

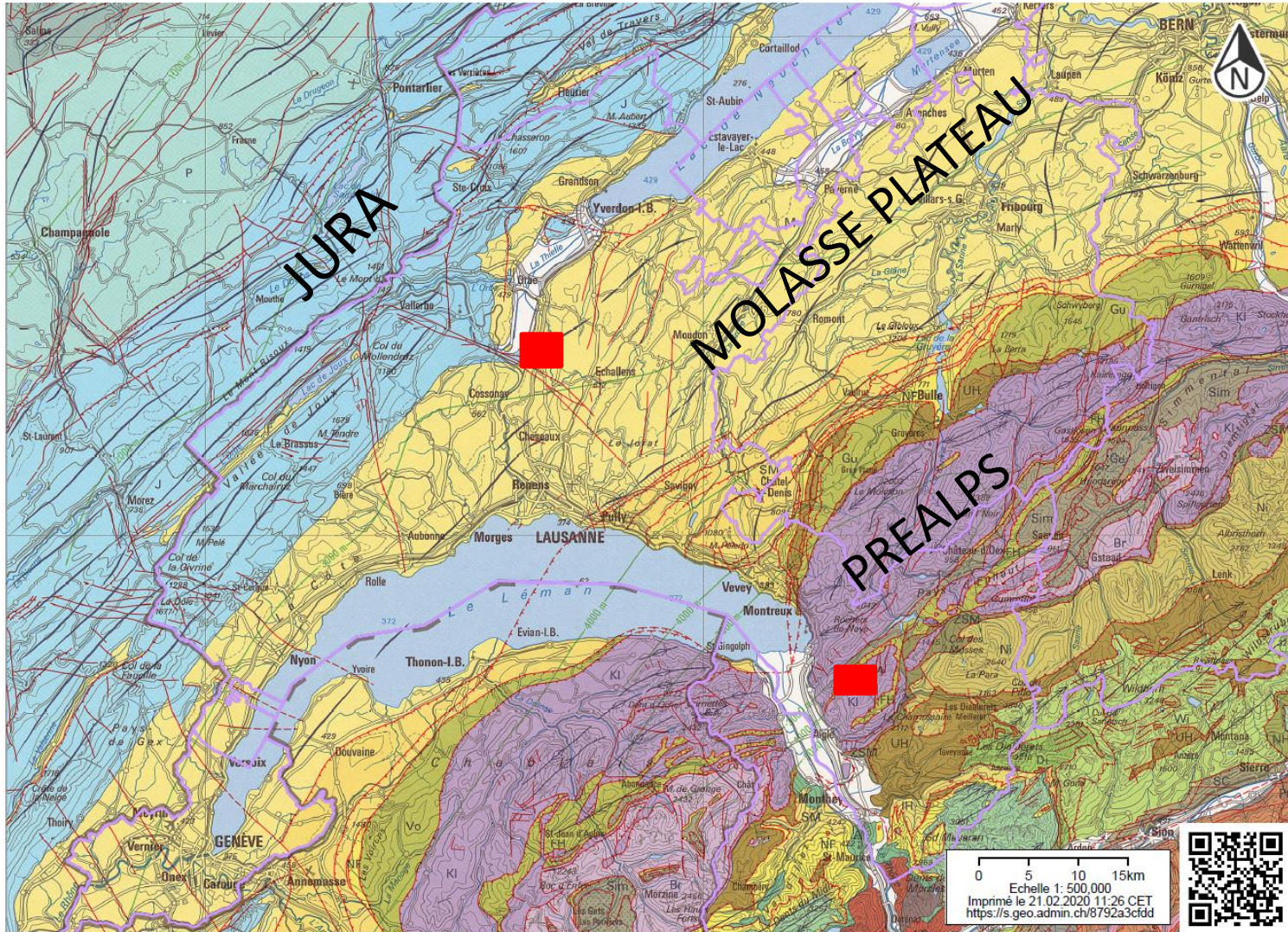
# Geology mapping with an emphasis on the Quaternary deposits in the Swiss Prealps and Molasse Plateau

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# Location for 2 test areas



0 5 10 15 km  
Echelle 1: 500 000  
Imprimé le 21.02.2020 11:26 CET  
<https://s.geo.admin.ch/8792a3cfd4>

