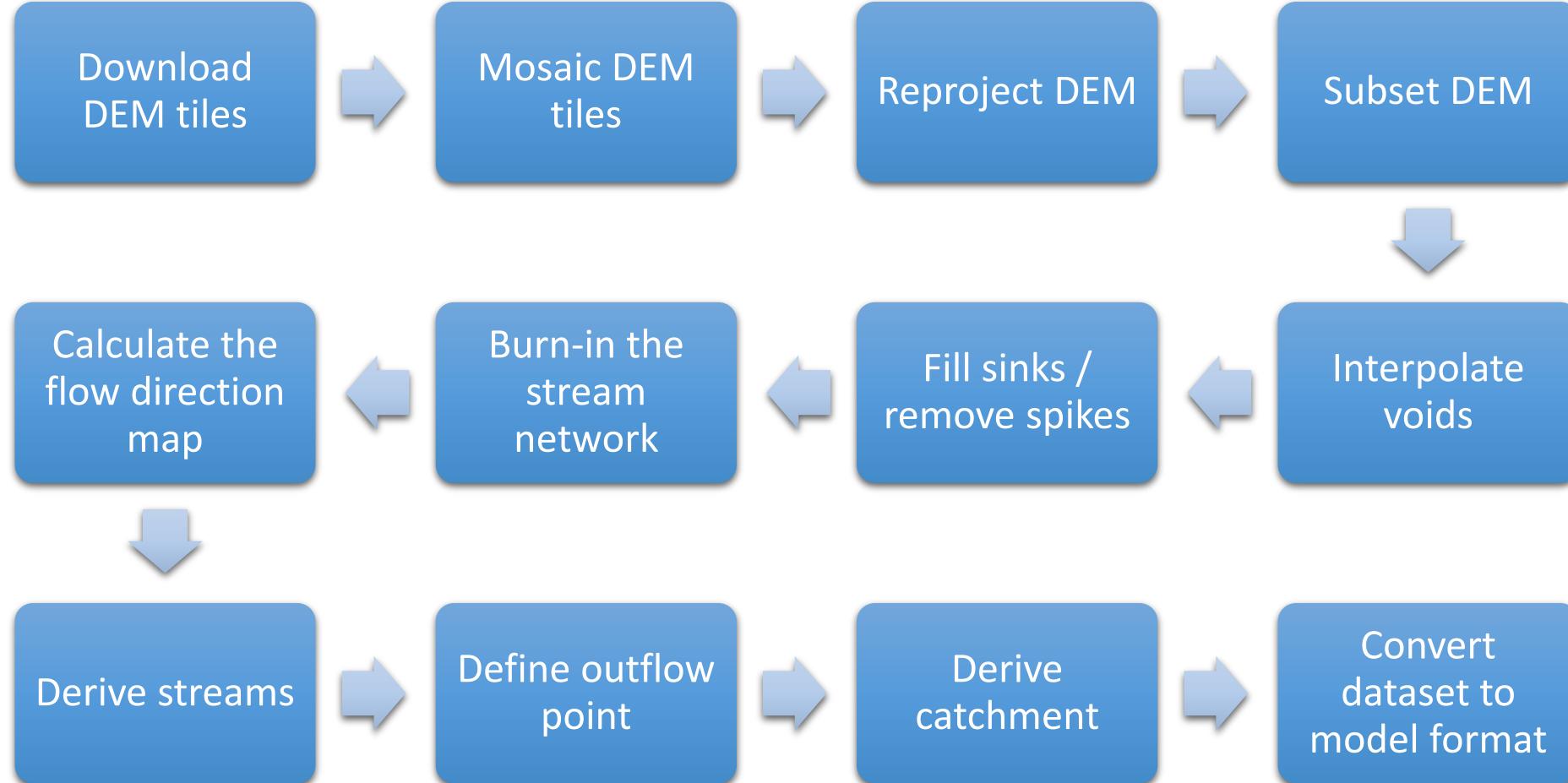
QGIS Plugins for Hydrology

Hans van der Kwast

Catchments

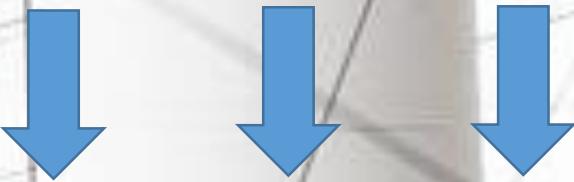


Stream and catchment delineation



Download DEM tiles

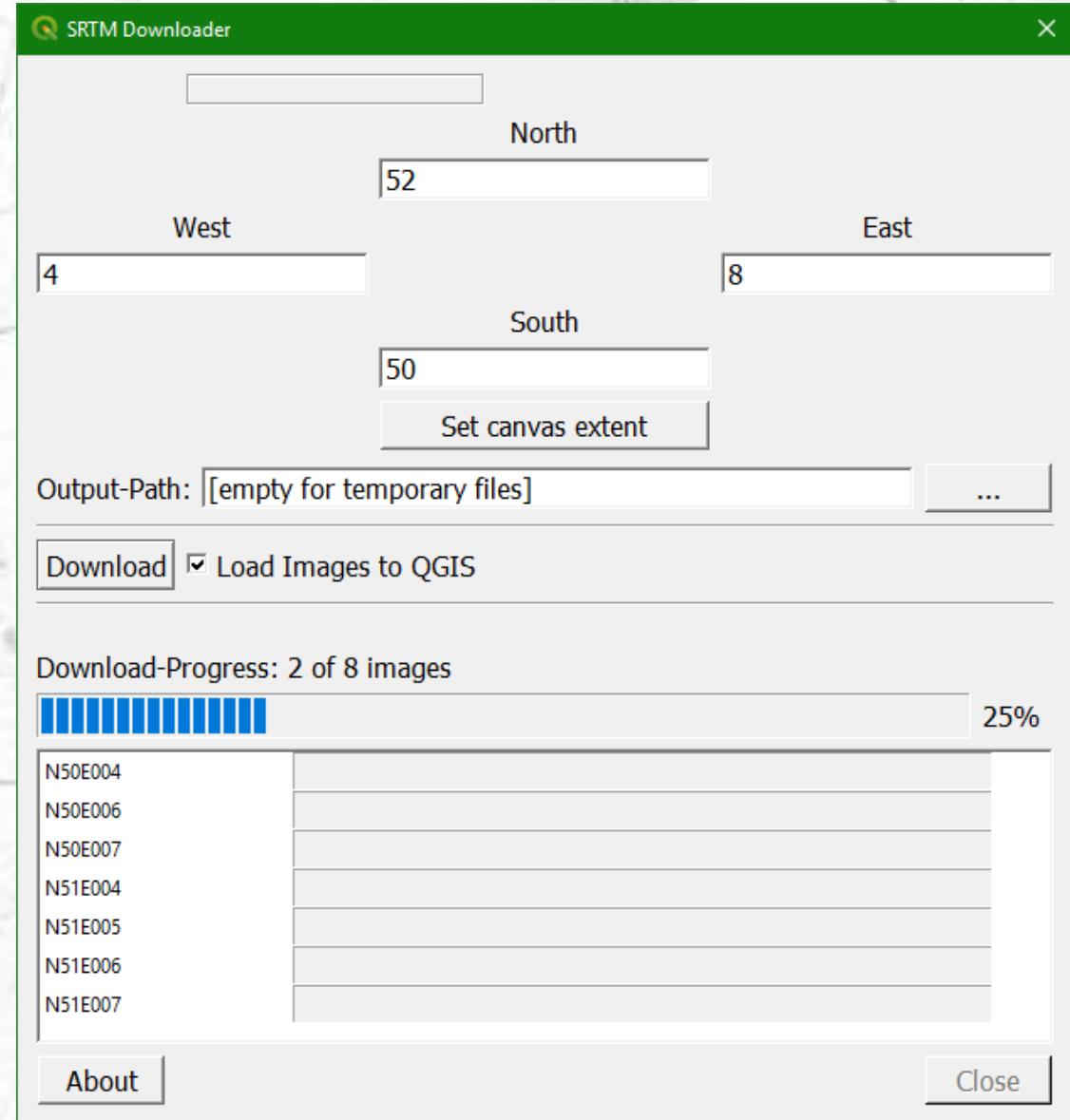
Open access data:



