



New tools for LiDAR, forestry, river management and hydro-geomorphology with JGrassTools in gvSIG

Franceschi Silvia & Antonello Andrea

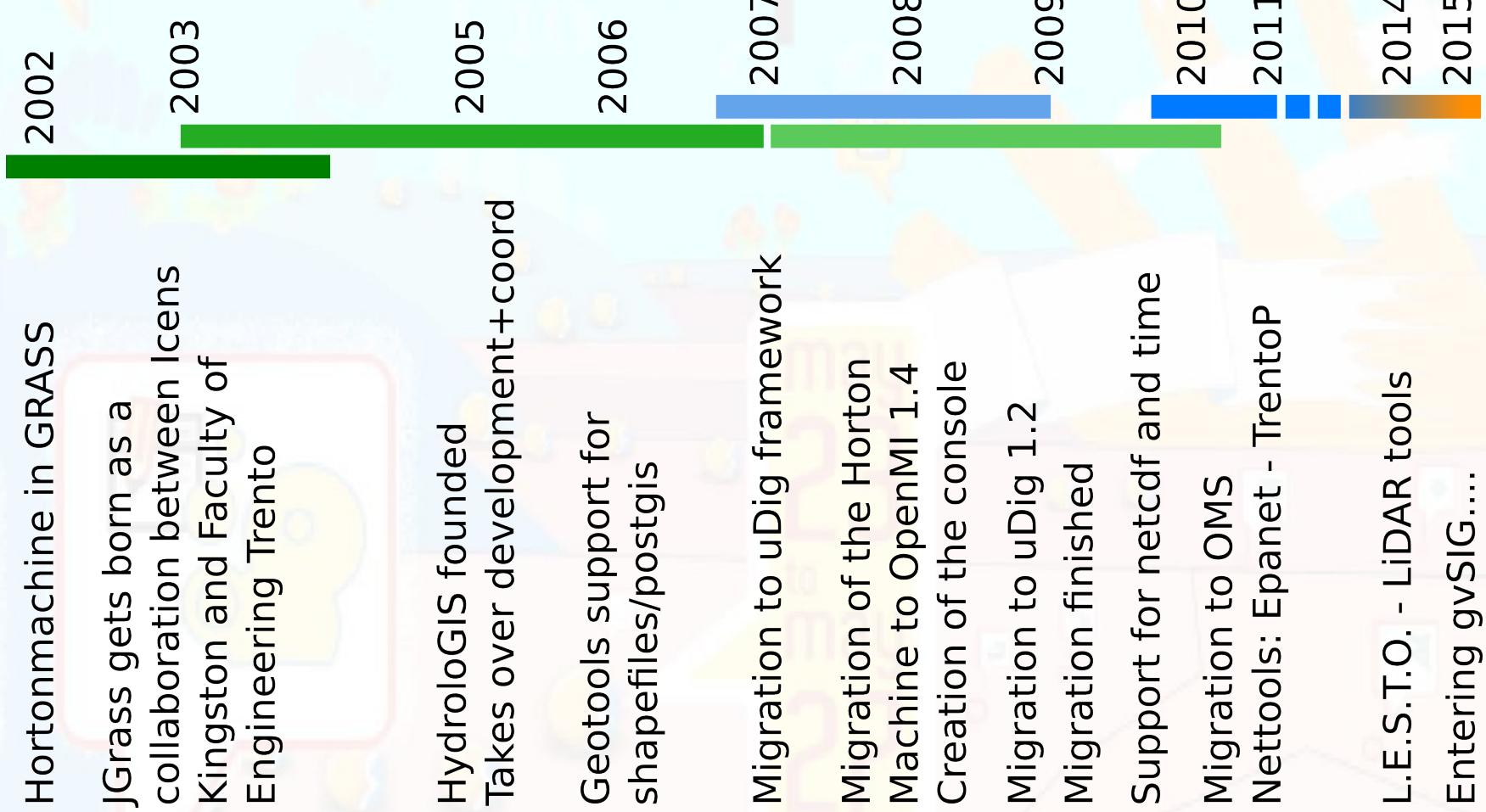
WHO AM I?

- environmental engineer specialized in hydrology, hydraulics and geomorphology
- co-founder of HydroloGIS member of gvSIG association
- developed scientific models contained in the JGrassTools library in the field of:
 - hydrology
 - hydraulics
 - forestry
- PhD student of Science and Technology at the Free University of Bolzano (Italy)
- OSGeo Charter Member

HydroloGIS
Environmental Engineering

THE JGRASSTOOLS LIBRARY

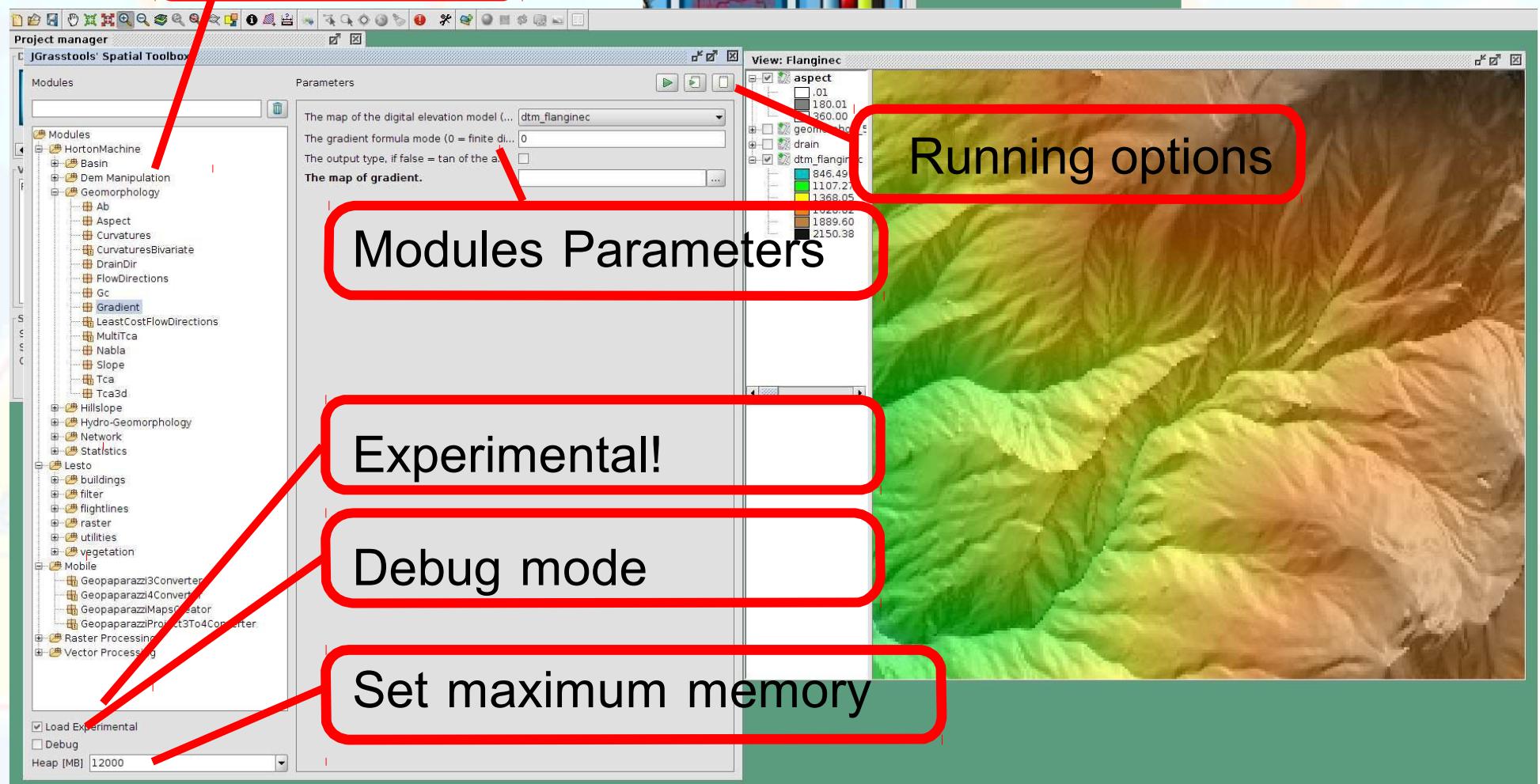
An open geospatial library focused on hydro-geomorphological analysis and environmental modeling in general.



THE JGRASSTOOLS SPATIAL TOOLBOX

JGrasstools inside gvSIG:

Modules List

The interface shows the "JGrasstools' Spatial Toolbox" window. On the left, the "Modules" tree view lists categories like HortonMachine, Geomorphology, Hydro-Geomorphology, Network, Statistics, Lesto, and Mobile. A red box highlights the "Modules" list. In the center, the "Parameters" panel displays settings for "Aspect" and "dtm_flanginec". A red box highlights the "Modules Parameters" section. On the right, a 3D terrain visualization of a mountainous area with a color gradient from green to brown. A red box highlights the "Running options" section.

Running options

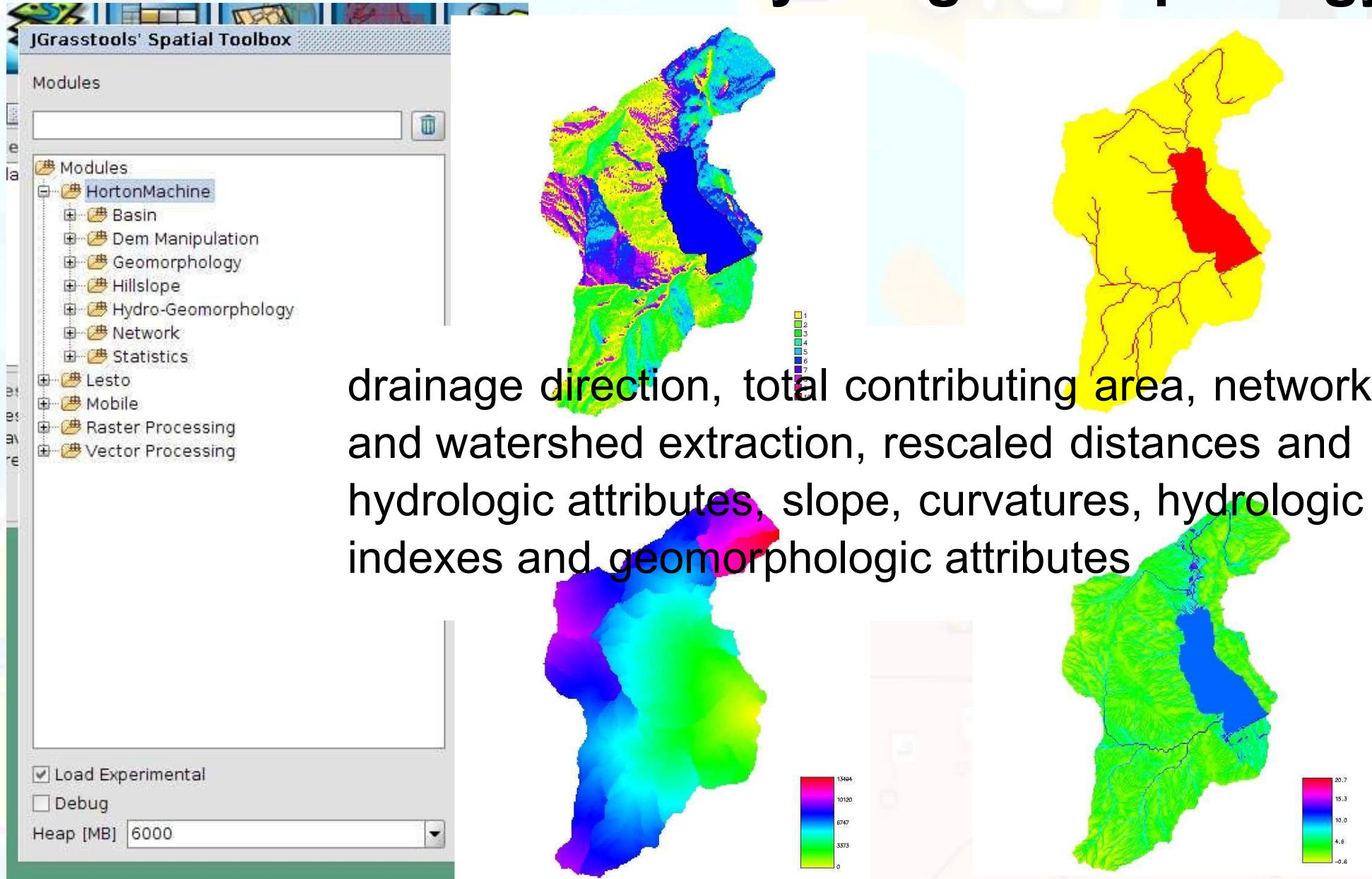
Modules Parameters

Experimental!

