

Bundesamt für Landestopographie  
Office fédéral de topographie  
Ufficio federale di topografia  
Uffizi federal da topografia

# Statewide Topographic 3D Model of Switzerland

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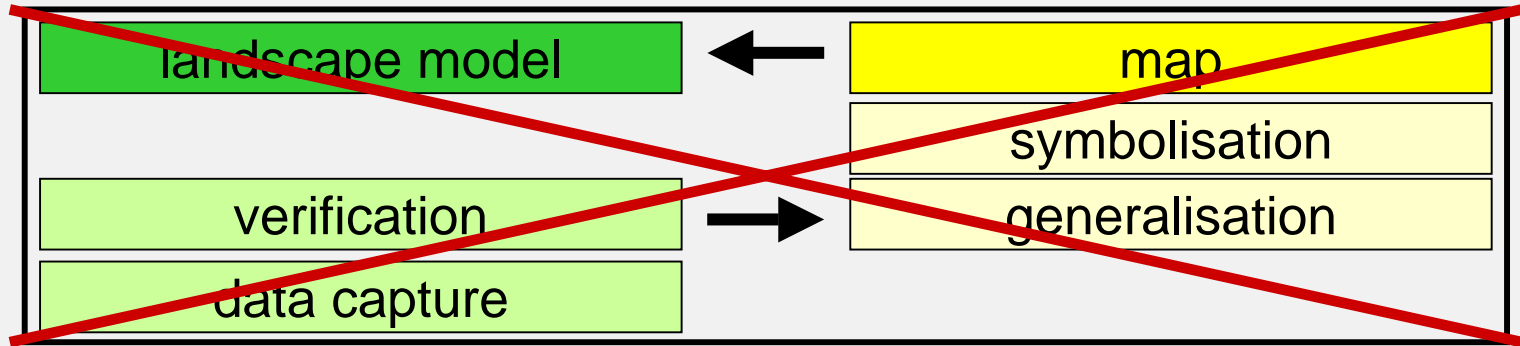
# Swiss Federal Office of Topography

- production unit
- founded in 1838
- 245 employees
- in constantly changing conditions
- very rapid technical evolution
- digital products in addition to analogue products
- customer oriented

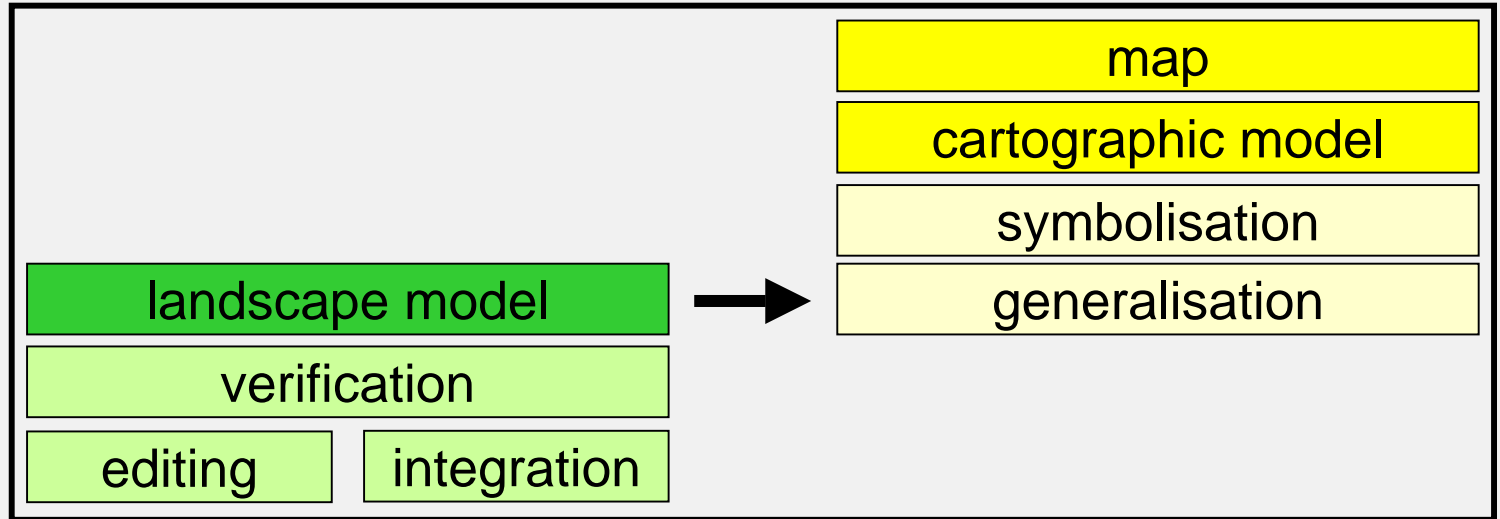


# Change of data- and workflow

at present:



in the future:



# Simple comparison

## Present production

- analogue aerial images
- data capture on analytical BC3's for 1:25'000 mapping
- “ignoring” the 3rd dimension
- raster based map generation
- digitising of VECTOR25 from the raster maps

☞ only cartographic models

## Future production

- digital aerial image data
- capturing and editing of the TLM and the DTM-TLM with a "corporate editor"
- preserving 3D information
- deriving a DCM from the TLM