SRTM 1 Arc-Second Global
(~30 m)

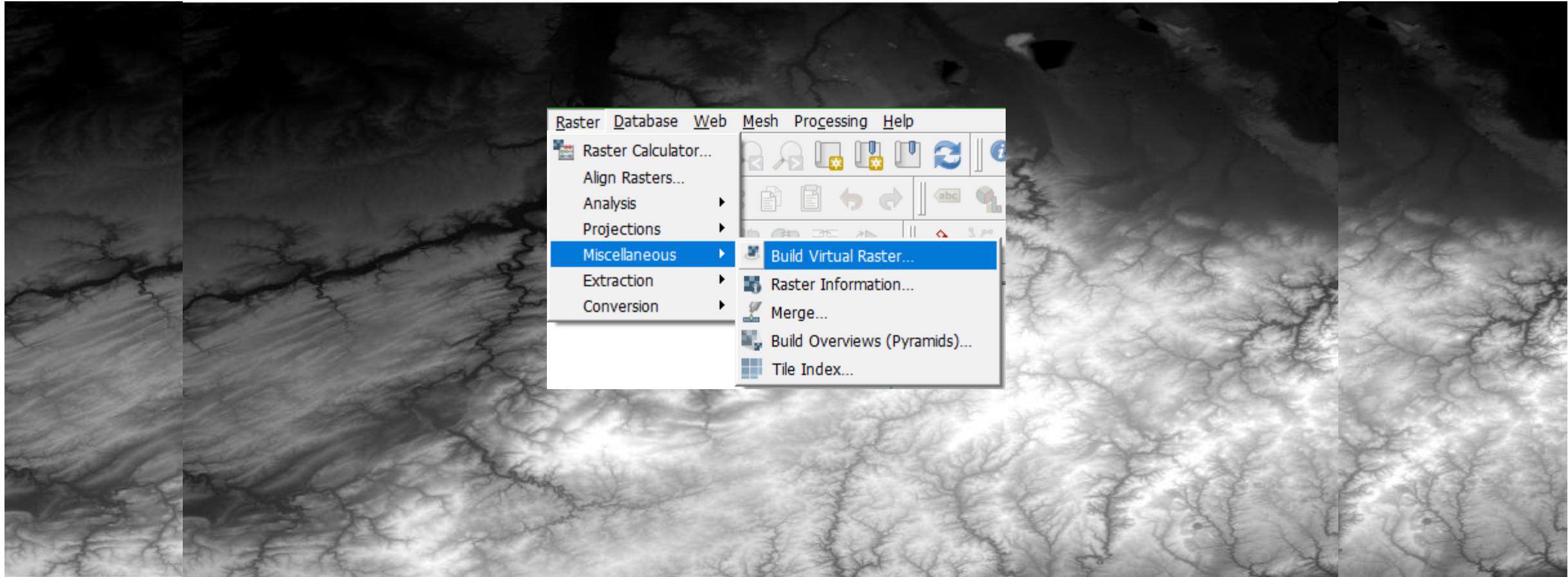
SRTM Void Filled:
~30 m for USA
~90 m global

ASTER Global
DEM (GDEM)
(~30 m)

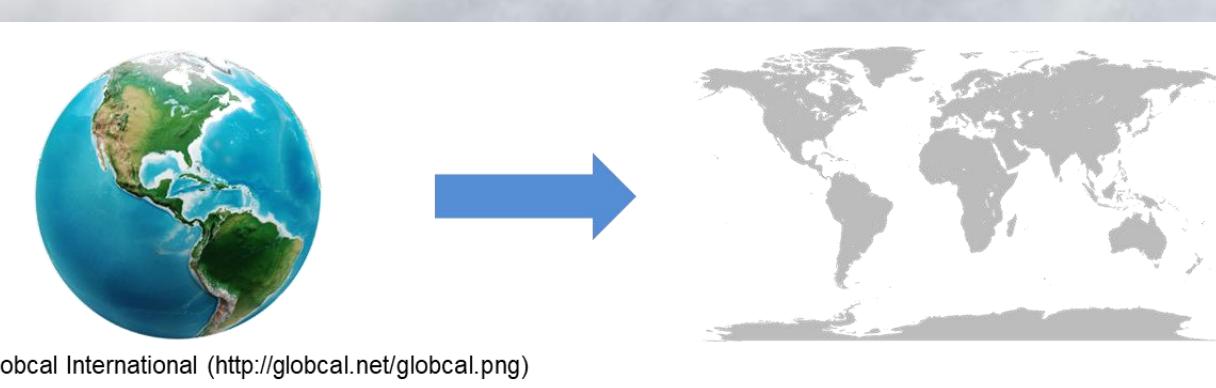


SRTM Downloader Plugin

Mosaic DEM tiles



Reproject DEM



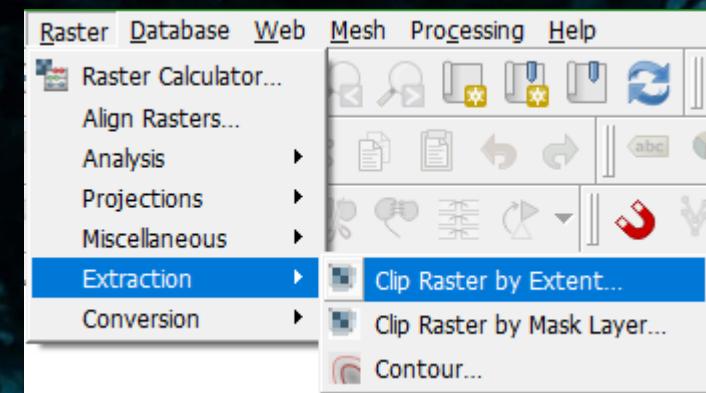
obcal International (<http://globcal.net/globcal.png>)