Debug mode

Set maximum memory

THE HORTONMACHINE: hydro-geomorphology



THE HORTONMACHINE: statistics

Interpolation of meteorological data with **Kriging** (rainfall and temperature) and **Jami** (temperature, pressure, humidity and wind)

JGrasstools' Spatial Toolbox

Modules

- HortonMachine
 - Basin
 - Dem Manipulation
 - Geomorphology
 - Hillslope
 - Hydro-Geomorphology
 - Network
- Statistics
 - Cb
 - Jami
 - Kriging
 - SumDownStream
- Lesto
- Mobile
- Raster Processing
- Vector Processing

Parameters

The vector of the measurement point, con...

The file with the measured data, to be i...

The vector of the points in which the da...

The collection of the points in which th...

The field of the vector of stations, def...

The field of the vector of stations, def...

The field of the interpolated vector poi...

The field of the interpolated vector poi...

The interpolation mode (0 = interpolate ...

The integral scale as comma separated va...

The variance.

Switch for logarithmic run selection.

The type of theoretical semivariogram: 0...

Include zeros in computations (default i...

The range if the models runs with the ga...

The sill if the models runs with the gau...

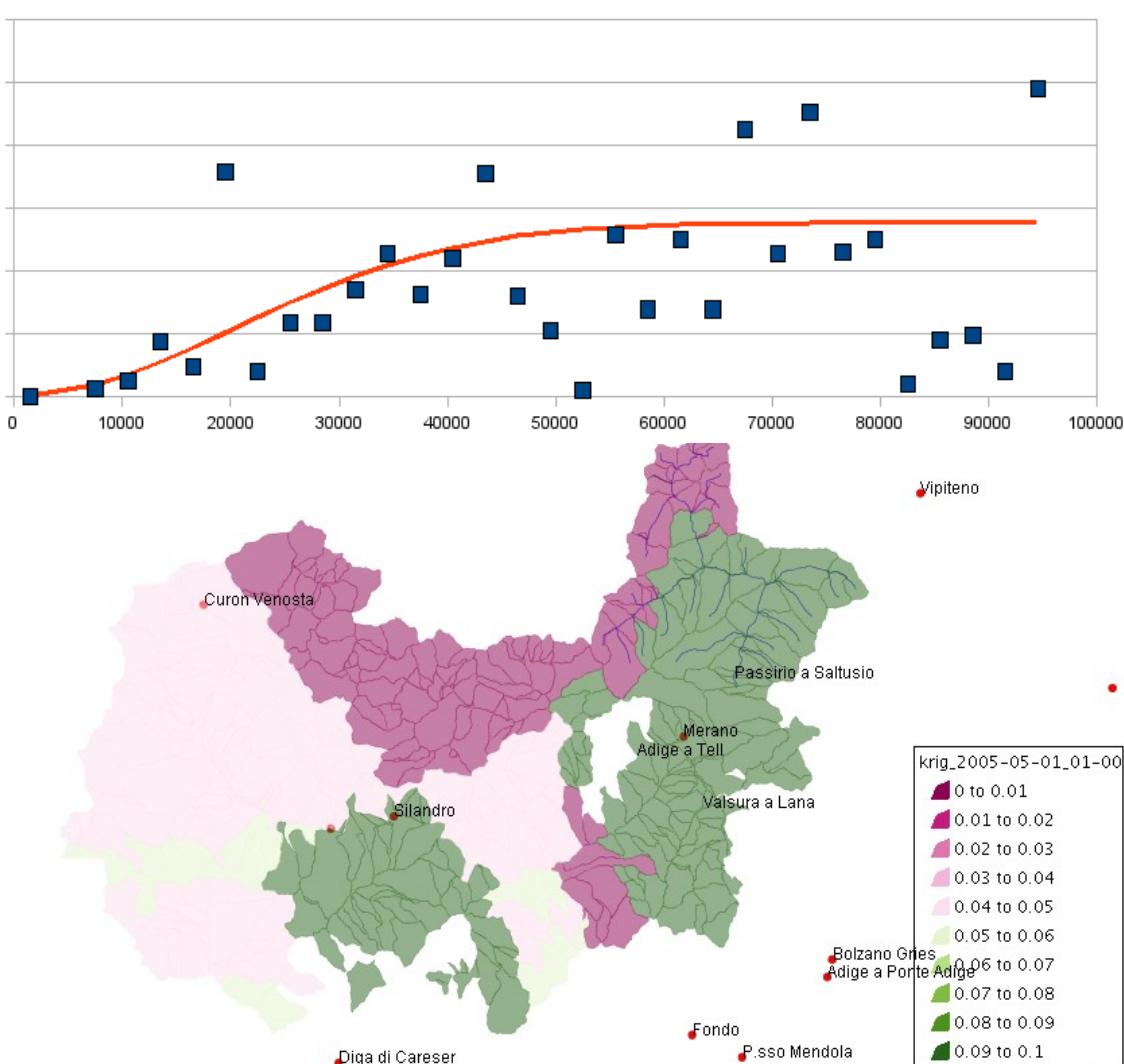
Is the nugget if the models runs with th...

The interpolated gridded data (for mode ...

Load Experimental

Debug

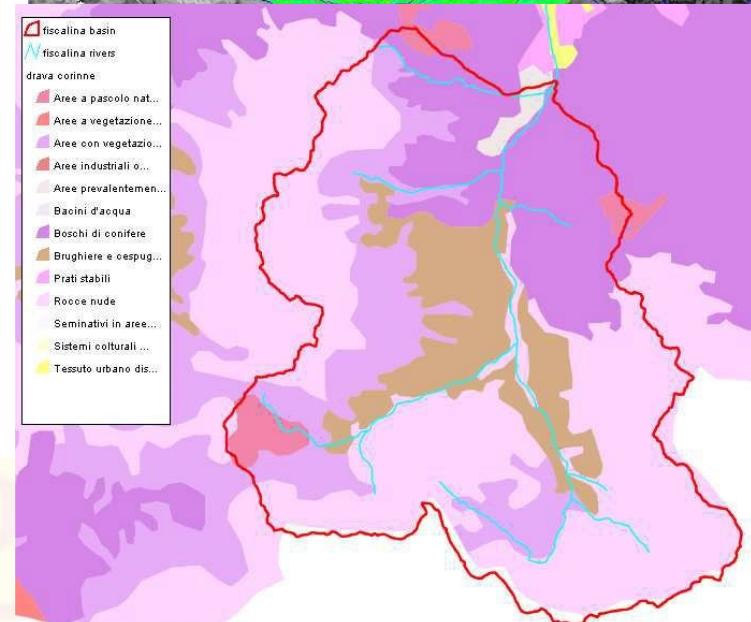
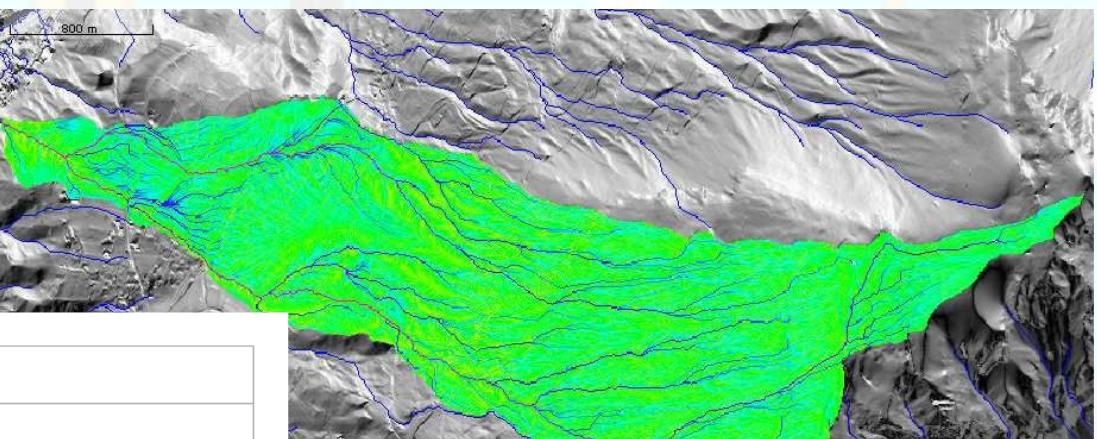
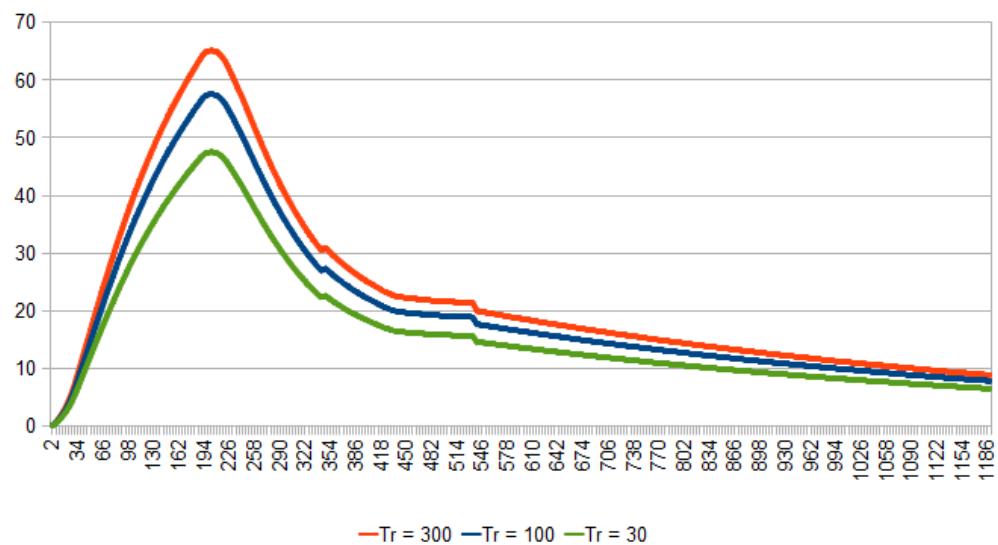
Heap [MB]



