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Insubric Ecosystems Research Group

CH-6500 Bellinzona





Agenda:

- Why historical photos?
- The mono-plotting principle
- Fields of application and examples
- Accuracy estimation: preliminary results of a *crazy* test
- Outlook





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Oblique photographs display a great potential for historical reconstruction of landscape dynamics

- They go back to the XIX century







Oblique photographs display a great potential for historical reconstruction of landscape dynamics

- There is a huge amount of images







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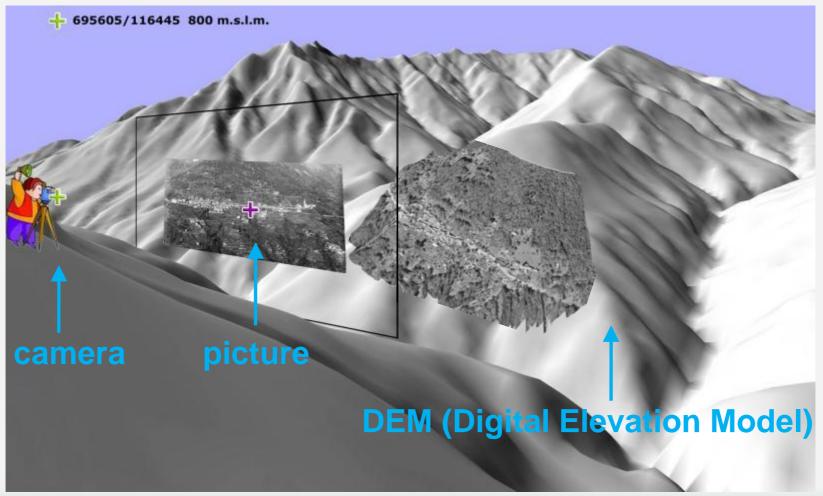
Outlook





The main components of the system are:

the camera, the picture and the DEM (Digital Elevation Model)