- Global datasets are usually in EPSG:4326 (Geographic Coordinate System, Lat/Lon)
- For correct calculation of DEM derivatives, the DEM should be reprojected to a Coordinate Reference System

Photo by [Sylwia Bartyzel](#) on [Unsplash](#)

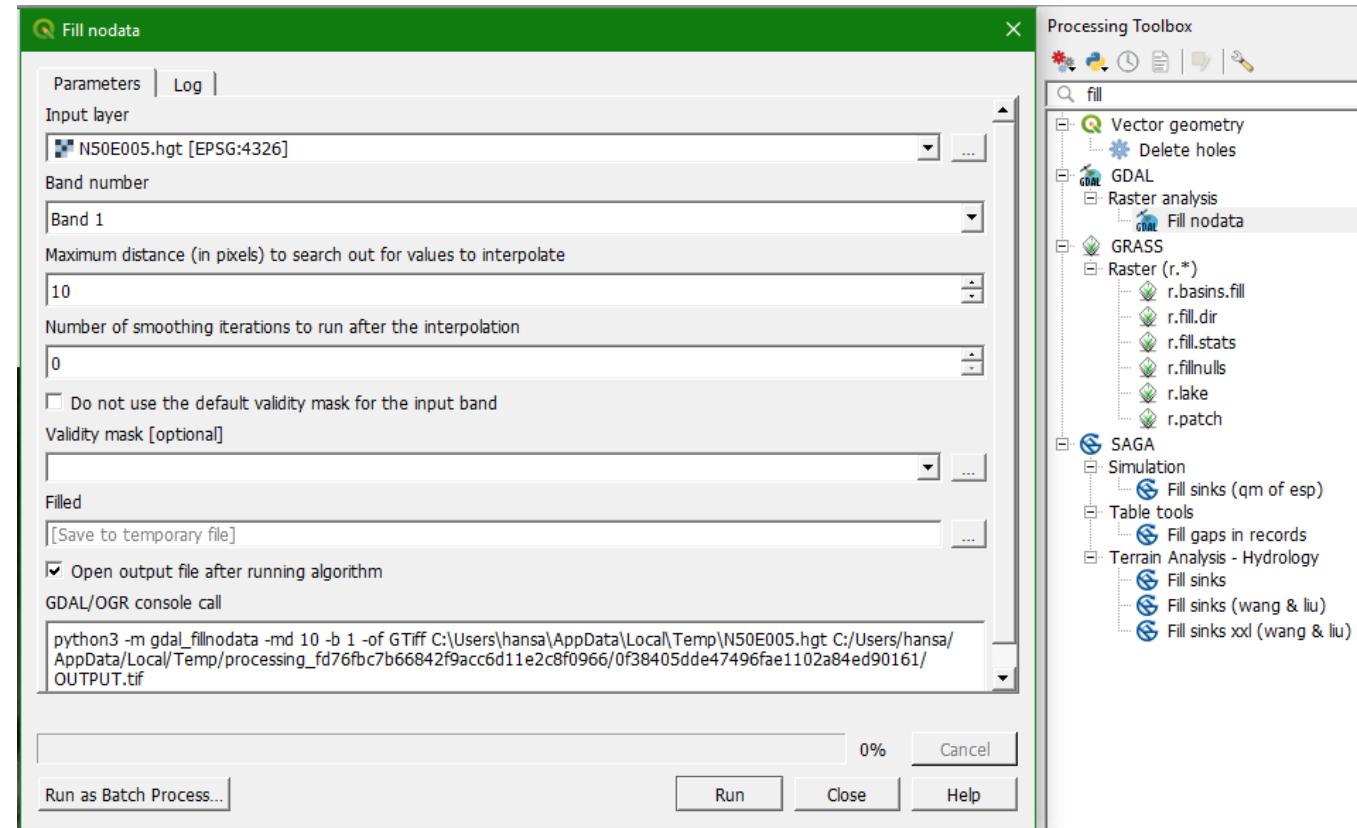
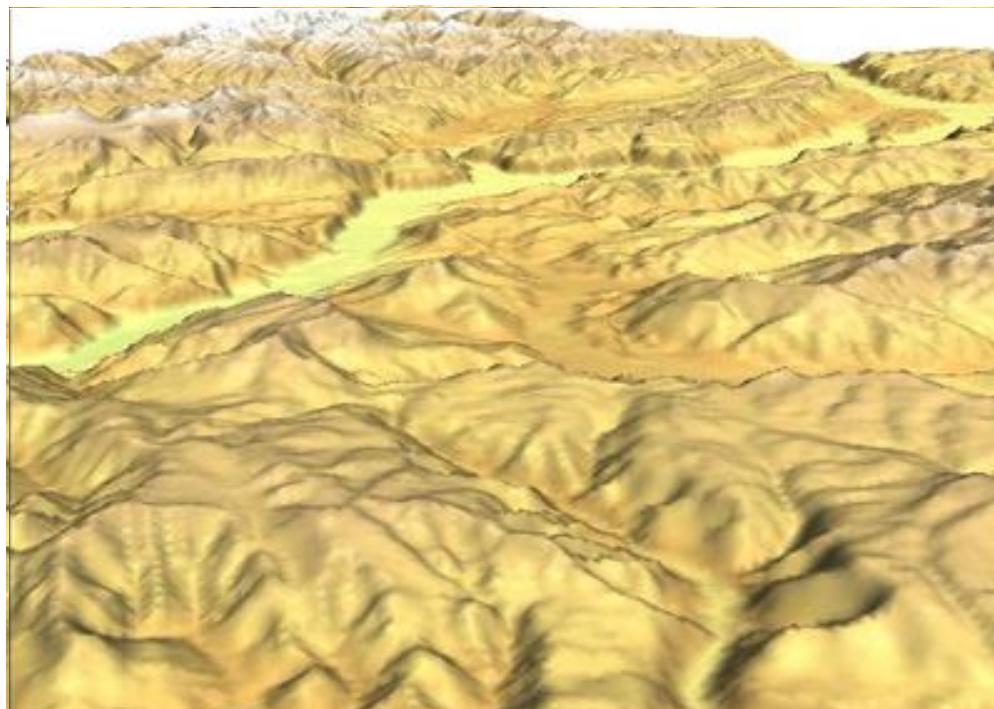
Subset DEM

- DEM too large: calculation times for the following steps can become too large or computer runs out of memory
- DEM too small: catchment boundaries are cut off