THE HORTONMACHINE: hydro-geomorphology

Evaluation of the maximum discharge for a given precipitation
 (works also with statistical information rainfall Intensity-Duration
 Curves)

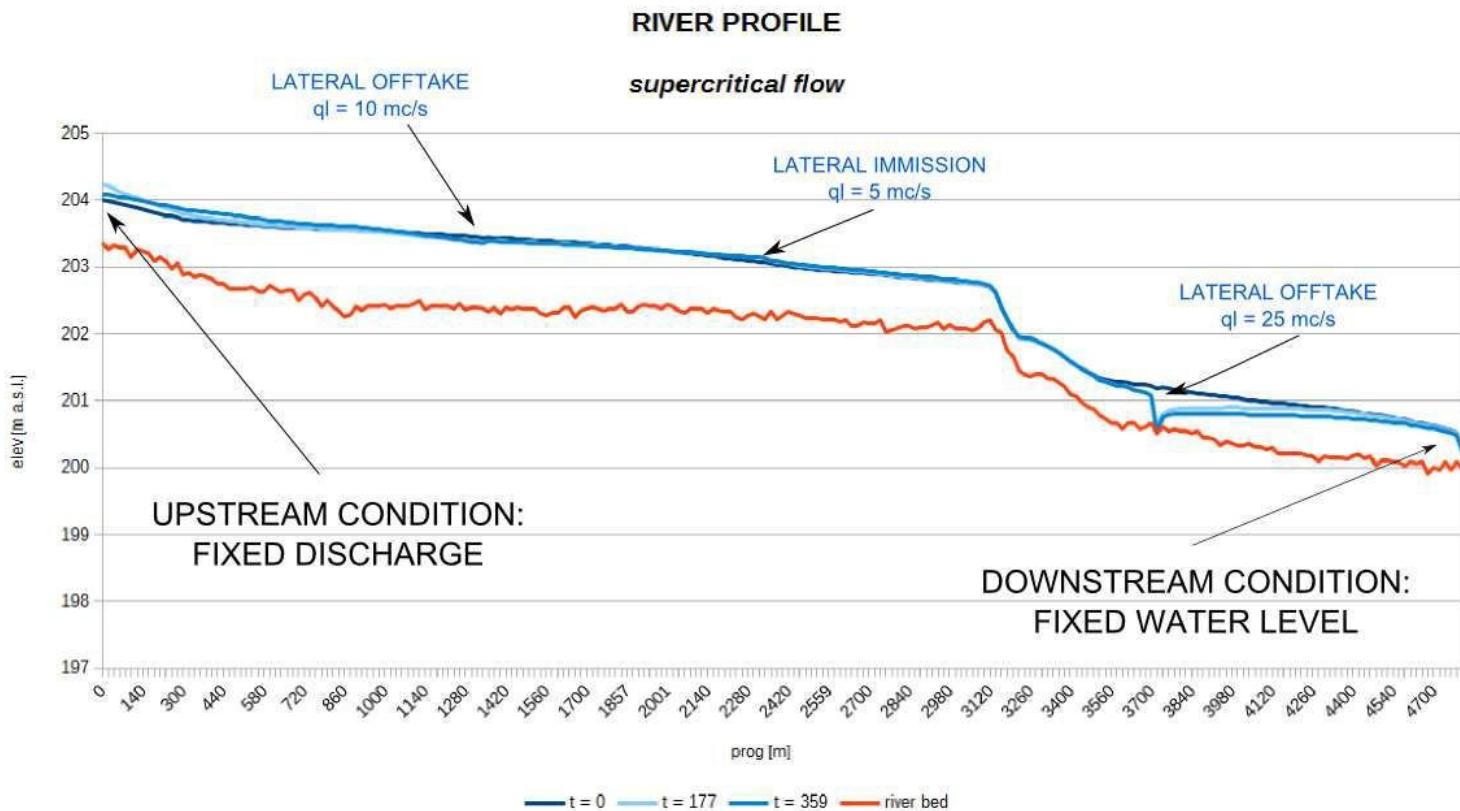
Peakflow



THE HORTONMACHINE: hydro-geomorphology

Simplified 1D hydraulic model:

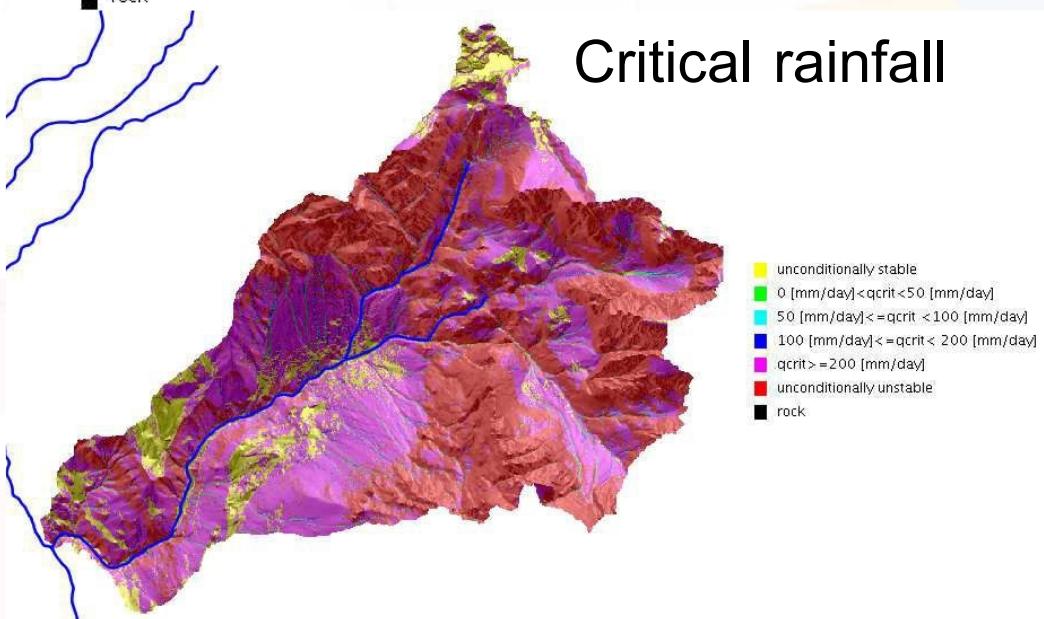
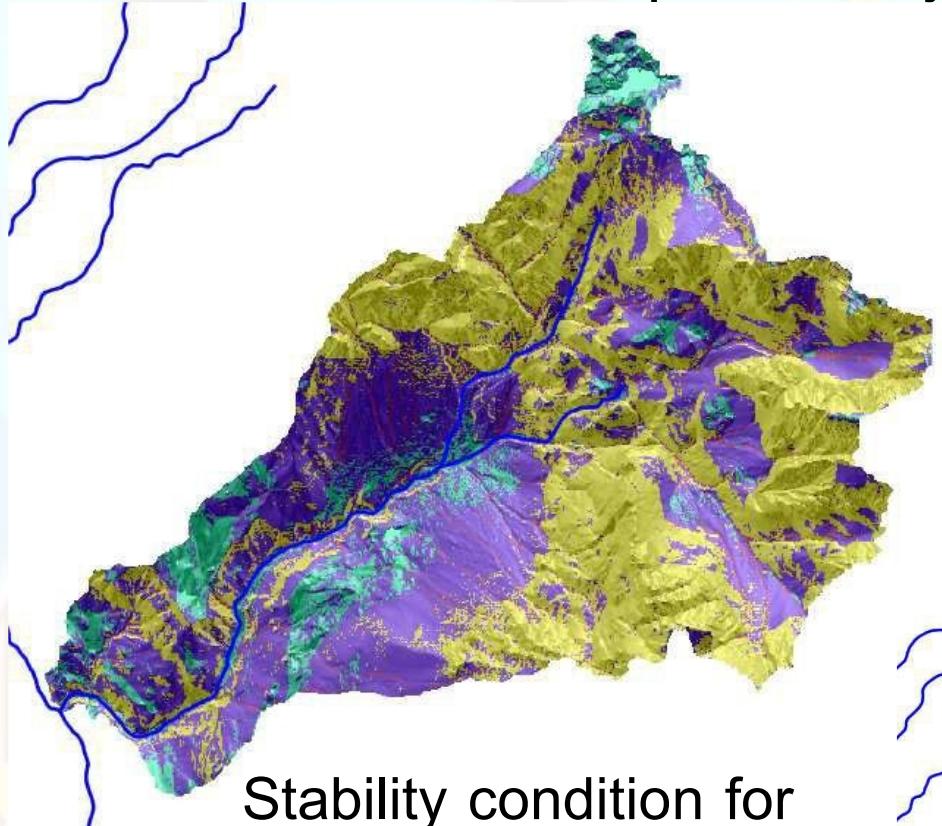
- based on Saint Venant equations
- GIS based: input and output are GIS layers
- calculates the water depth and velocity for each section
- can handle lateral contributes: inflow and outtakes



Data preparation for the **Hecras** hydraulic software for channels.

THE HORTONMACHINE: hydro-geomorphology

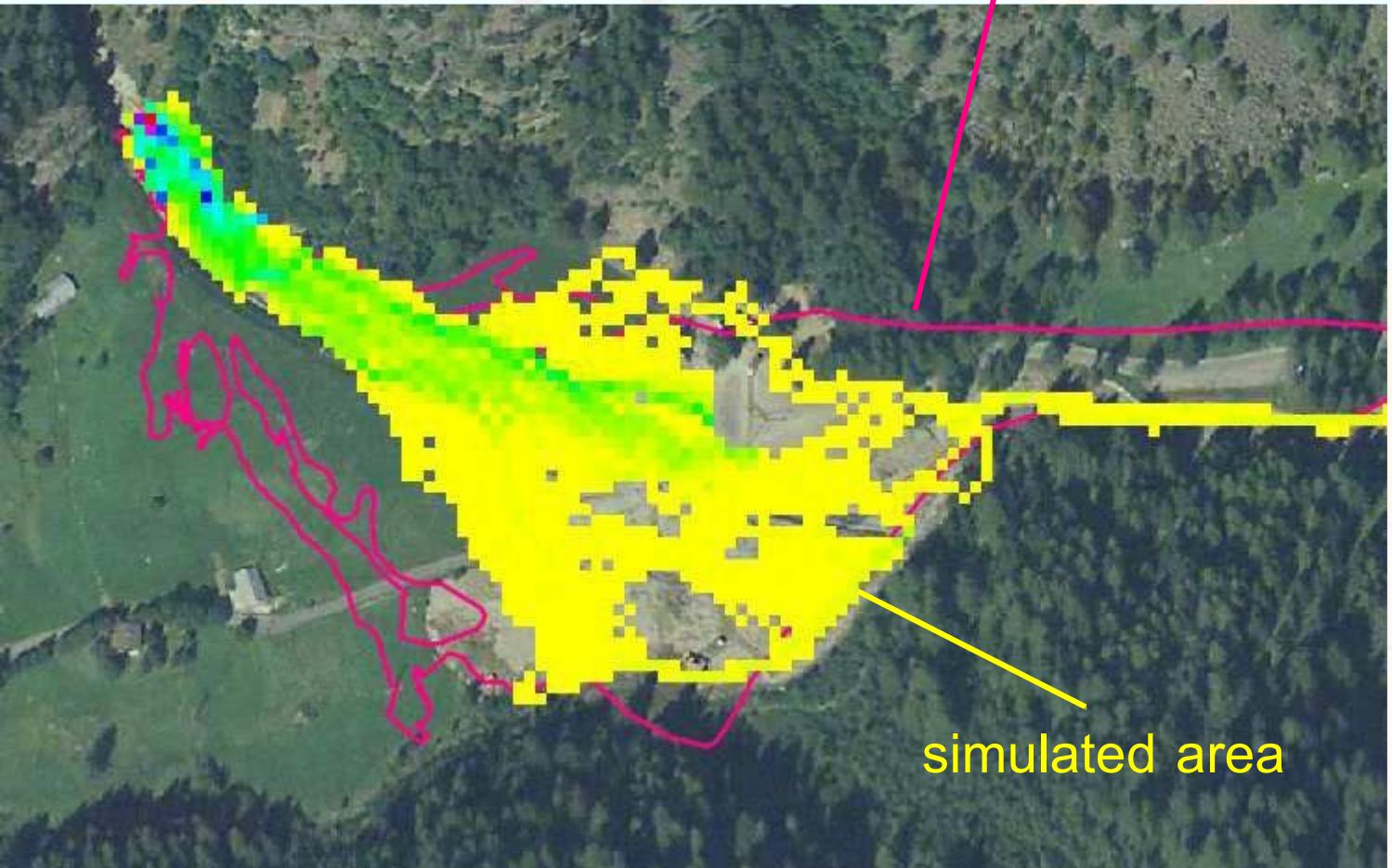
Evaluation of the hillslope stability: Shalstab