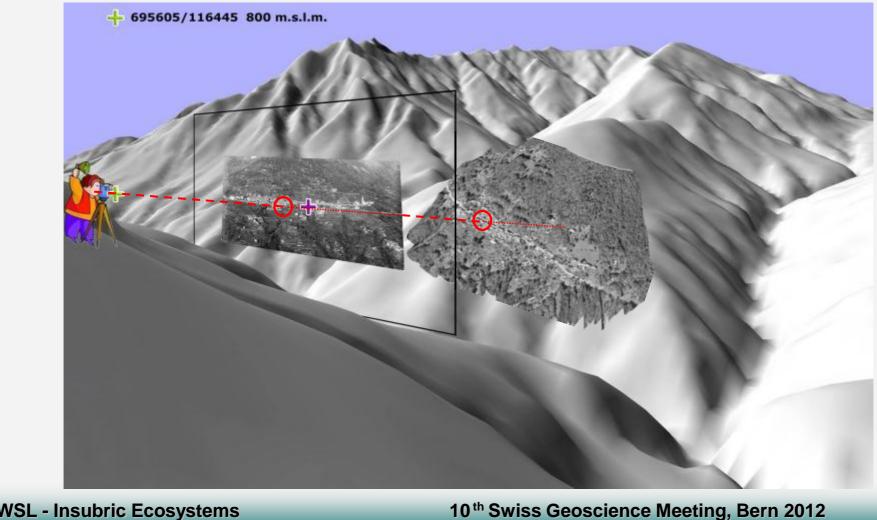




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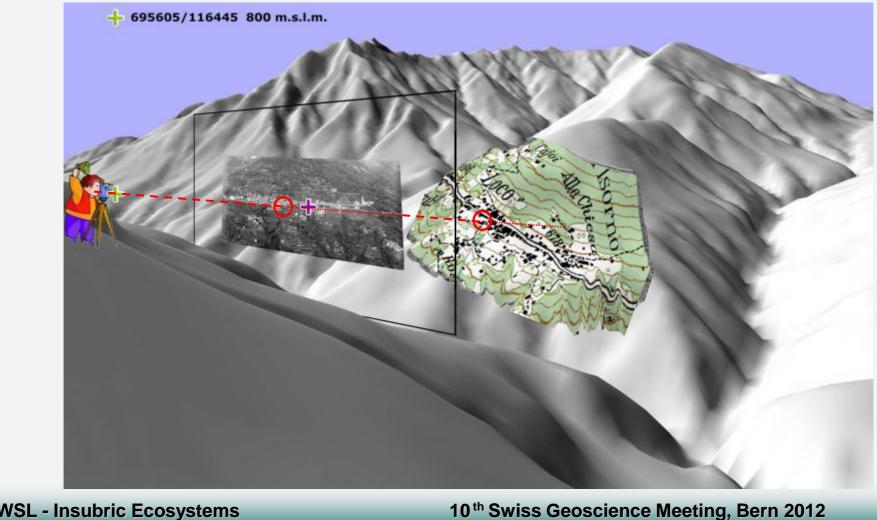
Camera and picture have to be placed in the world space so that:

a ray from the camera through a point on the picture will intersect the DEM at the corresponding real point



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a ray from the camera through a point on the picture will intersect the DEM at the corresponding real point



The accuracy of the system is influenced by:

- camera: accuracy of camera calibration
- picture: resolution
- **DEM:** accuracy

correspondence between DEM and relief at the time of the picture



The WSL Monoplotting Tool

"A tool for inserting and managing oblique photographs in the corresponding 3D-space"

Main requirements:

- assuring the correspondence of each pixel of the picture with the corresponding xyz coordinates in the real space
- enabling digitization or measure of specific features in the picture
- importing and exporting digitized features from the picture to the standard GIS systems
 - self-intuitive, user-friendly handling



The WSL Monoplotting Tool: state of the art

- 0 GIS-Suite - WSL Monoplotting-Tool - [Bedretto - 24_013_12-05-1986_12-55_1A+B - 2012.07.26 - claudio.gis] File Edit Insert View Tools Window Help . # x 🖸 😂 🖶 🗏 📥 🖨 🖨 🔂 🖬 🔂 Project Photo Camera Points Polygons Polylines Maps/dems Maps Dems Photo Bedretto - 24_013_12-05-1986_12-55_1A+8.jpg Browse Save. Control points Import... Export. Idx Name Photo position World posit Dem (683357.82, 151513.56, 1354.8 0.04 (2994.21, 966.11) 7 0.03 (2874.24, 1035.58) (683272.32, 151545.31, 1359.4 1 0.04 (1199.59, 983.47) (682396.33, 151046.02, 1391.6 7 (2023.78, 997.98) (682819.36, 151287.00, 1370.1 0.08 R (682352.38, 152386.89, 2114.7 0.22 (2067.04, 2842.09) 되 0.26 (2296.30, 2635.72) (682535.68, 152380.36, 1987.5 (683383.58, 151894.12, 1432.3 0.08 (3208.62, 1377.87) 5 0.02 (2970.95, 1253.64) (683274.04, 151733.95, 1405.4 514 y X 3407.80 Y 896,60 X 300 < 1 Select all Unselect all Toggle selection Select checked + Check all Uncheck all Toggle check Show all Hide all Show selection C Cear all Insert., 下位。 Test 1 Test 2 Test 3 Project. Center and origin Edt.. Center (2269.50, 2238.00) (683454.94, 150668.19, 3000.53) Edt. Origin Work area Left Top Edit. Right Bottom 300 X 3407.60 Y 896.60 E 663595.59 N 151595.58 H 1320.46 × 514 Y

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The WSL Monoplotting Tool: state of the art