Interpolate voids

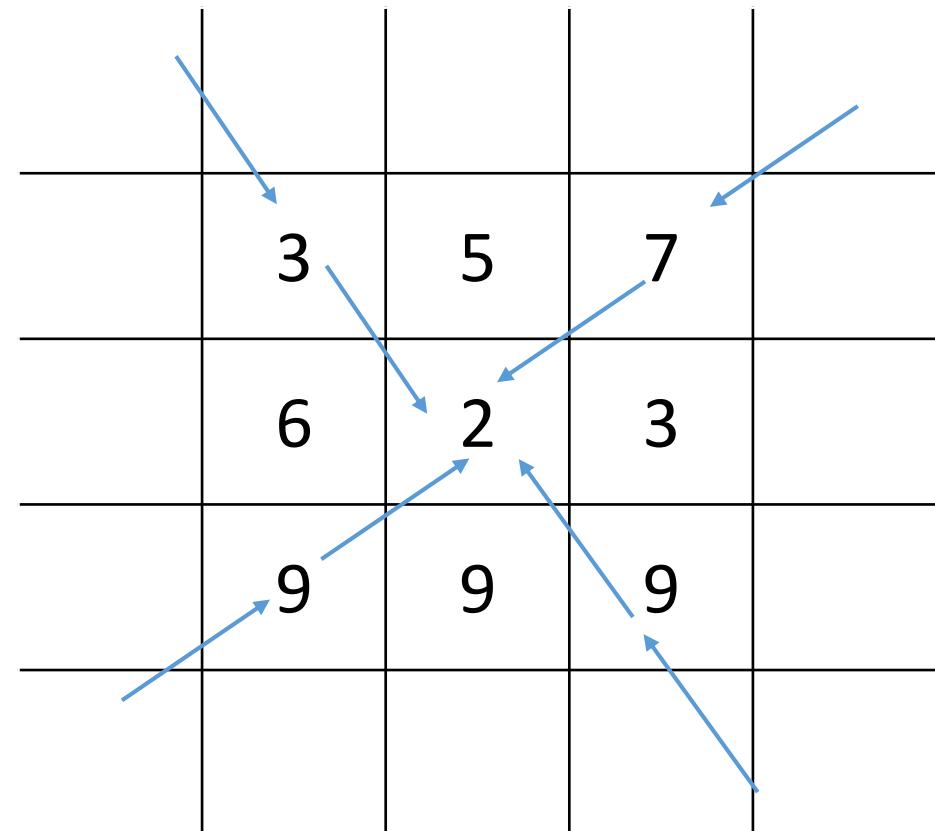
- Voids are pixels with NODATA in your DEM as a result of the acquisition procedure
- Voids can be interpolated using the values of surrounding cells



Fill sinks

- DEM creation results in artificial pits in the landscape
- A pit is a set of one or more cells which has no downstream cells around it
- Pits are removed using the fill sinks function in GIS software
- If landscape contains real sinks (e.g. lakes), these need to be added after pit removal

Water trapped in a pit

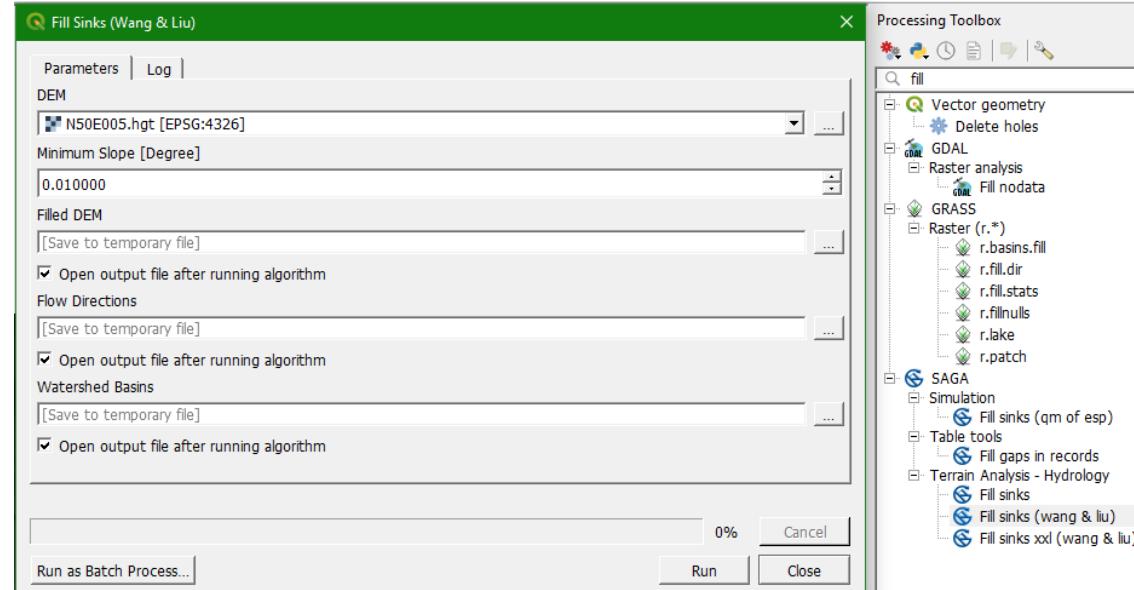
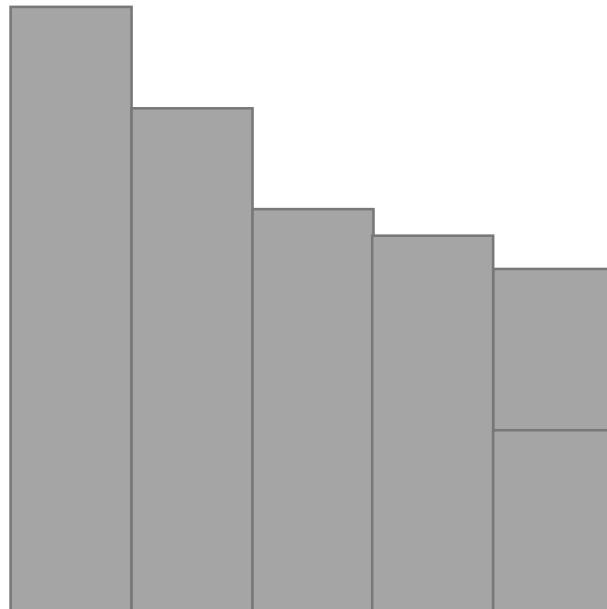


Fill sinks

Pits can be removed by:

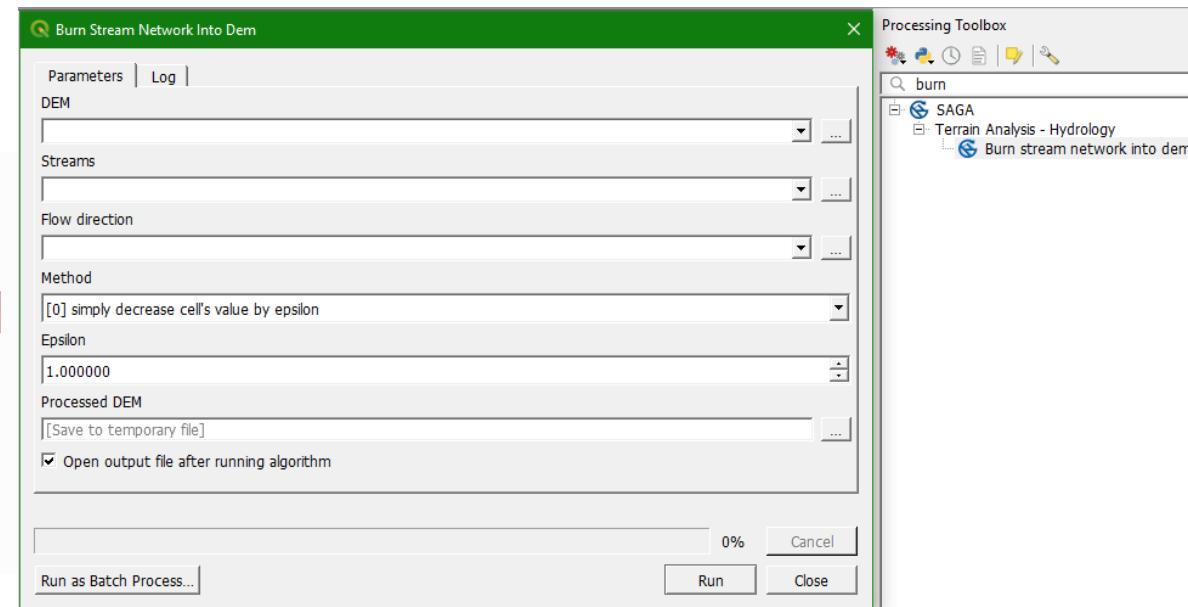
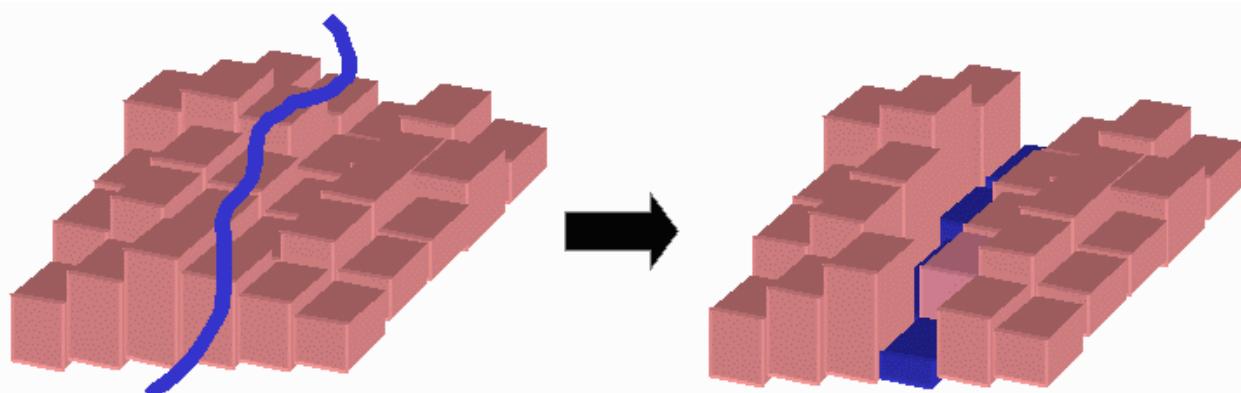
- Filling up
- Cutting through

Flow direction



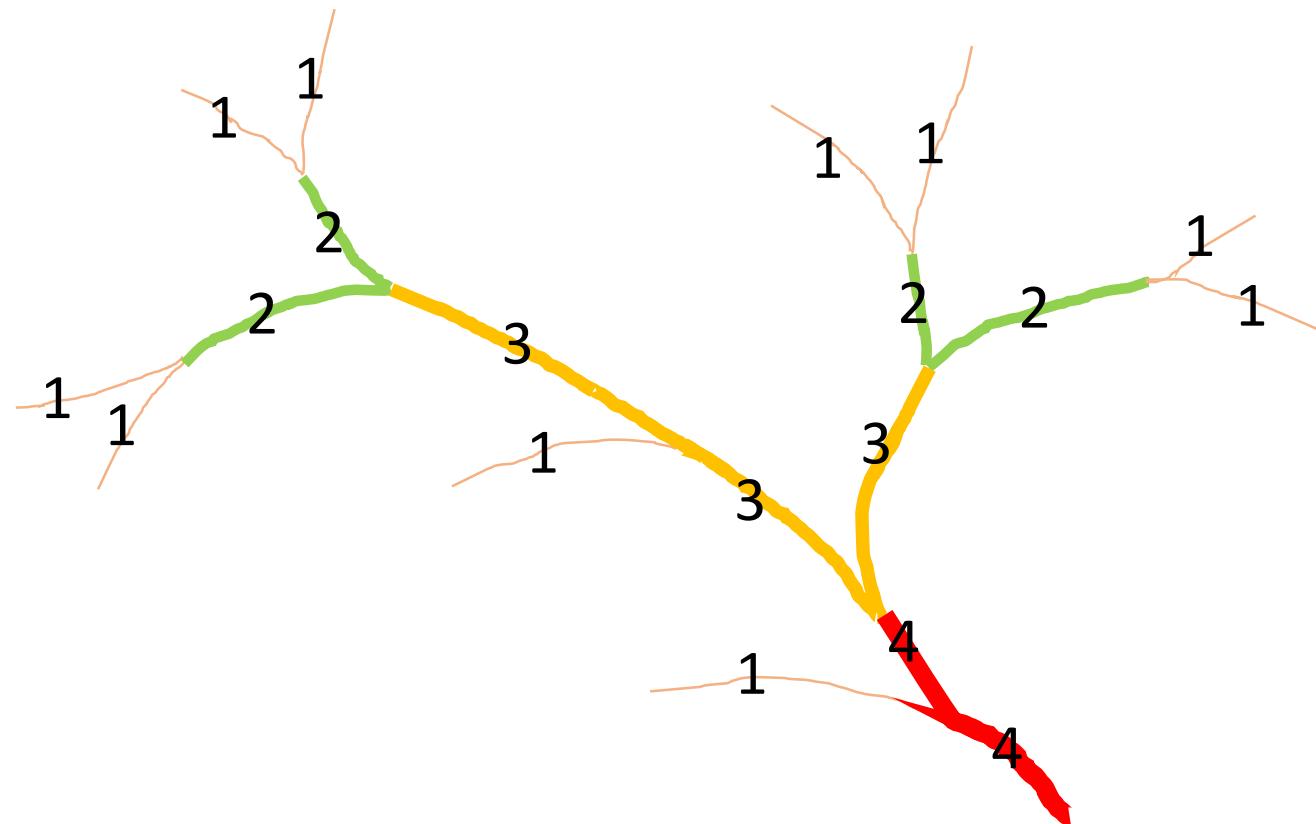
Burn-in the stream network

- When a river network layer exists it can be used to force the flow direction algorithm to follow the river network



Source: [Brad Hudgens \(1999\)](#)