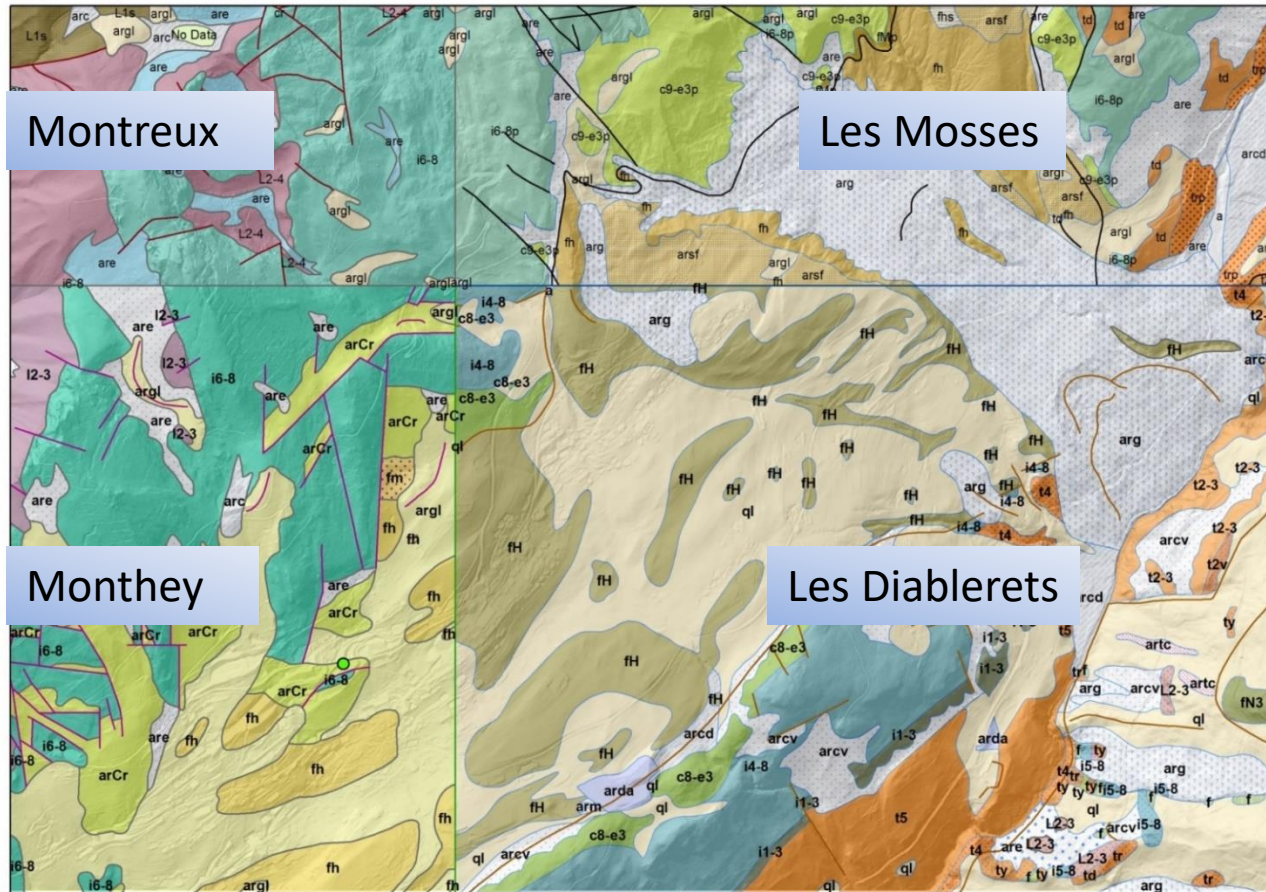
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# Digital detailed geological maps (scale 1:25000)



Maps source: Atlas géologique 1:25000, Federal Office of Topography, swisstopo

Detailed geological maps have been produced for the whole Switzerland since about a century. In the last decades maps were converted to digital maps. However, often the limits for each formation (or name) are different from one sheet to the other.