THE HORTONMACHINE: hydro-geomorphology

DebrisFlow: triggering, propagation in network and final propagation on the fan

area interested by the event



RASTER & VECTOR TOOLS

JGrasstools' Spatial Toolbox

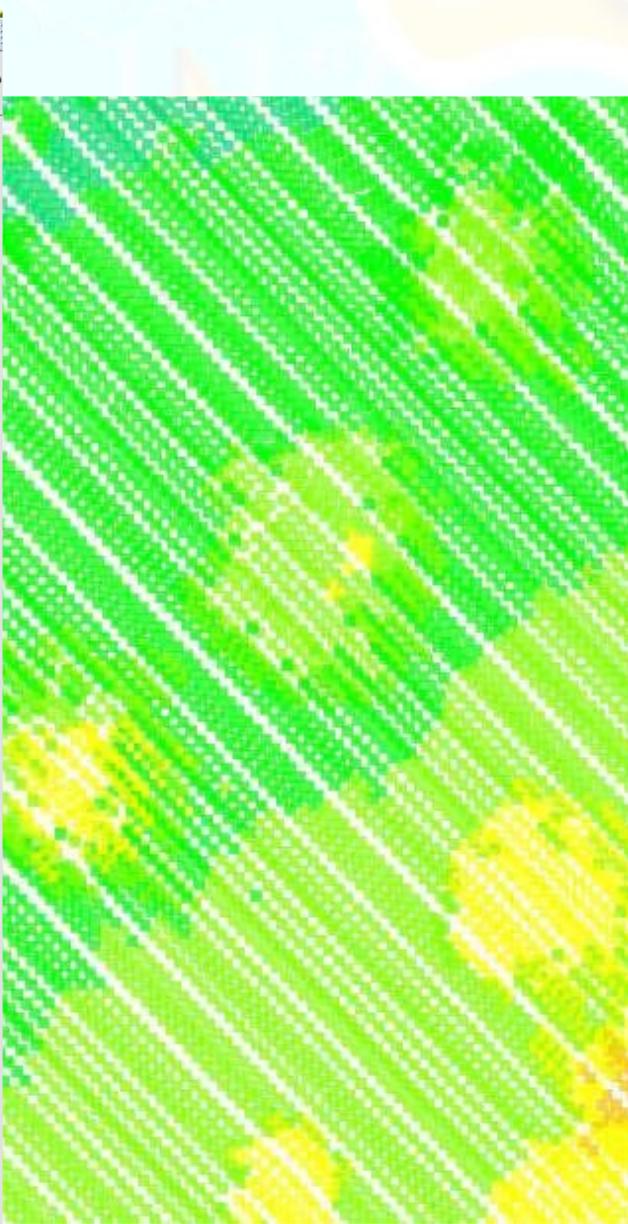
Modules

- Lesto
- Mobile
- Raster Processing
 - BobTheBuilder
 - CannyEdgeDetector
 - Carver
 - CutOut
 - Geomorphon
 - ImageMosaicCreator
 - KernelDensity
 - Labeler
 - LinesRasterizer
 - Mapcalc
 - Morpher
 - Mosaic12
 - PointsRasterizer
 - Profile
 - RangeLookup
 - Raster2Xyz
 - RasterConverter
 - RasterCorrector
 - RasterDiff
 - RasterExtruder
 - RasterGenerator
 - RasterNull
 - RasterReprojector
 - RasterResolutionResampler
 - RasterSummary
 - RasterTransformer
 - RasterValueRounder
 - RasterVectorIntersector
 - ScanLineRasterizer
 - SurfaceInterpolator
 - WindowSampler
 - Xyz2Raster
- Vector Processing

Load Experimental

Debug

Heap [MB] 6000



JGrasstools' Spatial Toolbox

Modules

- HortonMachine
- Lesto
- Mobile
- Raster Processing
- Vector Processing
 - Buffer
 - ContourExtractor
 - DelaunayTriangulation
 - DwgConverter
 - DxfConverter
 - GridsGenerator
 - IntersectionFinder
 - LasConverter
 - LasNativeChecker
 - LineSmoothenJaitools
 - LineSmoothenMcMaster
 - LinesPolygonizer
 - PointsVectorizer
 - RasterCatToFeatureAttribute
 - Shp2DxfConverter
 - VectorClipper
 - VectorFieldRounder
 - VectorFilter
 - VectorIntersector
 - VectorMerger
 - VectorOverlayOperators
 - VectorReprojector
 - VectorReshaper
 - VectorSimplifier
 - VectorTableJoiner
 - VectorTransformer
 - Vectorizer
 - VoronoiDiagram