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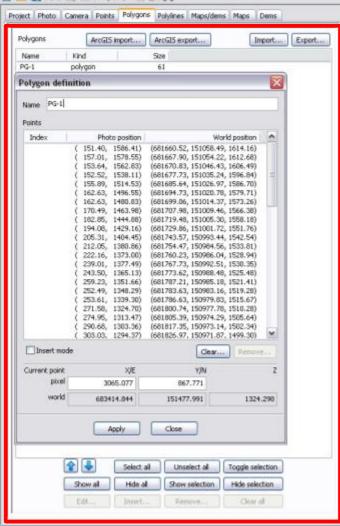
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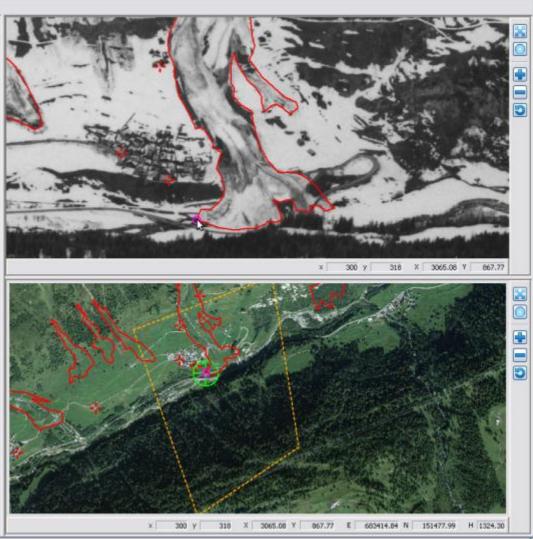
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The WSL Monoplotting Tool: state of the art

GIS-Suite - WSL Monoplotting-Tool - [Bedretto - 24_013_12-05-1986_12-55_14+B - 2012.07.26 - claudio.gis]









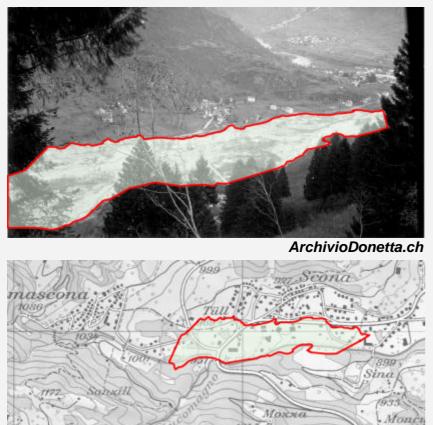
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Reconstruction of natural events: flood of 1927



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Pianexxa di Larescia

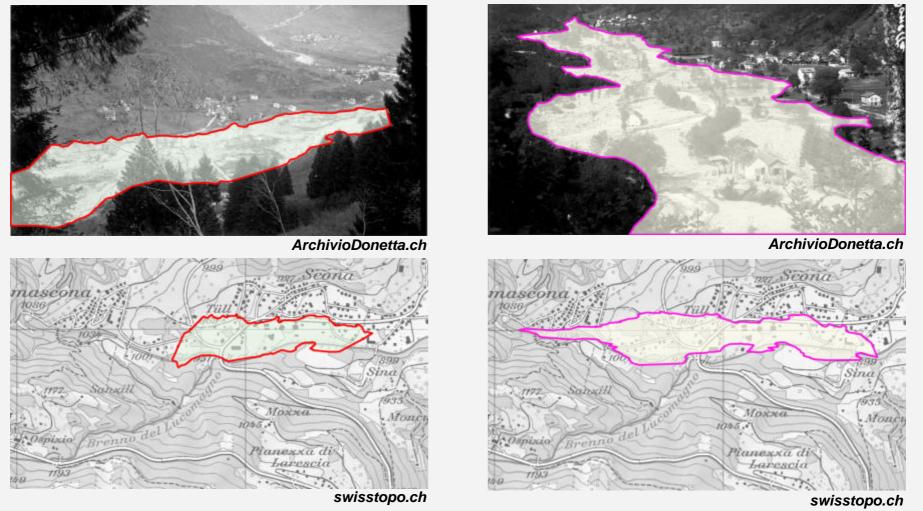
Office for Natural Hazards (TI) – Olivone 1927: boundary of the alluvial material