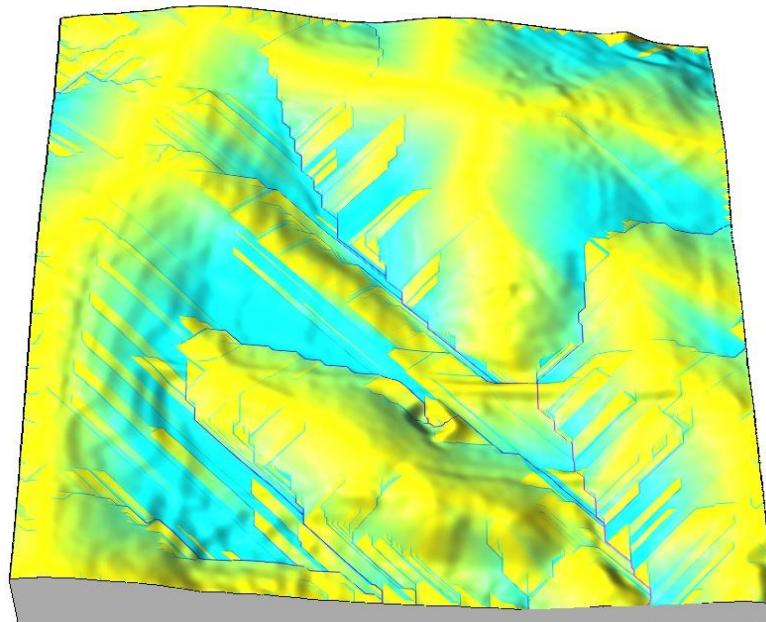
Derive Streams with Strahler order



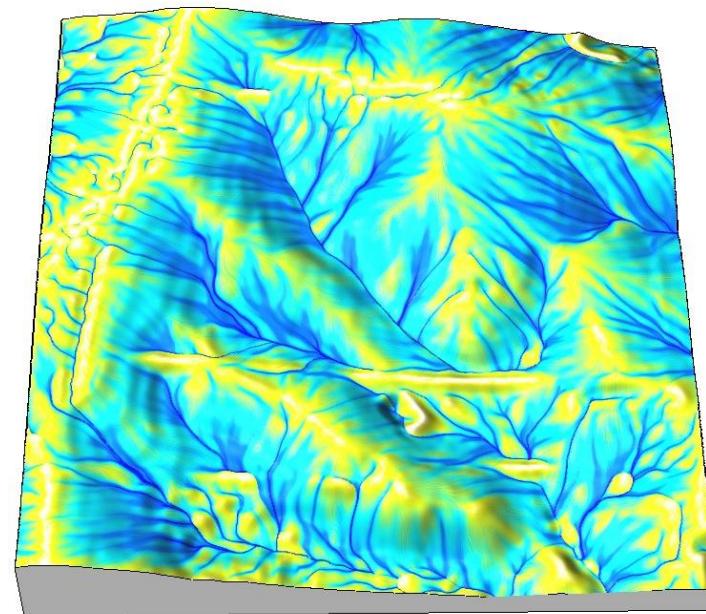
Calculate flow direction

- D8 algorithm: uses 8 discrete directions to calculate flow direction (0, 45, 90, 135, 180, 225, 270, 315 degrees) to steepest cells downwards
- Dinf algorithm: uses continuous directions

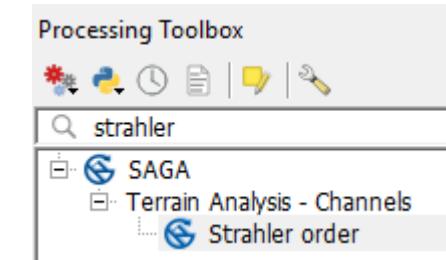
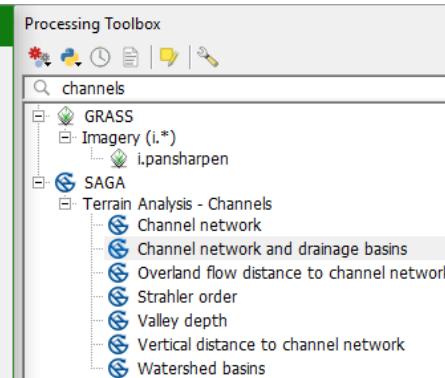
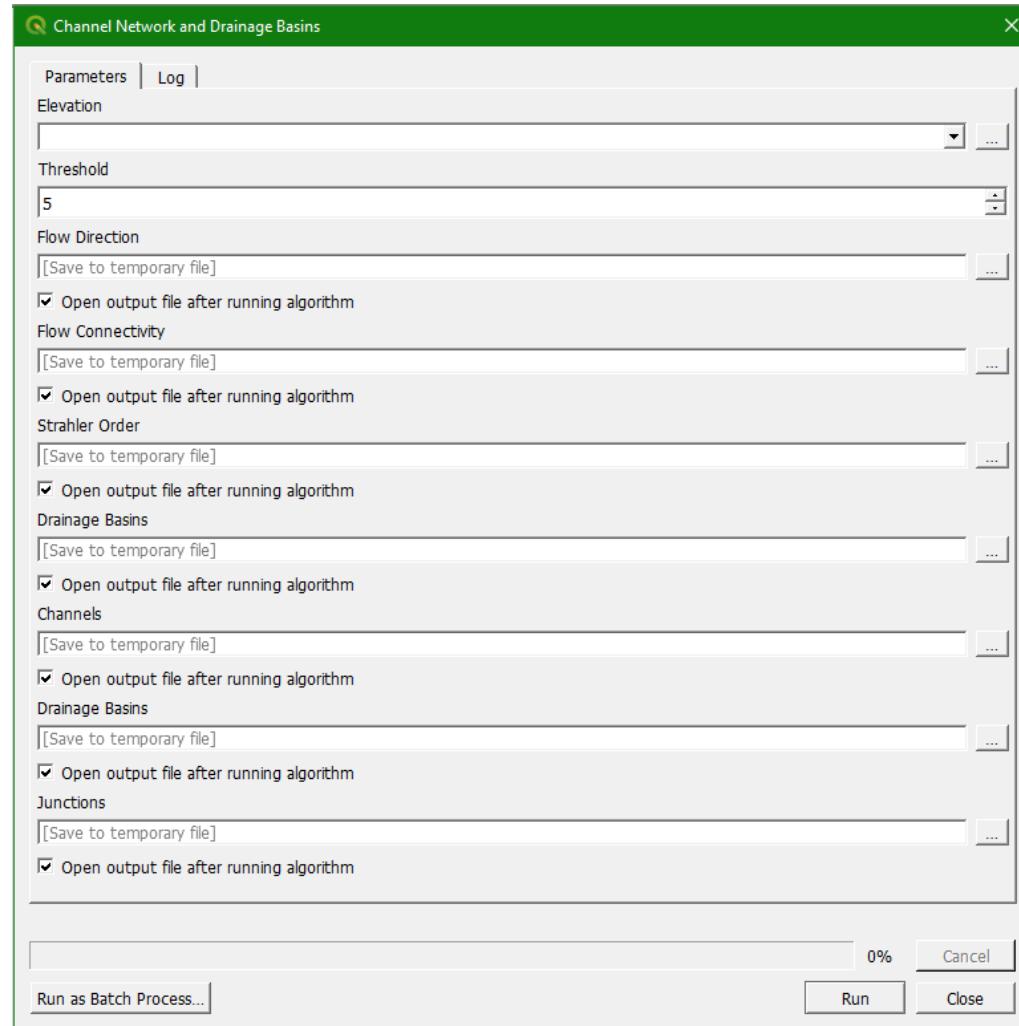
D8