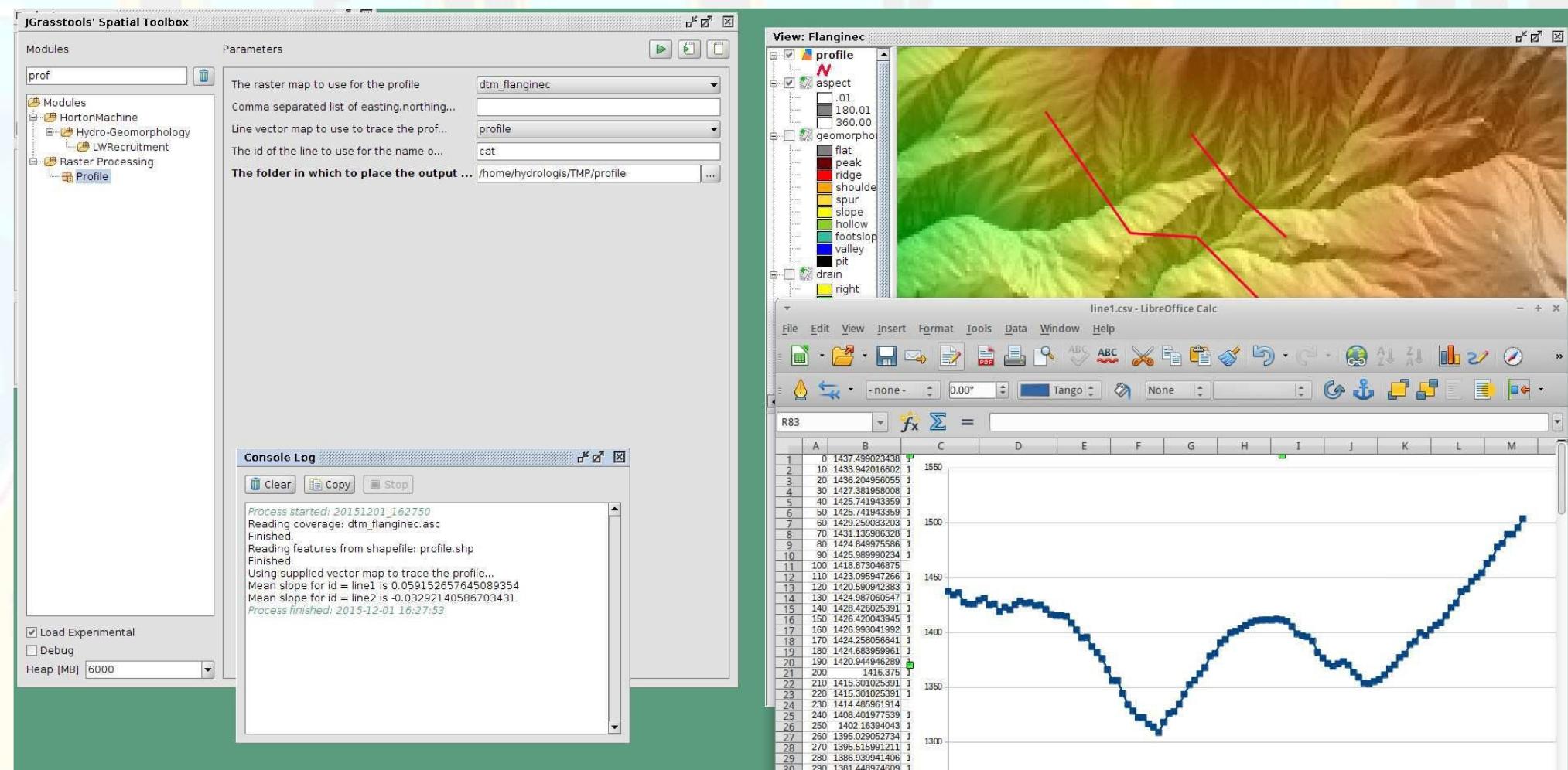
Load Experimental

Debug

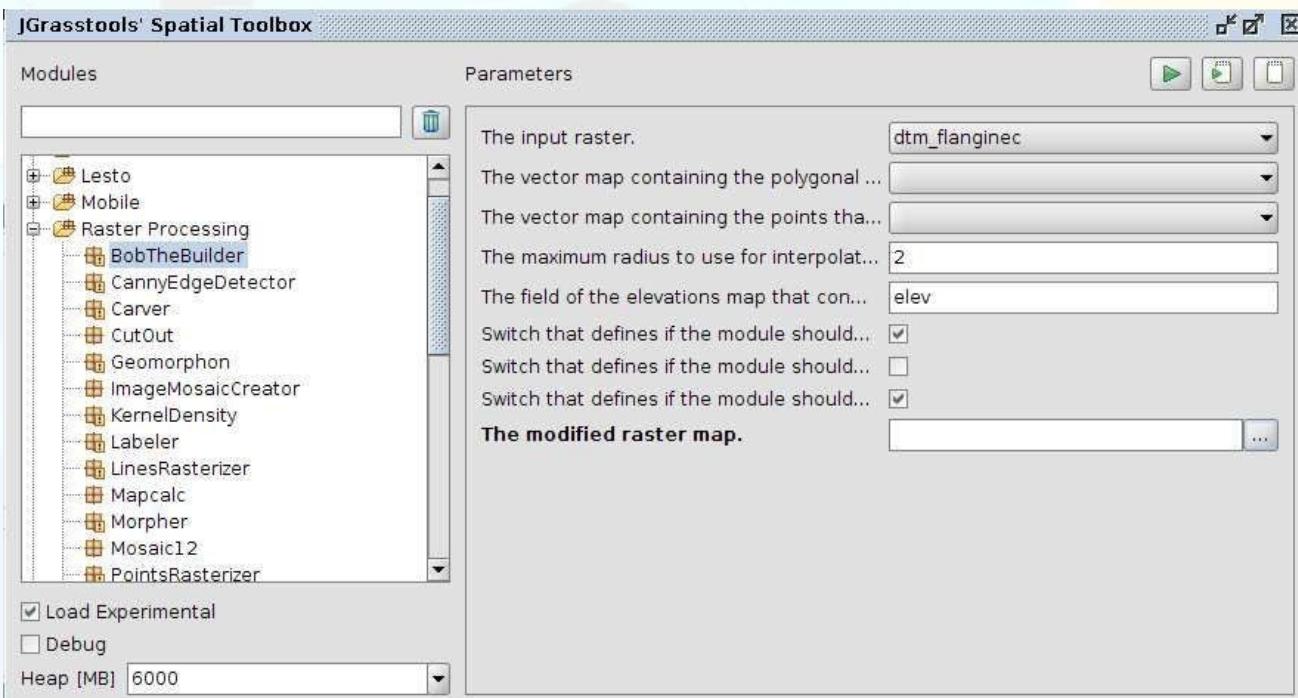
Heap [MB] 6000

RASTER & VECTOR TOOLS

Extraction of shapefile **profiles** over the elevation model

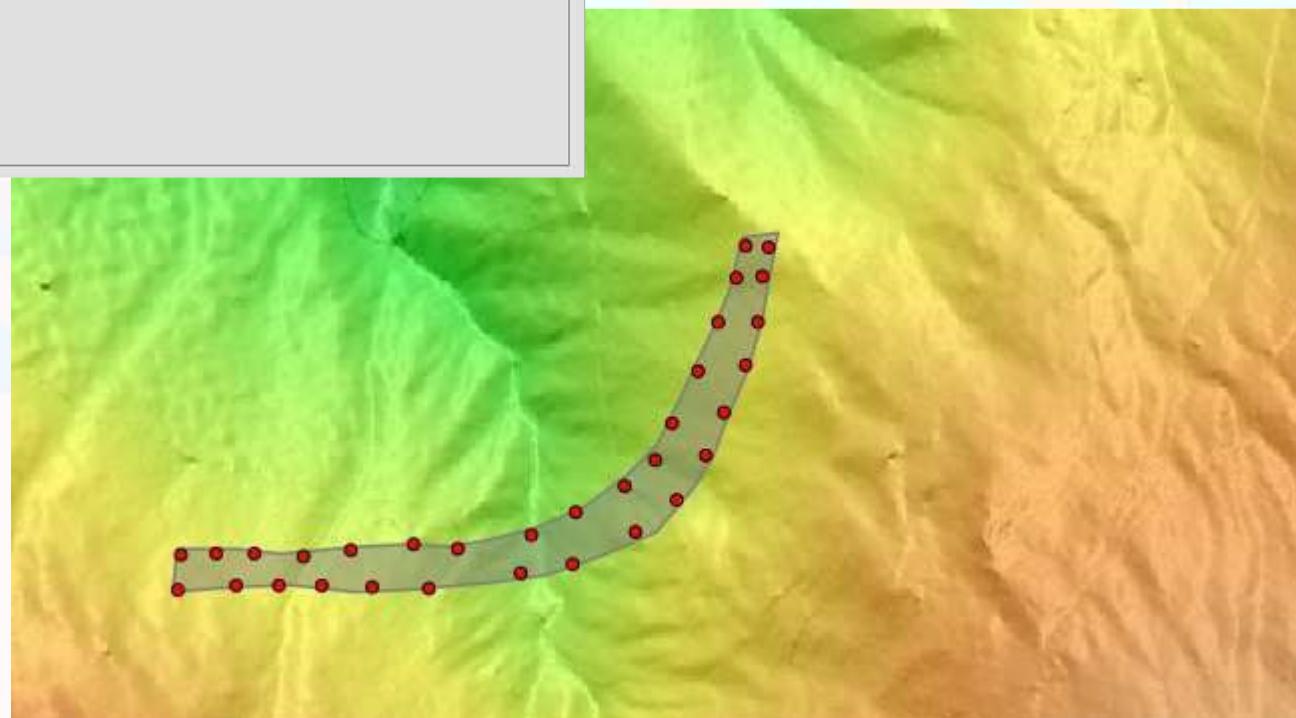


RASTER & VECTOR TOOLS

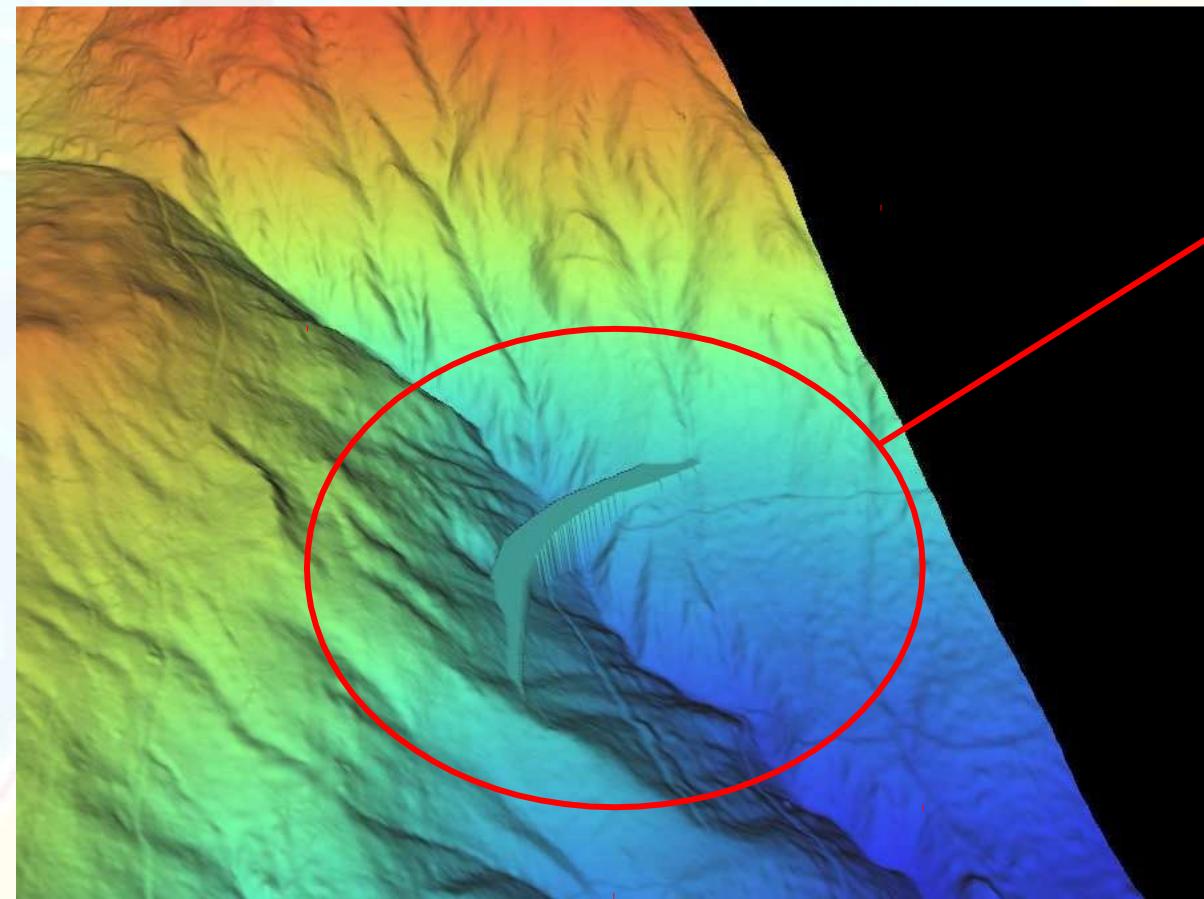


Bob the Builder

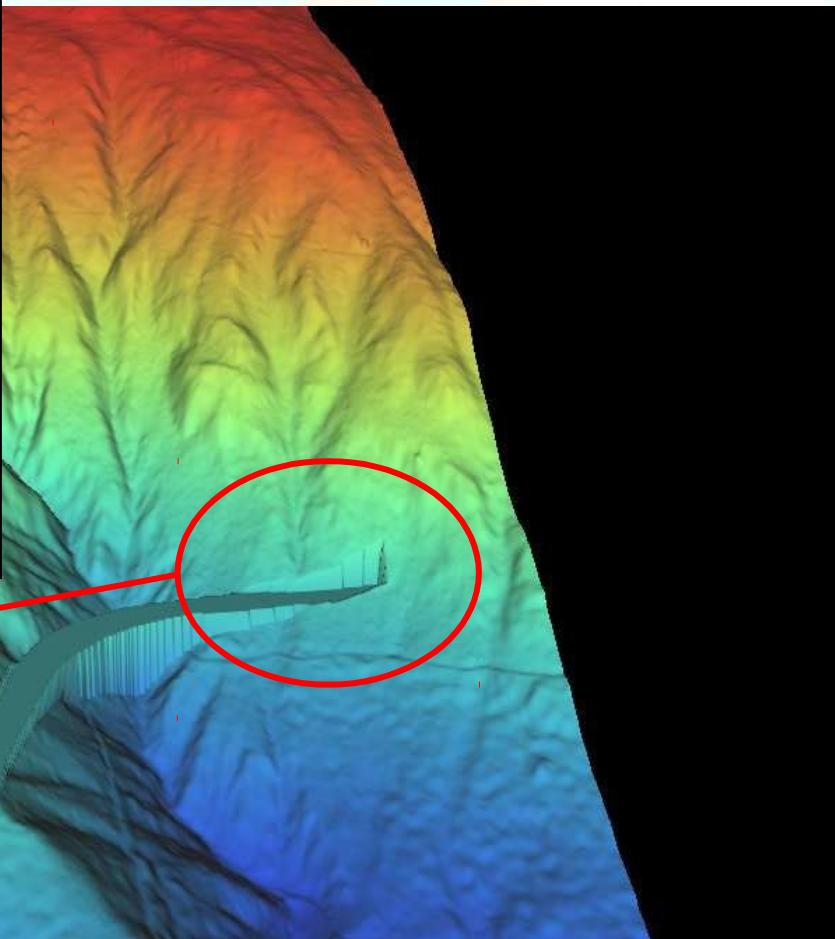
Modelling of artifacts in the elevation model