Ispixia

Brenno

Reconstruction of natural events: flood of 1927

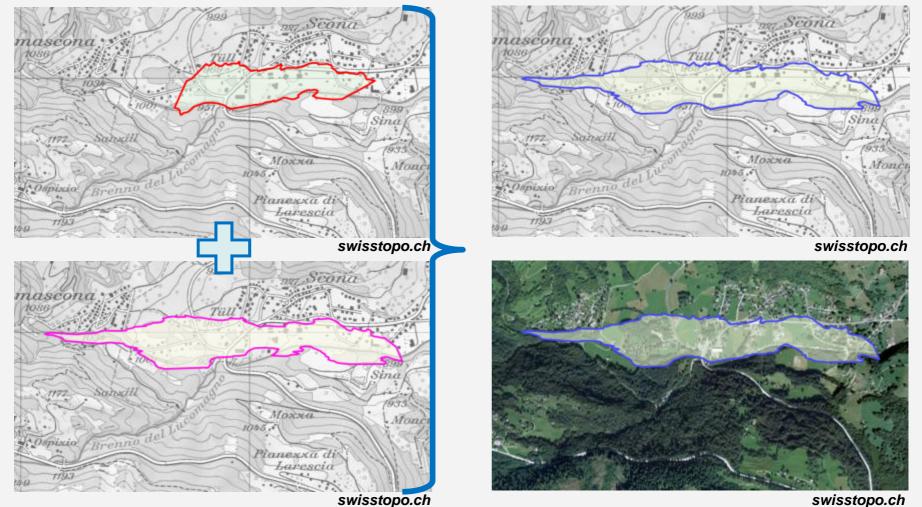


Office for Natural Hazards (TI) – Olivone 1927: boundary of the alluvial material



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Reconstruction of natural events: flood of 1927

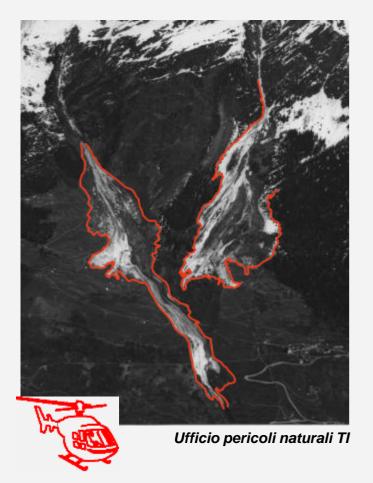


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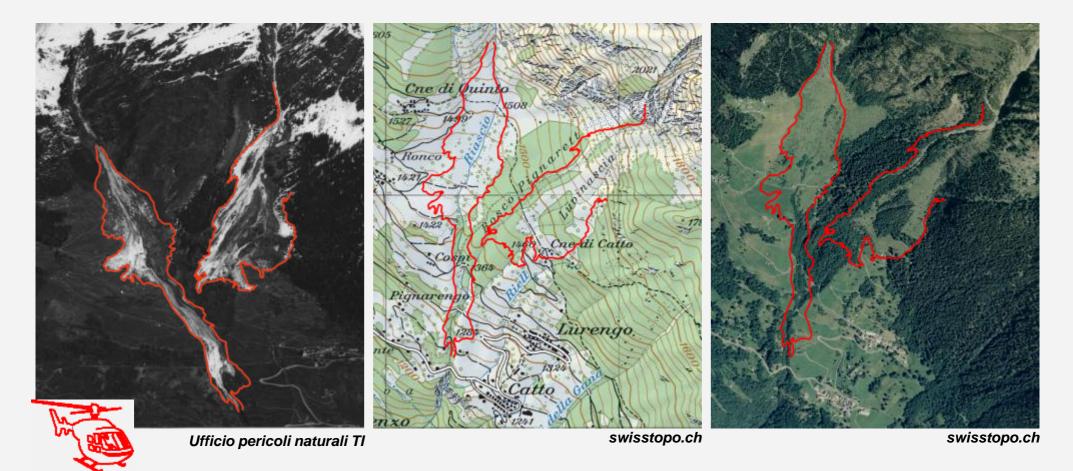
Reconstruction of natural events: avalanche of 1986



Office for Natural Hazards (TI) – Quinto 1986: avalanche tracks and outlets



Reconstruction of natural events: avalanche of 1986



Office for Natural Hazards (TI) – Quinto 1986: avalanche tracks and outlets



Landscape changes due to a rockslide: Airolo 28.12.1898



Before the event

Ufficio pericoli naturali TI



Just after the event

Ufficio pericoli naturali TI

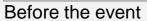
Office for Natural Hazards (TI) – Airolo 1898: rockslide