Dinf



SAGA Tools



A screenshot of a Stack Exchange post titled "Circular color map in QGIS". The post includes the following text and a color ramp visualization:

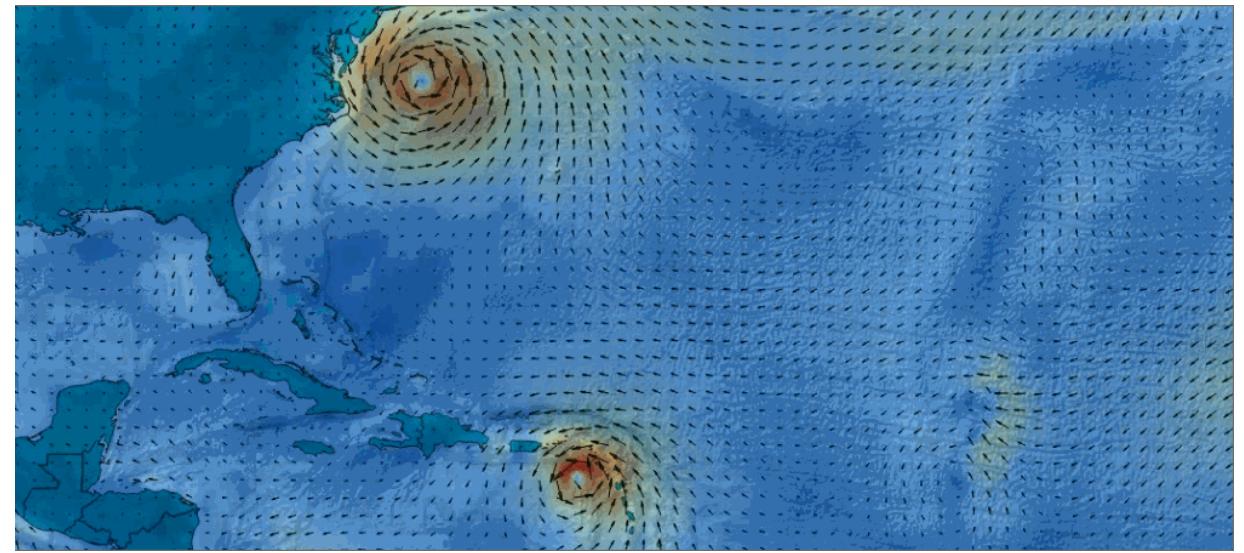
In order to plot azimuth values for example, does anyone know any good circular color map?
By *good* I mean, visually suited for human color perception.
I didn't find any suited color ramp preset in QGIS.
So I build one, like the following, by taking profit that HSV values are given as angular degrees:

The visualization shows a circular color ramp with stops labeled N, E, S, W, and N. It includes controls for "Color 1" and "Color 2", "Type" (set to "Continuous"), and a "Gradient stop" section with a relative position of 0.0% and a "Delete stop" button. Below the main ramp, there is a smaller color bar with a slider and a value of 240°.