# Main Goals

- Harmonise the different geological maps (scale 1:25.000)
- Improve the Quaternary deposits mapping of “canton de Vaud” in Switzerland

## Methodology

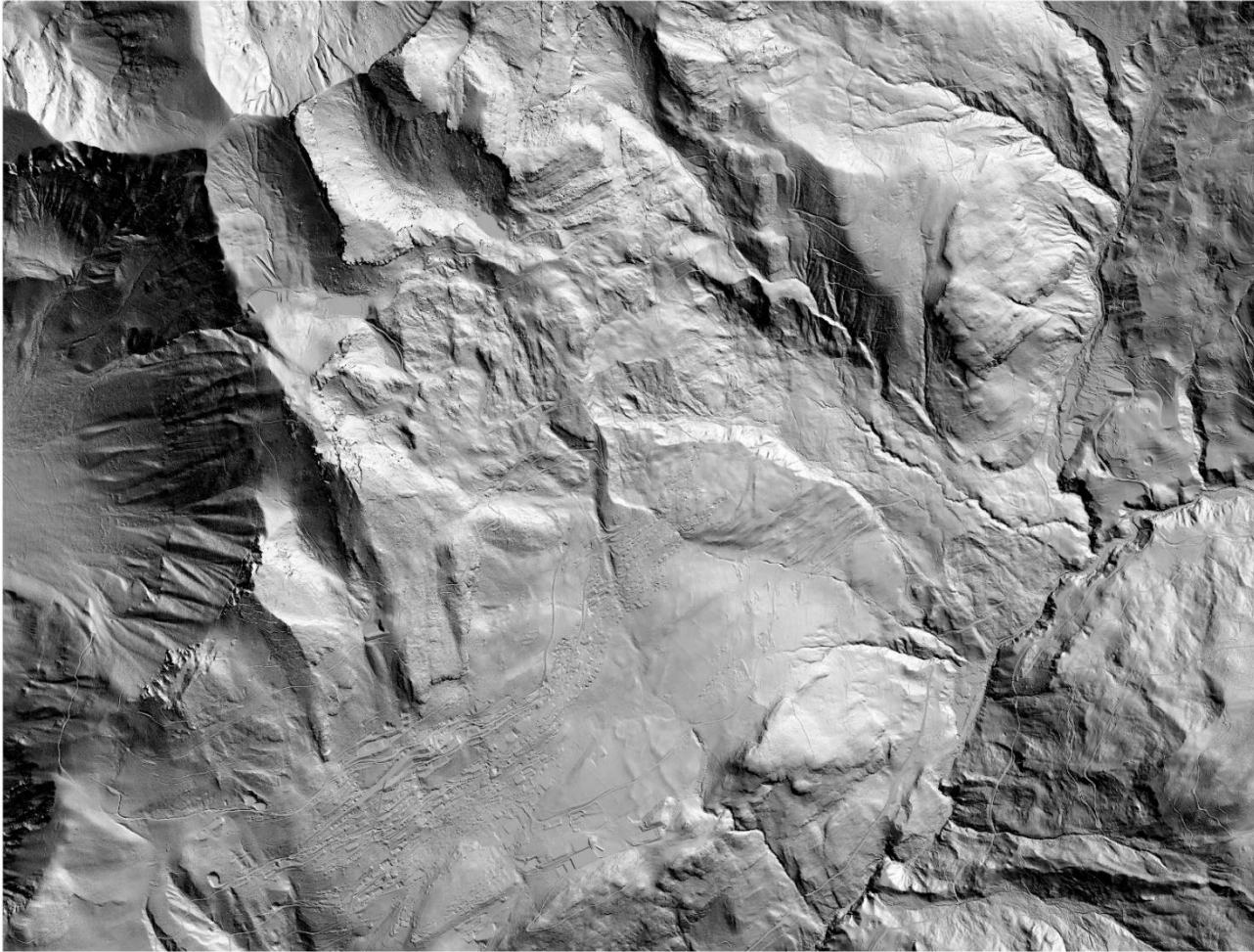
The geology mapping was performed using different data:

- The geological maps (scale: 1:25000)
- Geological publications for the studied areas
- High resolution LiDAR data and derived hillshades
- Aerial photographs
- Boreholes data