RASTER & VECTOR TOOLS



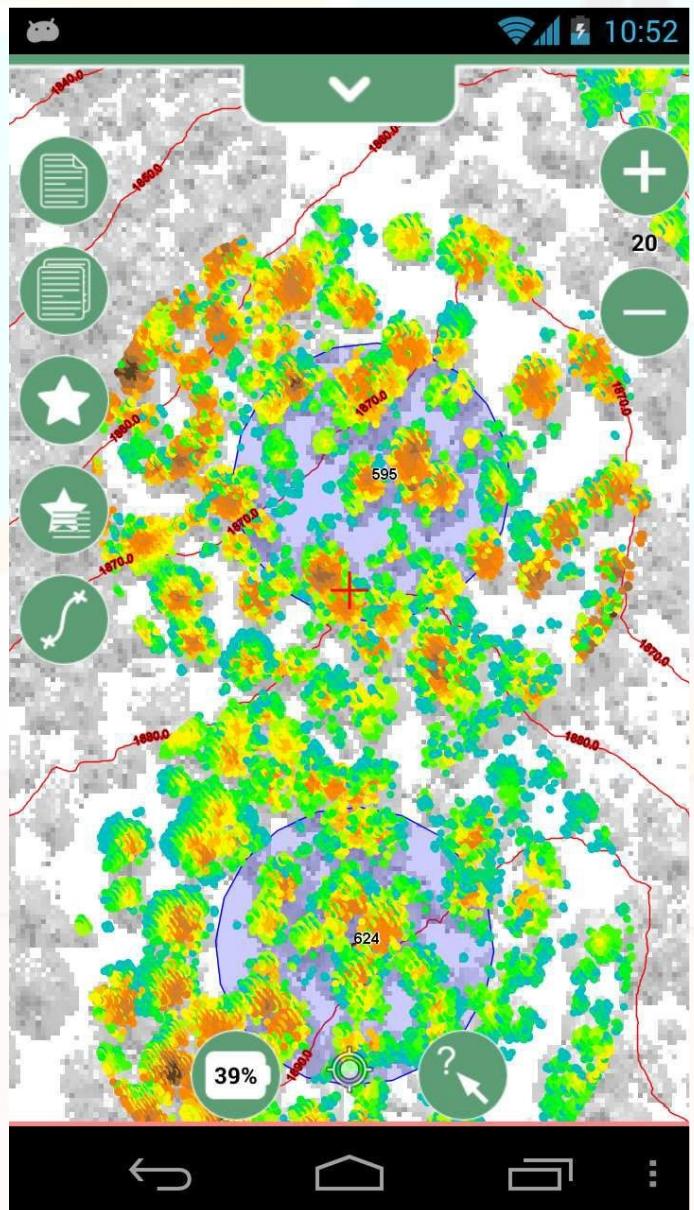
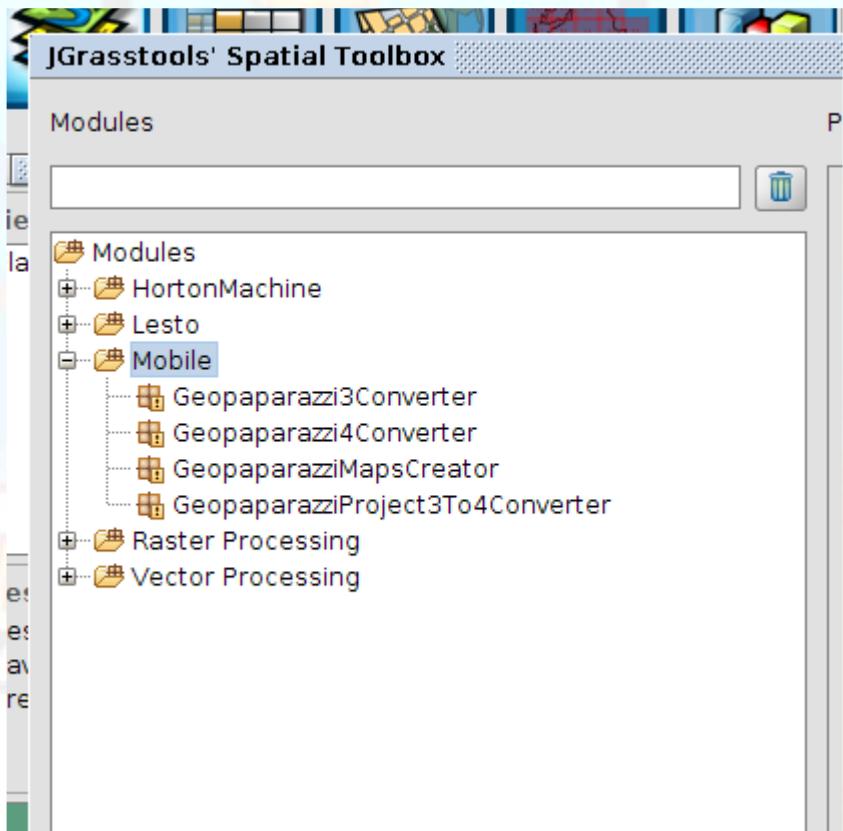
Bob the builder
result



adding some
erosion

MOBILE

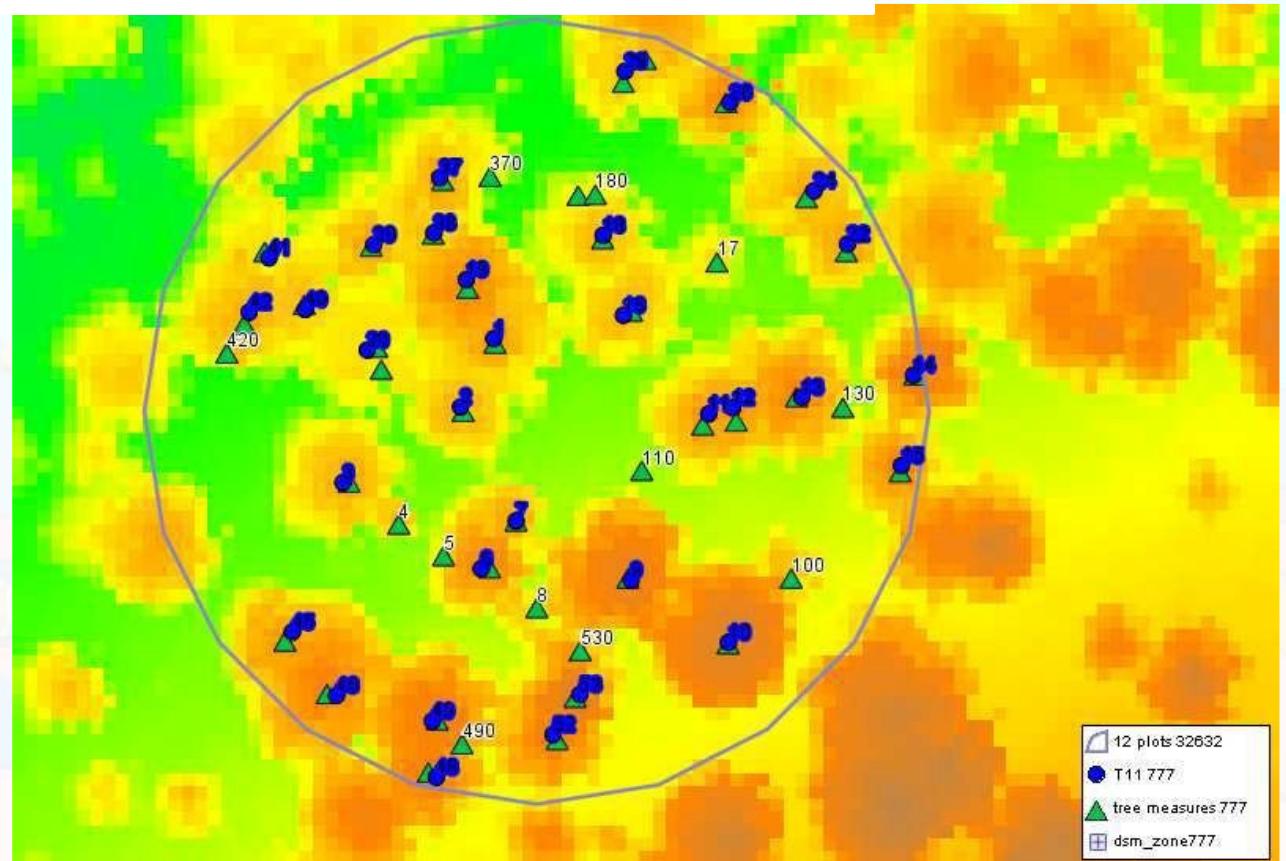
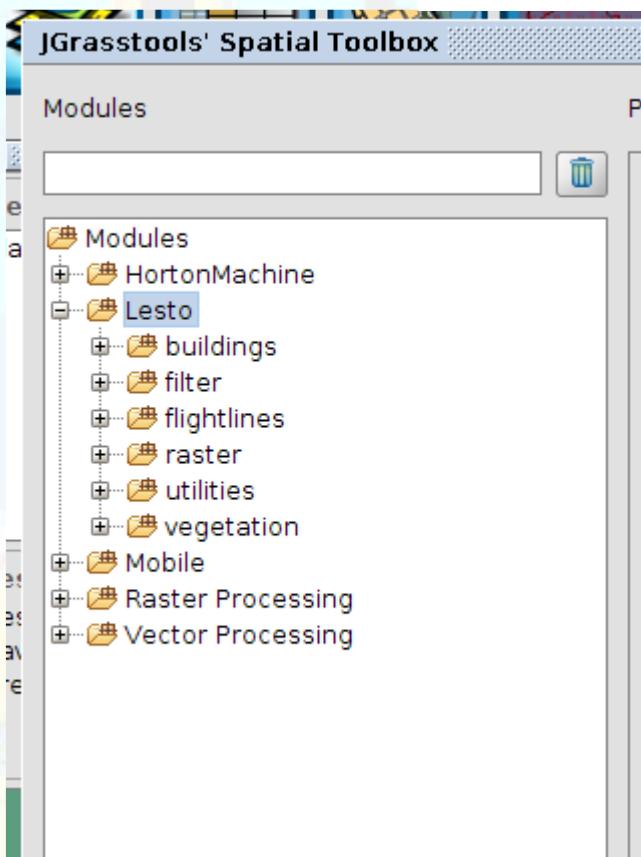
Prepare data and evaluate data
from/to **Geopaparazzi***