Inspired during
QGIS User Conference in A Coruña



Workshop by Kurt Menke



Visualisation of mesh data using the Crayfish plugin

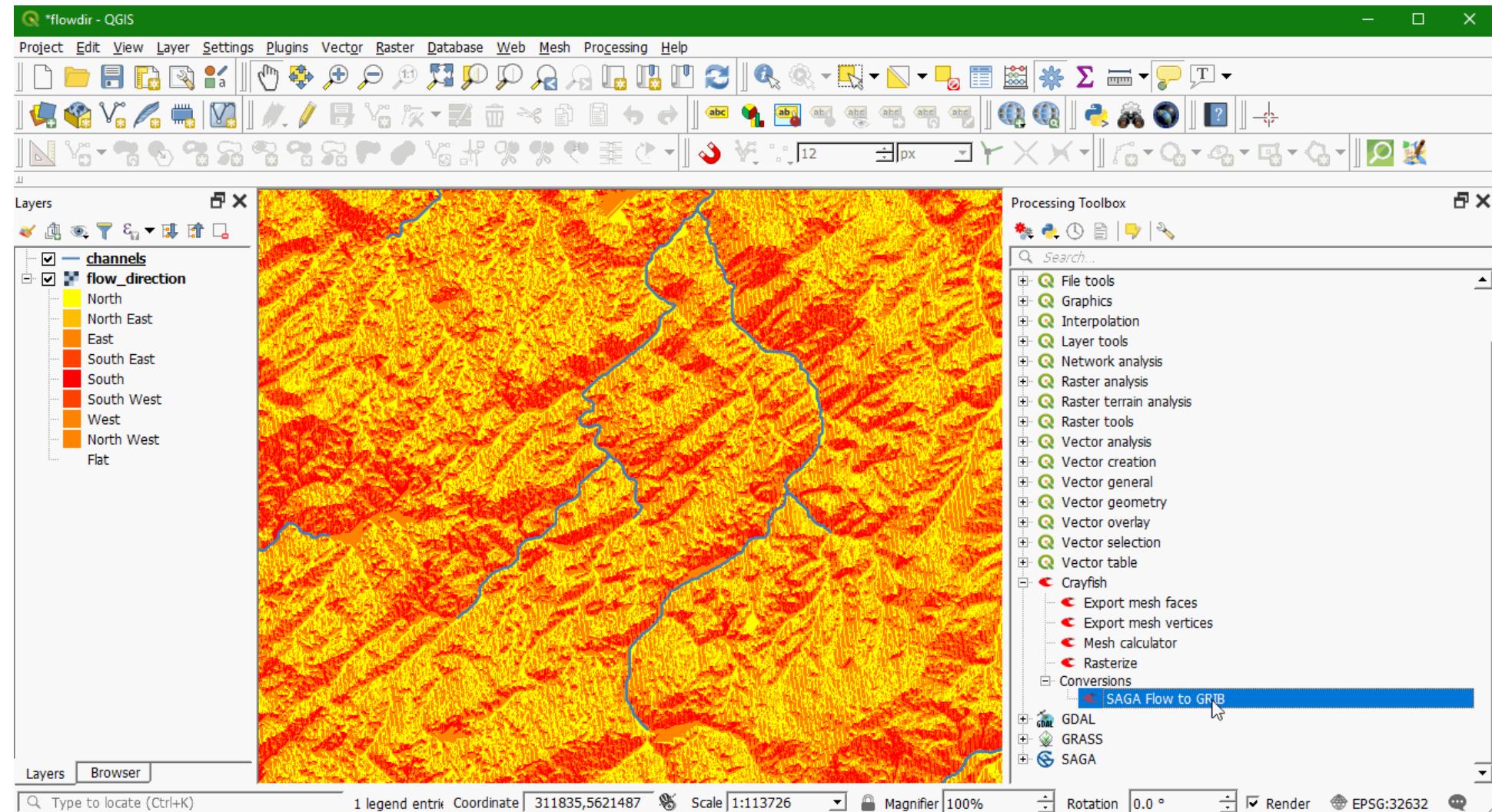
Developing plugins during QGIS hackfest



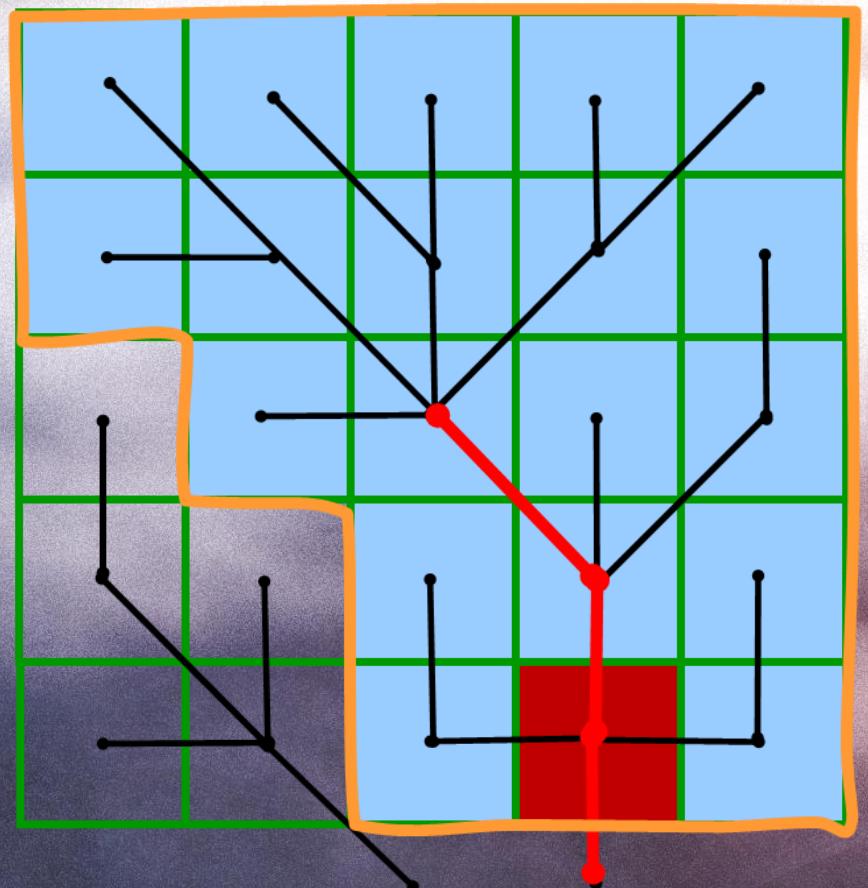
Picture by Erik Meerburg

Thanks to Radek Pasiok and Peter Petrik
from Lutra Consulting!

Visualise SAGA Flow Direction with Crayfish



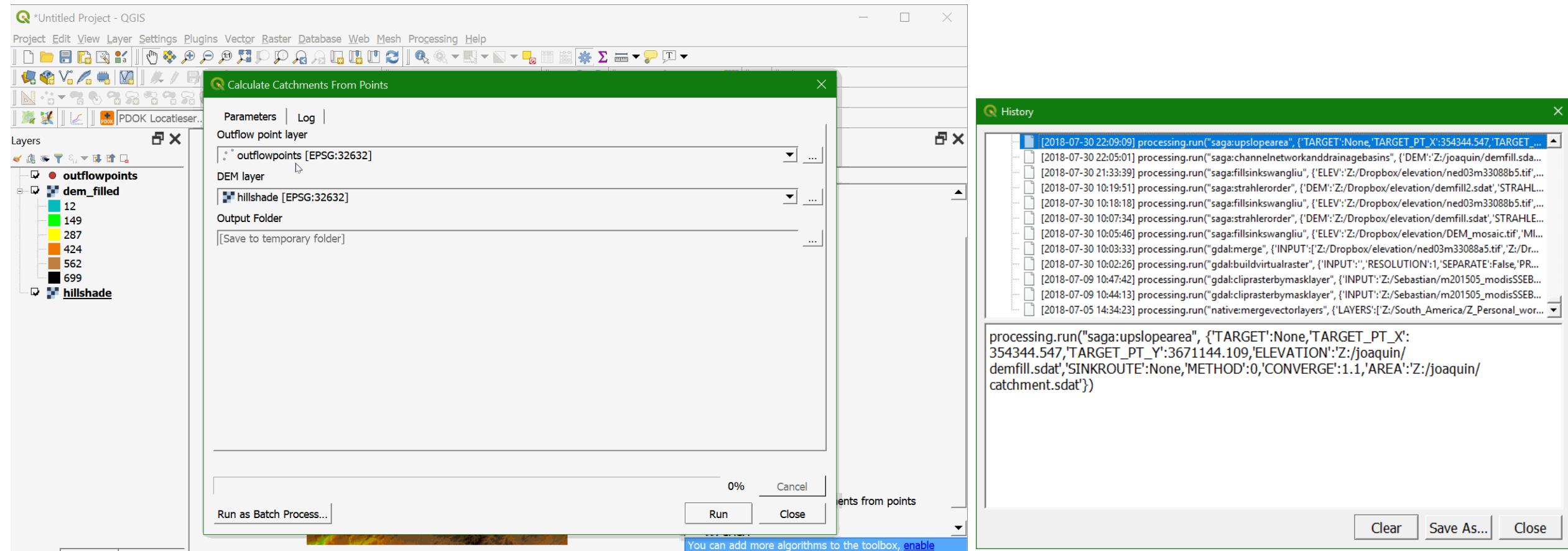
Define outflow point



The red cell is the OUTLET cell

- Outlet needs to be defined in a delineated river that corresponds with the flow directions that have been calculated
- Outlets can be:
 - Location in river with discharge measurement
 - Outlet of a tributary
 - ...

Plugin for deriving catchments for multiple outlets



Use Processing History in combination
with PyQGIS

Conclusions

- Innovation is about connecting the dots
- QGIS is a team effort
- Hackfests are great fun
- QGIS is a great tool for hydrology



Image by [Whitney Waller](#) (CC-BY-SA)



Save the date!

- Book launch on September 19 2019, 5:30 pm at IHE Delft
- Masterclass Cartographic Skills in QGIS by Kurt Menke on September 23 at GeoFort
- Sneak preview of the book at FOSS4G 2019 in Bucharest on August 27
- Short course QGIS for Hydrological Applications from 16-20 September 2019 at IHE Delft
- Online course with Nieuwland Geoinformation:
<http://www.learning-gis.com>