and field work in order to solve specific problems



# Hillshade map for the region of Leysin (Prealps)

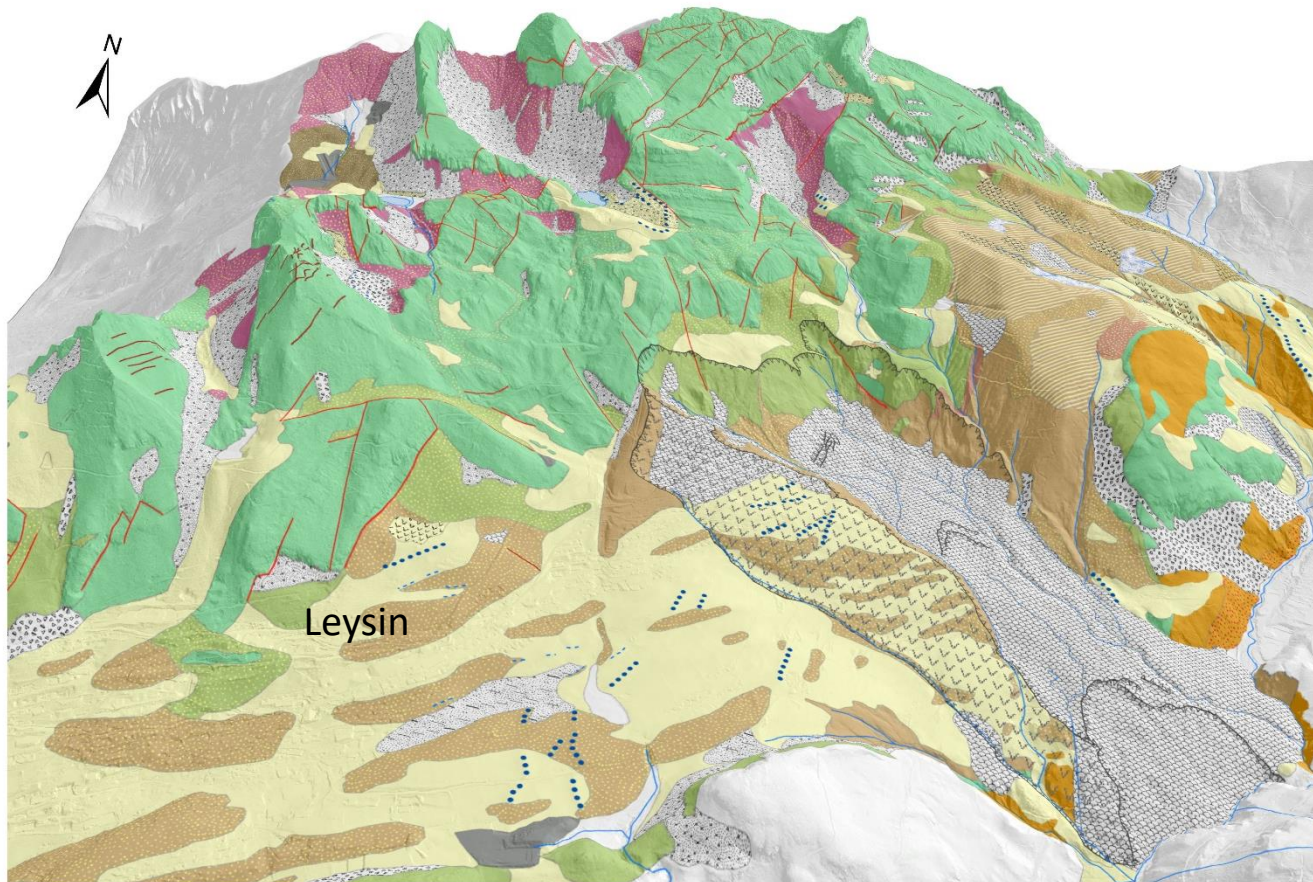


The hillshade is derived from high resolution LiDAR data (LiDAR 2015, Etat de Vaud). The possibility to remove the trees in the forested areas allows the detection and interpretation of new morphologic features.





# 3D geological map of the Leysin area (Prealps)



## Légend

- Kame
- Fractures
- Faults
- Frontal and lateral moraines
- ∇∇∇ Landslide scarp
- ∇∇∇ Landslide
- ∇∇∇ Gravitational slope deformation

## Quaternary

- Anthropogenic
- Lake
- Lacustrine
- fluvial deposit
- Swamp
- Talus cones
- Collapse
- Talus cone and rockfall
- Landslide
- Local glacial deposit
- Local glacial deposit under colluvial deposit

## Cretaceous-Paleocene

- Flysch
- Flysch et Flysch with lenses
- Flysch under thin moraine deposits
- Flysch under thin moraine deposits
- Flysch under thin moraine deposits
- Soils on clayey limestones and marl
- Soils on flysch
- Clayey limestone and marl
- Clayey limestone and marl under thin moraine deposits