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Landscape changes due to a rockslide: Airolo 28.12.1898





Ufficio pericoli naturali Tl



Just after the event

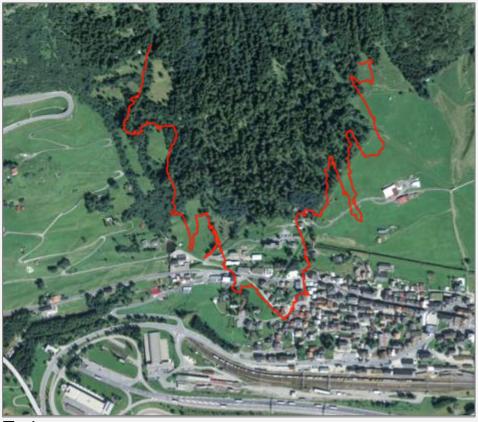
Ufficio pericoli naturali Tl

Office for Natural Hazards (TI) – Airolo 1898: rockslide





Landscape changes due to a rockslide: Airolo 28.12.1898





Today

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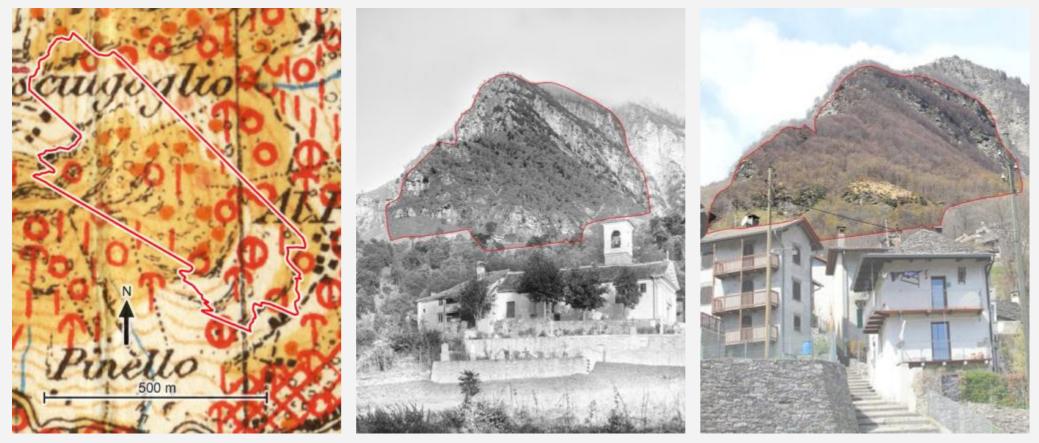
Ufficio pericoli naturali TI