* <http://www.geopaparazzi.eu>

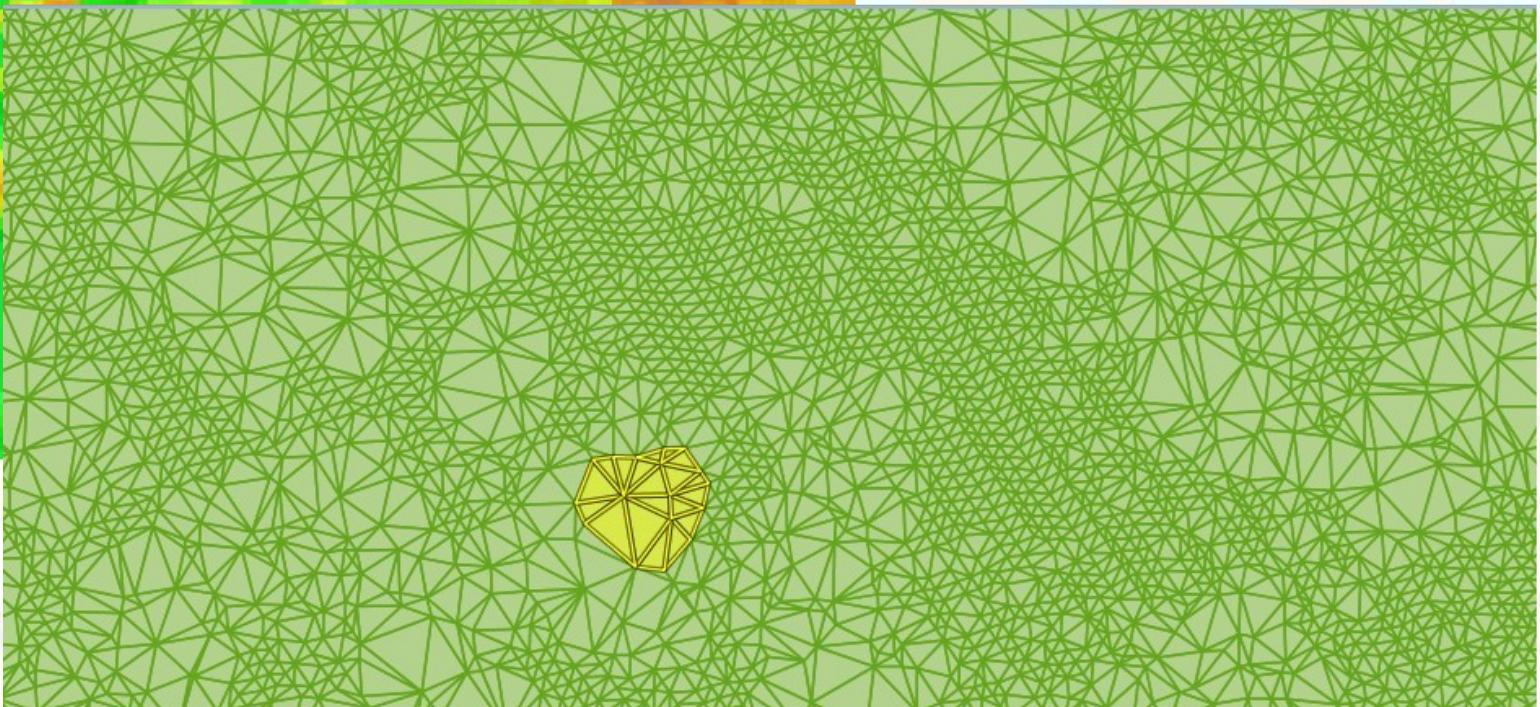
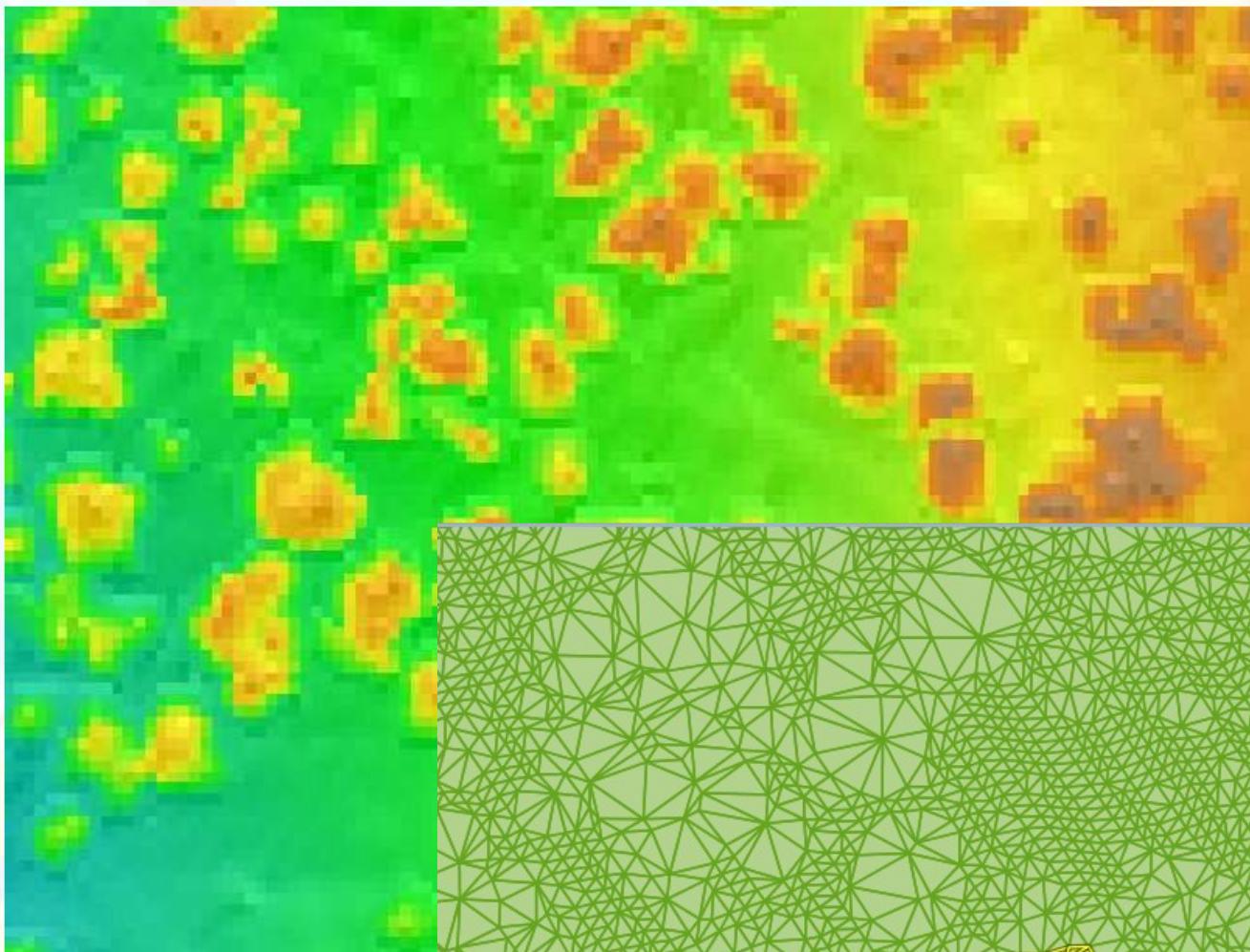
LESTO

LiDAR Empowered Sciences Toolbox Opensource



Developed in collaboration with the Free University of Bolzano. The toolbox is initially mainly dedicated to forestry analysis.

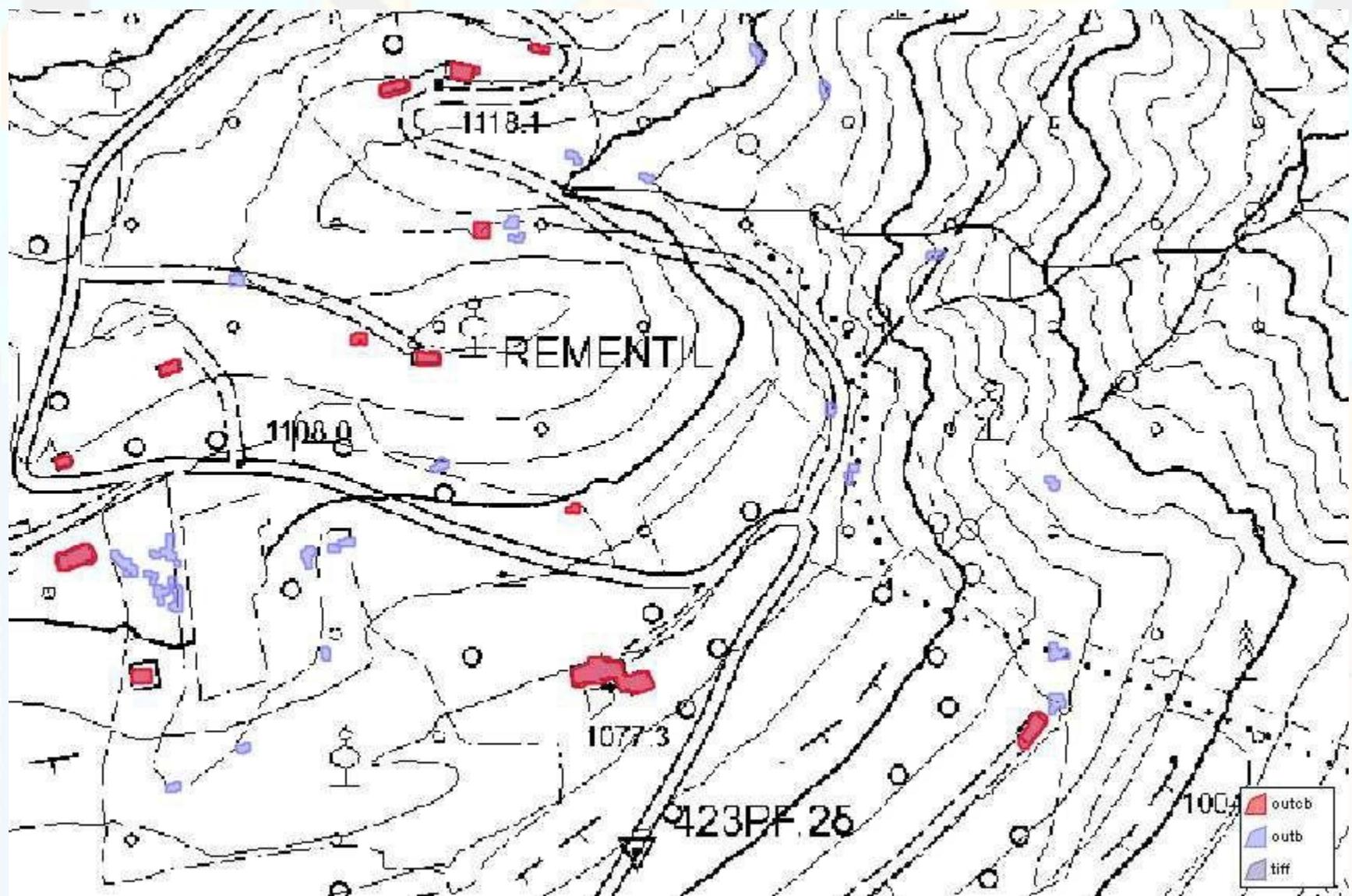
L.E.S.T.O.