## Jurassic

- Limestone
- Limestone under thin moraine deposits
- Limestone and shale
- Limestone and shale under thin moraine deposits
- Limestone breccia and oolitic limestone under moraine de

## Triassic

- Dolomites
- Blond dolomites
- Cornieule

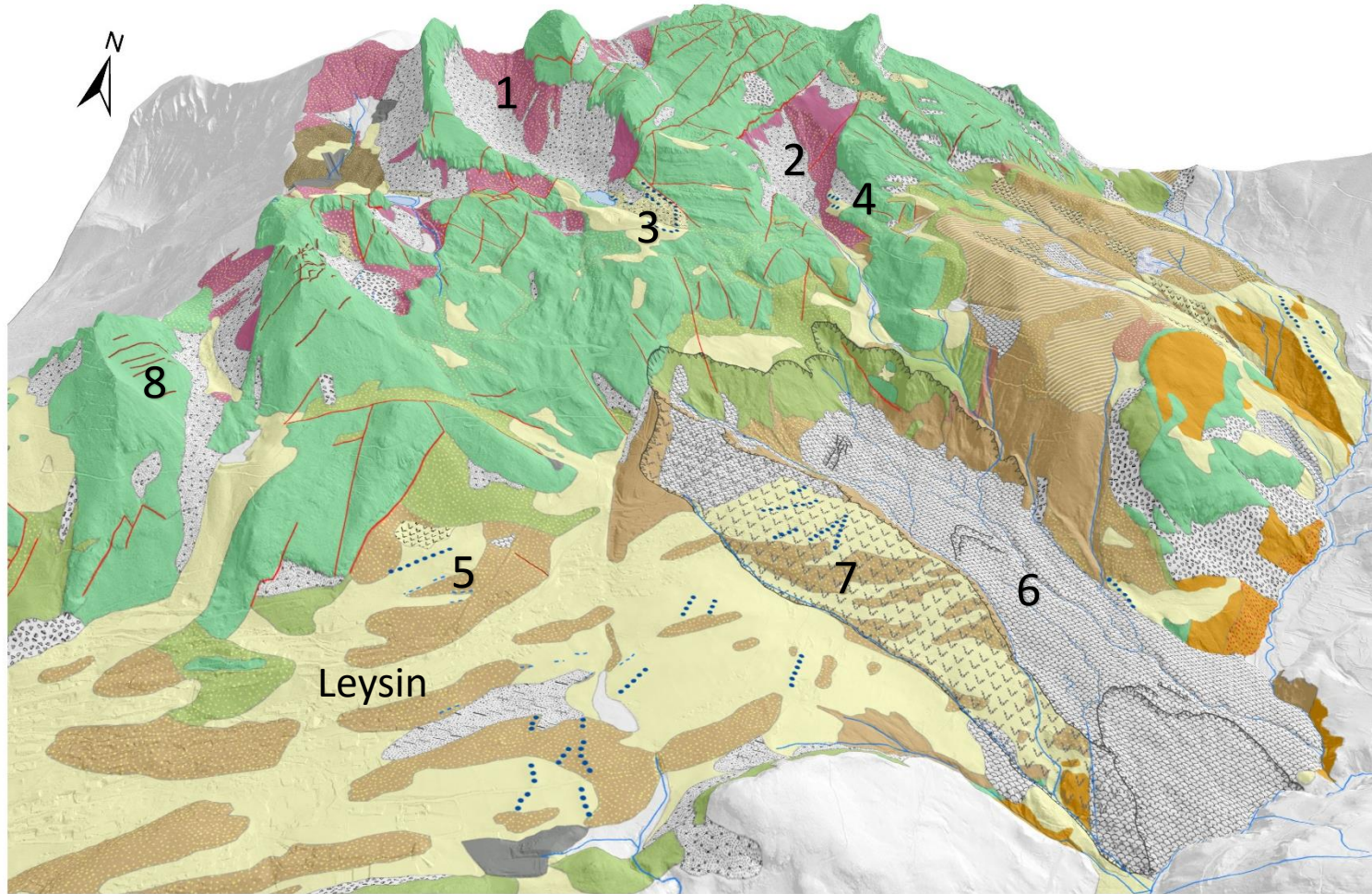
In order to produce the geological map for the test area from the 4 pre-existent geological maps, we adjusted and modified the geological limits for the different formations and linear structures, such as faults.