Office for Natural Hazards (TI) – Airolo 1898: rockslide





Fields of application and examples Landscape evolution: Crana 1910 - 1933 - 2012



Bär: vegetation map of 1910

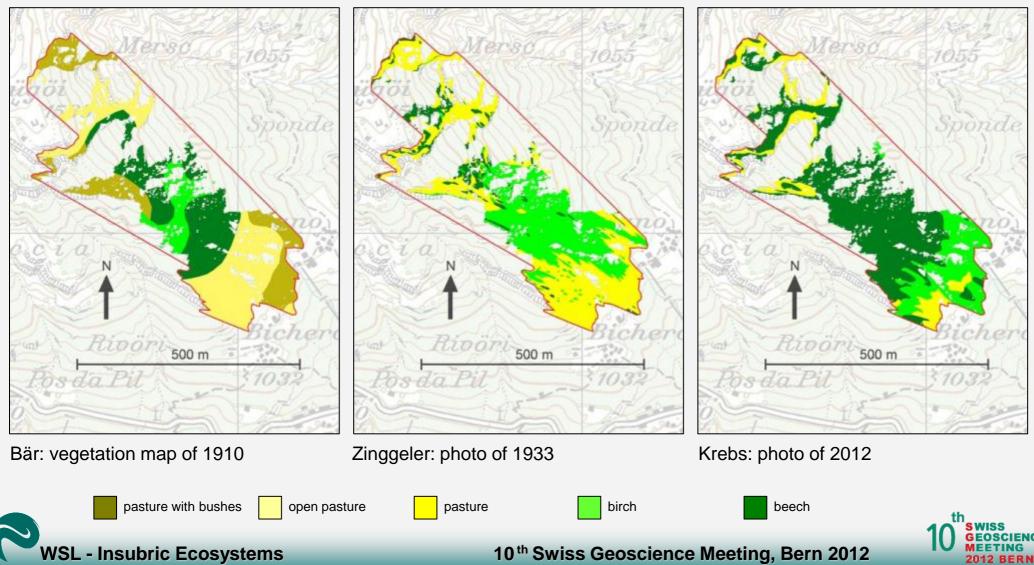
Zinggeler: photo of 1933

Krebs: photo of 2012





Fields of application and examples Landscape evolution: Crana 1910 - 1933 - 2012



Landscape evolution:

- reconstruction of forest boundary and stand age
- glacier's dynamics
- land-use changes (i.e. urbanization)

Archaeology and history:

- roads and trails
- channels for water and material transport
- disappeared or no longer recognizable elements

Reconstruction of natural events:

- floods
- landslides
- avalanches

Monitoring of current processes:

- surface of glacier melt water
- snowmelt
- wind erosion



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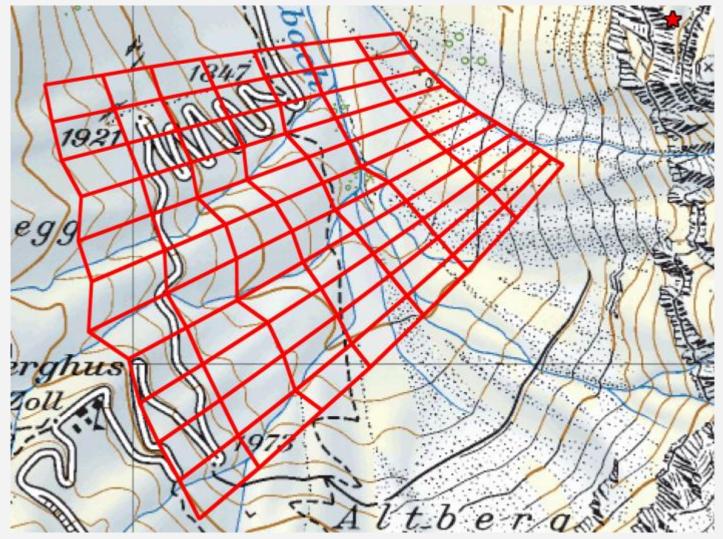
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Splügenpass, Grisons, Switzerland: day 1

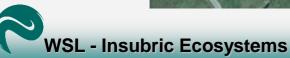




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Splügenpass, Grisons, Switzerland: day 1







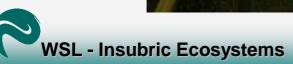
Splügenpass, Grisons, Switzerland: day 2





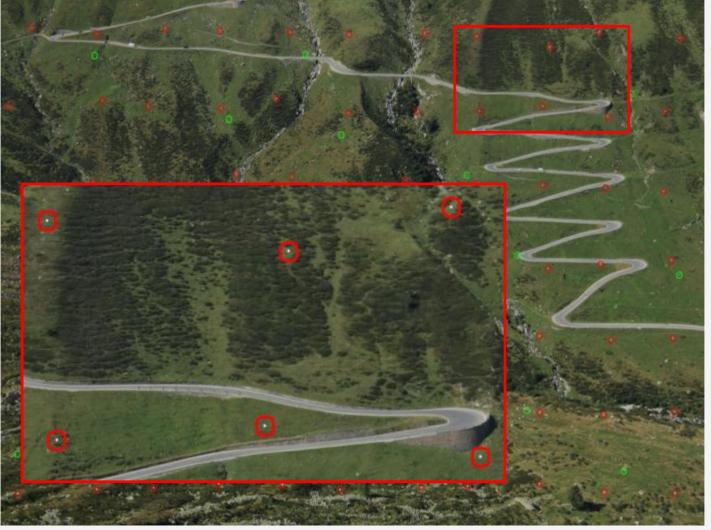


Accuracy estimation: a crazy test in the real world Splügenpass, Grisons, Switzerland: day 2