Adaptive TIN,
generation of DTM
from LiDAR datasets

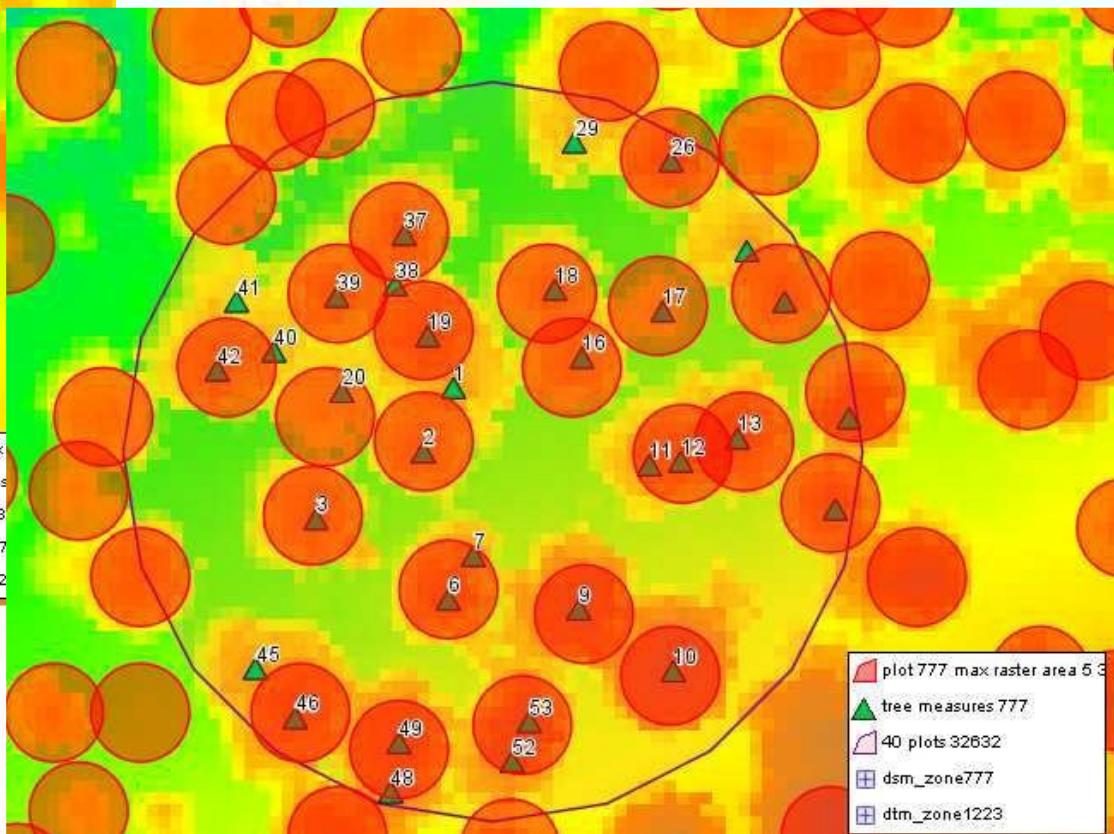
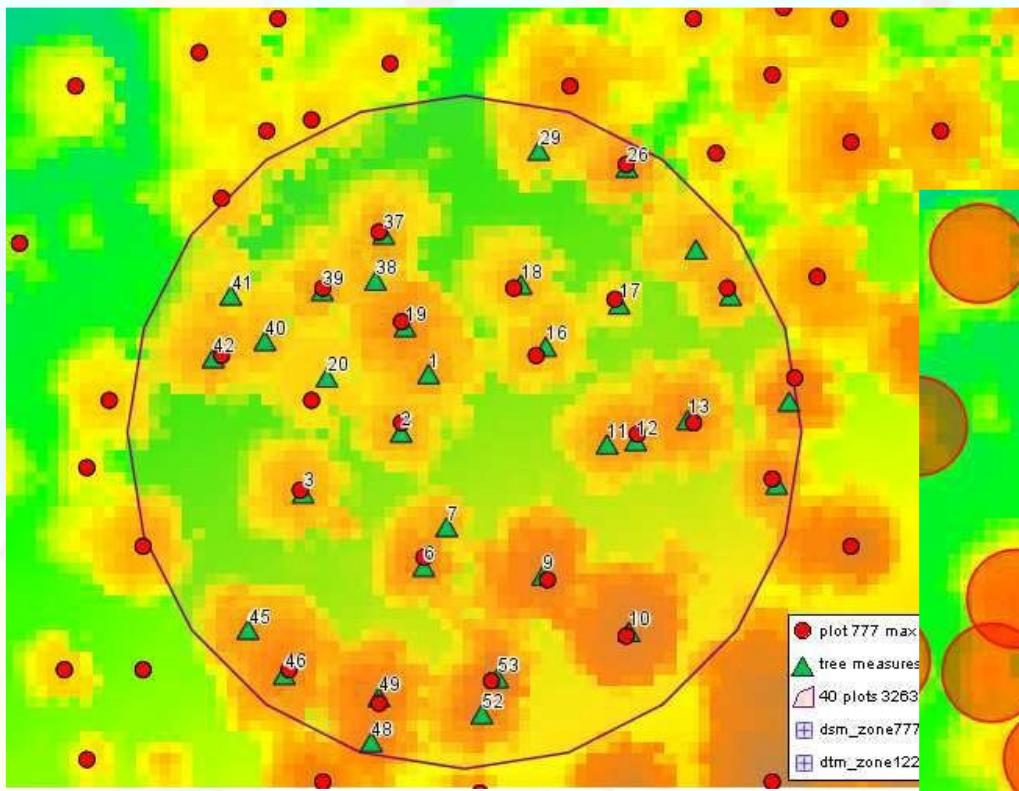
L.E.S.T.O.

Extraction of buildings from LiDAR datasets



L.E.S.T.O.

Vegetation: individual tree crown approaches are followed, aimed to detect position and main characteristics of each single tree.

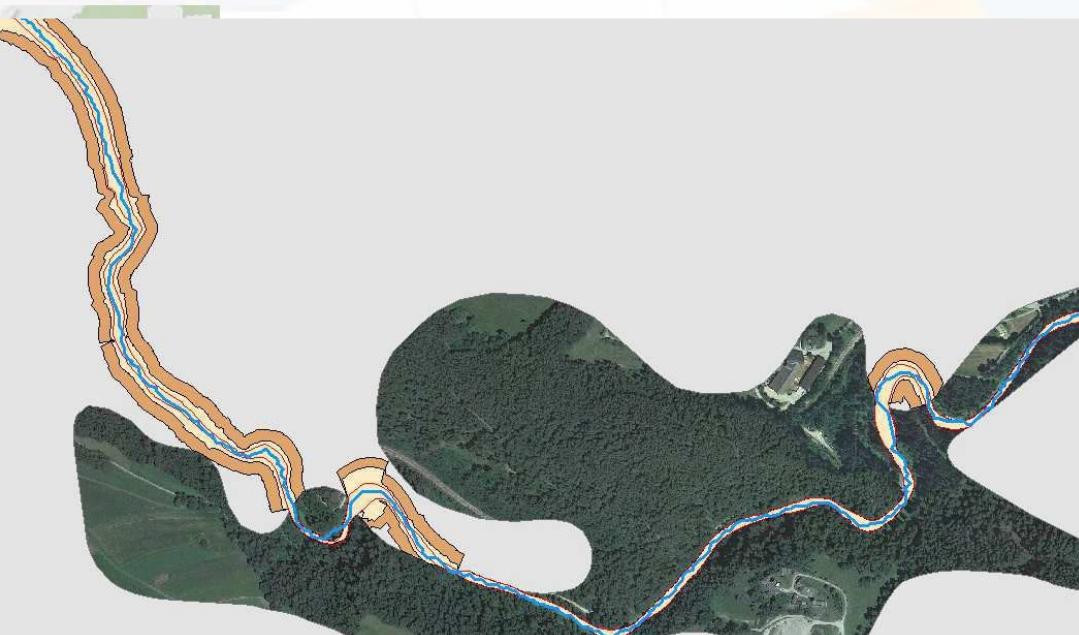


Modules that work both on
raster and **point clouds**

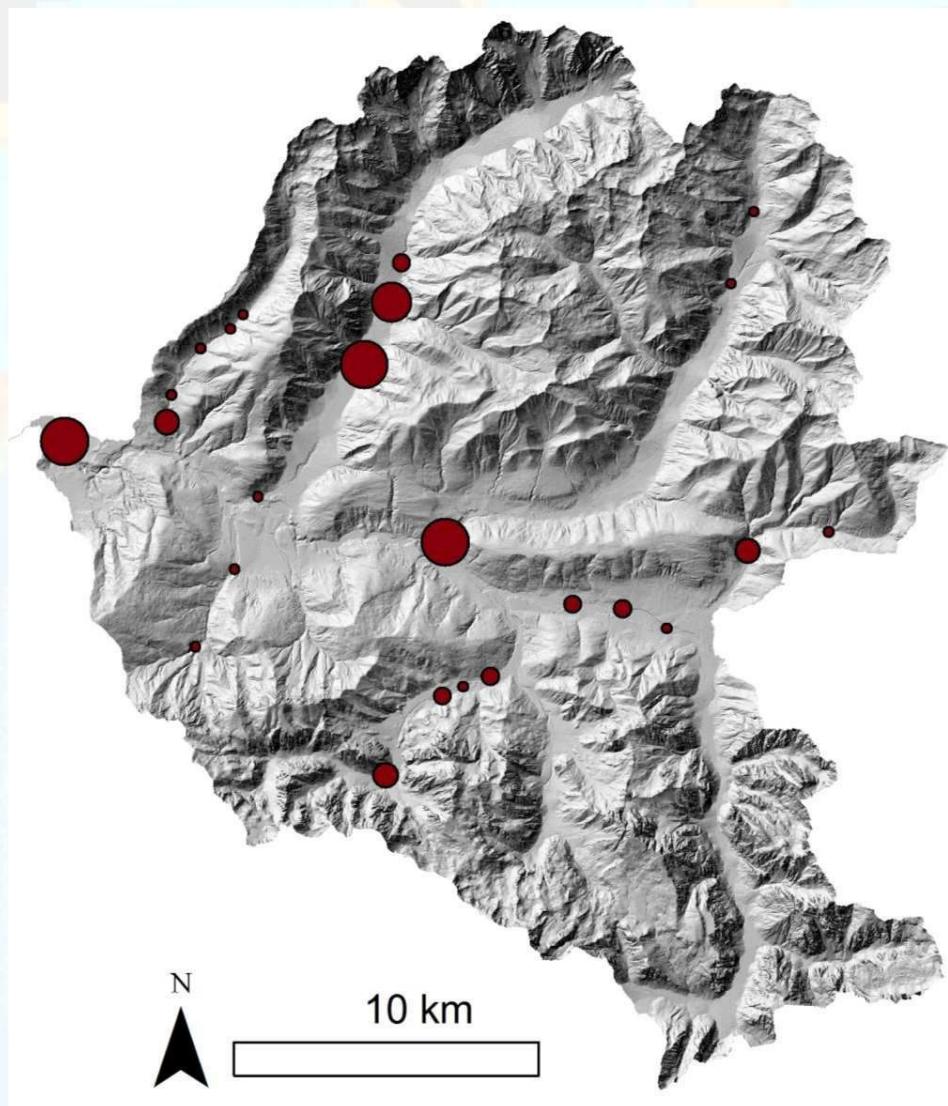
LARGE WOOD CONTRIBUTION DURING FLOODS

Developed during the Google Summer of Code 2014.

- GIS-based tool for predicting the magnitude of LW transport during flood events at any given section within a river basin (Lucía et al, 2014)
- two main processes related to wood debris:
 - * LW recruitment from hillslopes
 - * LW transport/propagation along the network



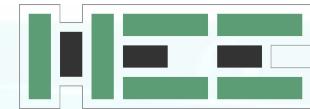
LARGE WOOD CONTRIBUTION DURING FLOODS



Critical sections for LW are usually bridges or dams

LW volume
[m³]

- 0.1 - 1
- 1 - 5
- 5 - 10
- 10 - 50
- 50 - 100
- 100 - 300



THANKS FOR THE ATTENTION!

Homepage: <http://www.jgrasstools.org>

Need help? **Join the Mailinglist.** <http://groups.google.com/group/jgrasstools>

Useful links: [http://jgrasstech
tips.blogspot.it](http://jgrasstechtips.blogspot.it)

<http://www.slideshare.net/search/slideshow?q=jgrasstools>

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