Also, new glacial deposits related to the Last Glacial maximum (LGM) and paraglacial rock slope deformations have been mapped.





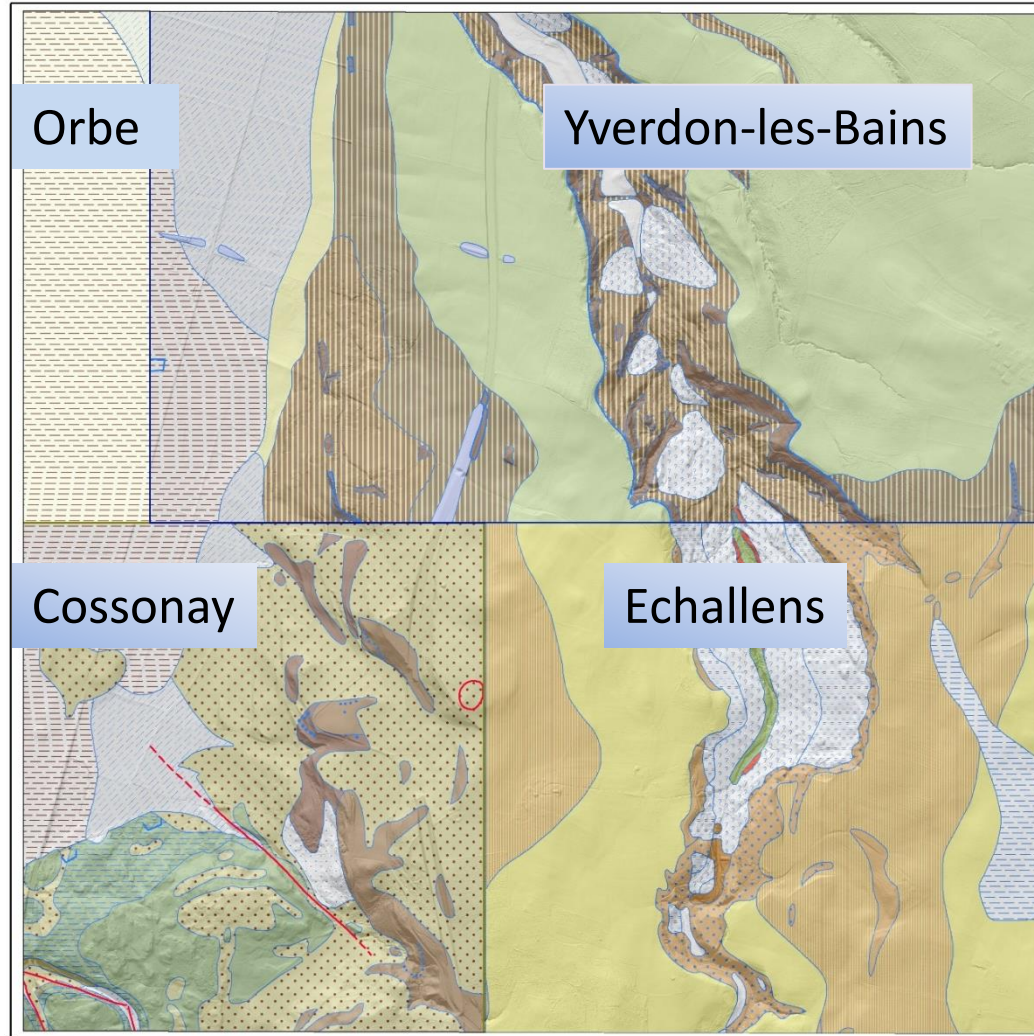
# Geological map of the Leysin area (Prealps)



**Glacial forms and deposits:** (1) old glacial valley (2) glacial cirque (3) frontal moraine (4) lateral moraine (5) terrace kame

**Paraglacial rock slope deformations:** (6) La Frasse landslide (7) gravitational slope deformation (8) deep seated gravitational slope deformation