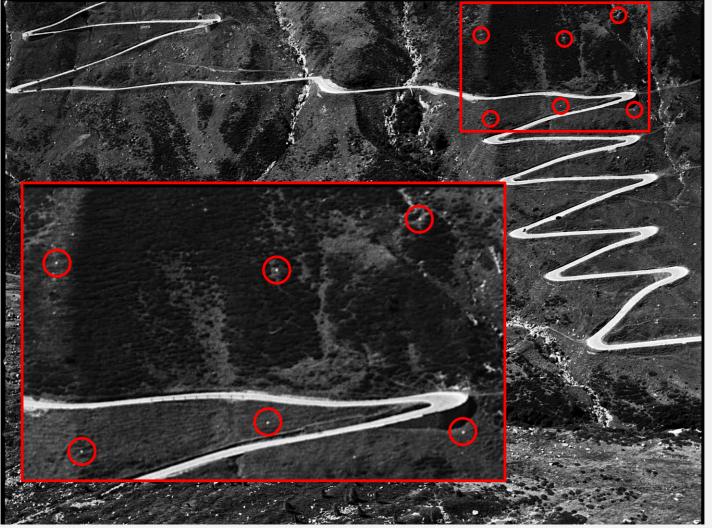
Splügenpass, Grisons, Switzerland: day 2





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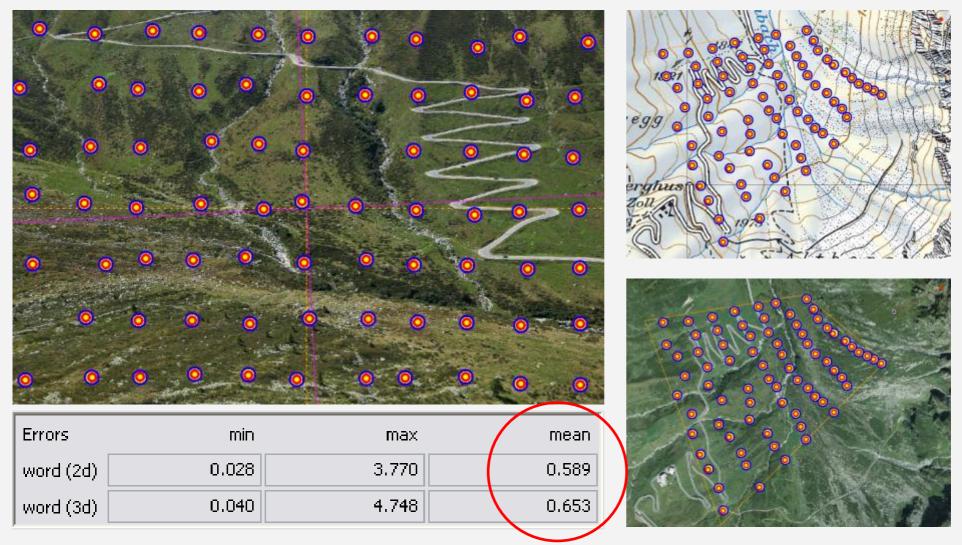
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Splügenpass, Grisons, Switzerland: very preliminary results





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Outlook of the project

Current status:

- user friendly, advanced prototype
- simple data editor (points, polylines, polygons)
- interoperability with GIS system through ASCII files (ArcGIS, Q-GIS)

Future plans:

- enhancing integration in ArcGIS
- implementing robust accuracy estimation
- encouraging the usage by research, educational and public institutions



For further information:

- contact me here, for practical demo
- <u>claudio.bozzini@wsl.ch</u>
- Google search: "wsl" and "bozzini"

Thank you.

- Insubric Ecosystems