# Digital detailed geological maps : Molasse Plateau

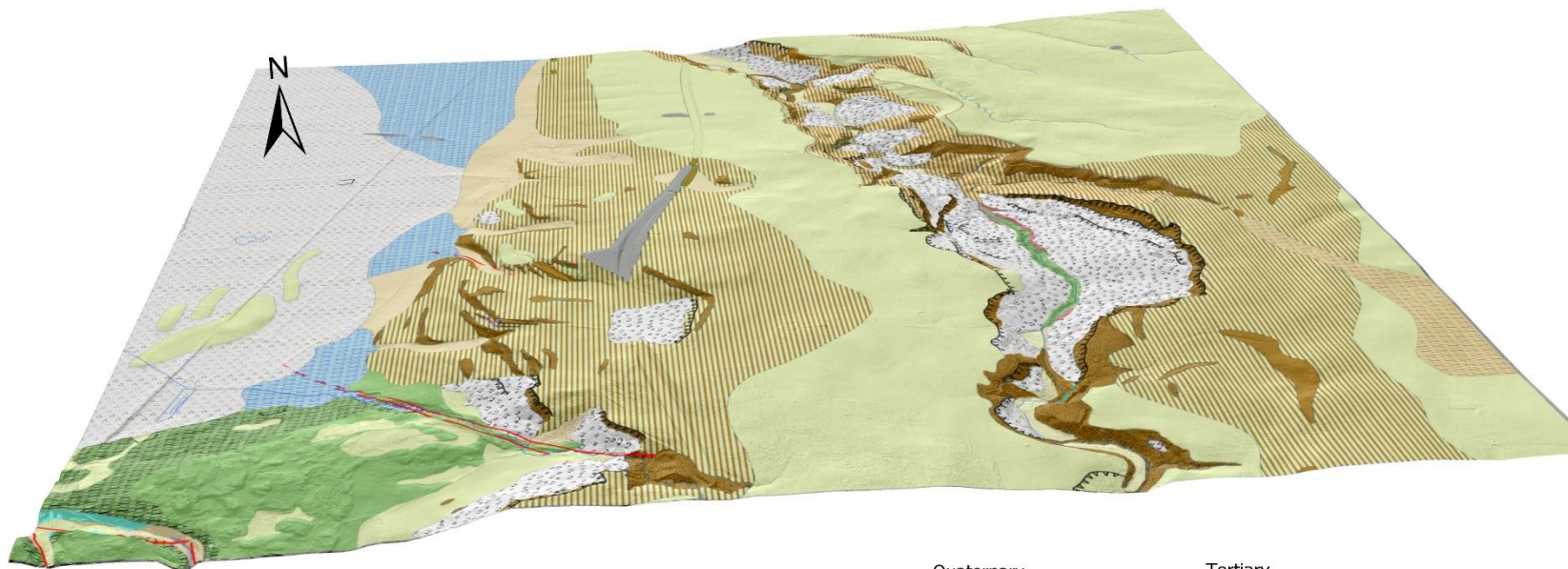


Maps source: Atlas géologique 1:25000, Federal Office of Topography, swisstopo





# 3D geological map of the molasse Plateau area



In order to harmonise the differences between the 4 maps we adjusted and modified the geological contours and standardized the geological formation names.

The molasse outcrops (brown color) limits have been modified and adjusted based on the erosional scarps. New quaternary deposits (moraine, colluvium, landslides) have been mapped based on the terrain morphology and boreholes data.

## Quaternary

- Anthropocenic
- Alluvium deposit
- Alluvial fan
- Landslide
- Swamp
- Land subsidence
- colluvial deposit
- Moraine (till)
- Peat deposit

## Tertiary

- Marl and sandstones
- Sandstones
- Marl and sandstones under thin talus deposits
- Marl and sandstones under thin moraine deposit
- Sid erolitique (clays and sandstones)

## Cretaceous

- Limestones
- Limestones and marl
- Limestones

- Fault
- Caldairchfontaineux, glauconie
- Landslide scarp
- Erosion scarp
- Quarry
- Covered outcrop
- Fresh water limestone
- Sandstone type Goumoens
- Gompholite

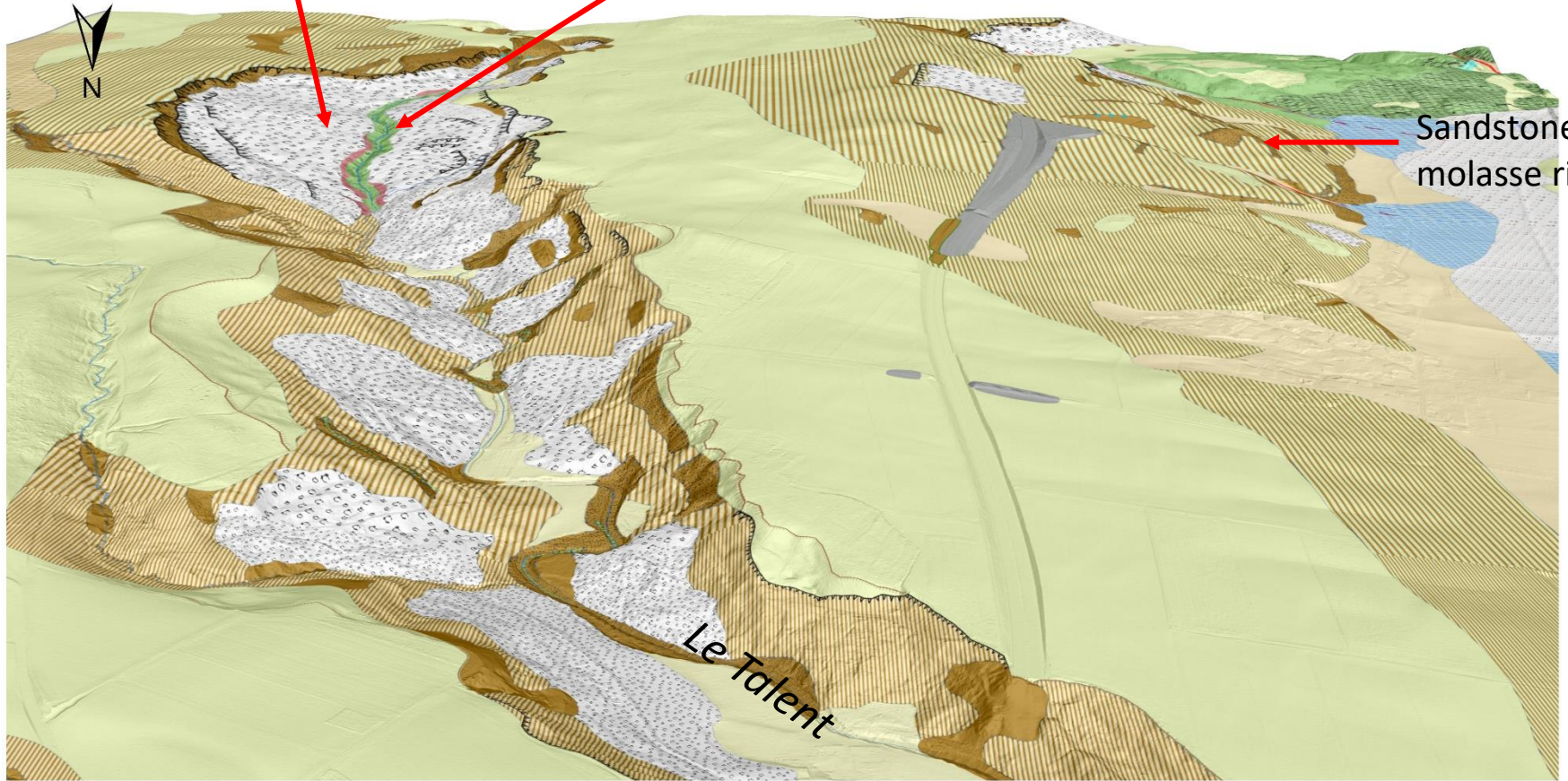


# 3D Geological map view of the molasse Plateau area

Landslides in the clayey molasse contributed to the widening of the Talent river

Cretaceous limestones (Mormont anticline)

Sandstones molasse ridges





# Concluding remarks

In this study, different LIDAR-derived hillshade maps (using a variety of shading options) have been used to improve the delimitation of bedrock and Quaternary formation through morphological feature analysis.

In the case of the Molasse Plateau and the Leysin area where the outcrops are sparse, the boreholes gave us very valuable data for the geology mapping

In the case of the Prealps test area the spatial distribution of the structures (faults), the glacial erosive features (i.e. old cirques) and the gravitational slope deformations provide very interesting data for further analysis of the landscape evolution during the last glacial and interglacial periods.

In the case of the Molasse Plateau test area the Quaternary deposits mapping has been improved , but studies at a regional scale are still necessary.

Detailed bedrock and Quaternary mapping will provide very good information for the resource management, land planning and geo-hazards.