☞ basic landscape model

☞ cartographic models

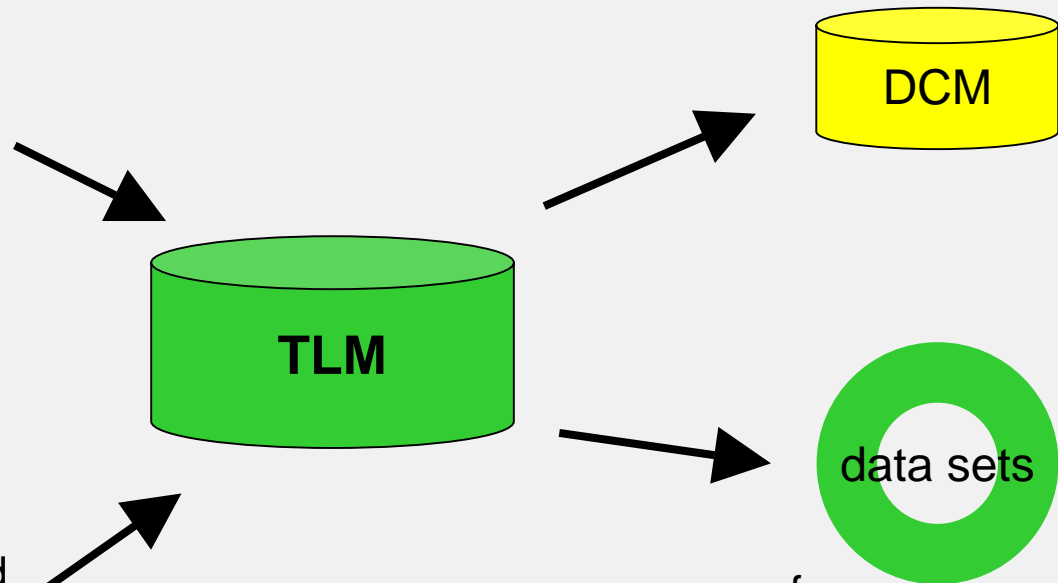
# Production chain and data flow

## editing

- digital photogrammetry
- digital remote sensing
- field verification with mobile GIS

## integration of data

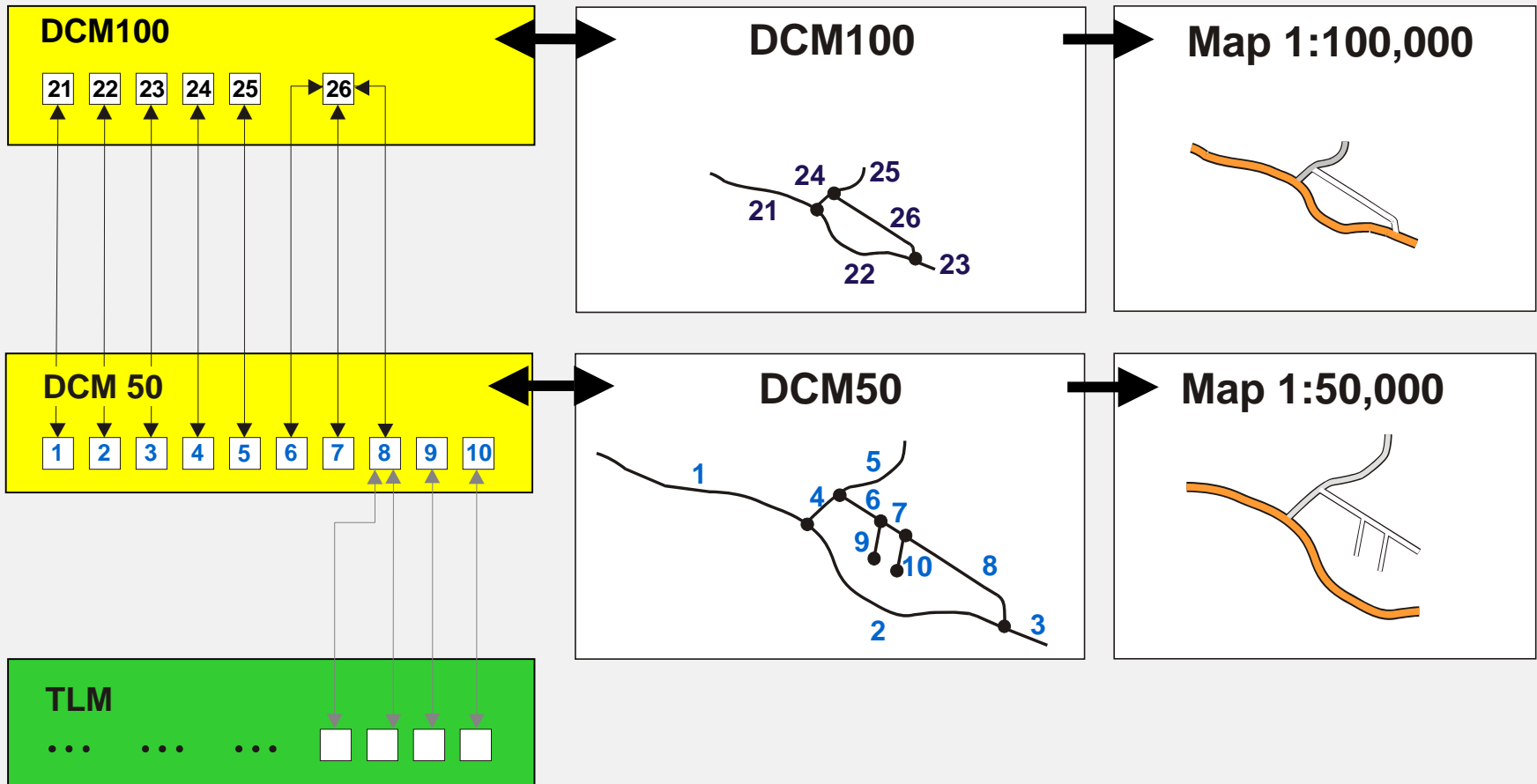
- from cadastral surveying
- from organisations abroad
- from federal offices
- from cantonal offices
- from railway companies
- etc.



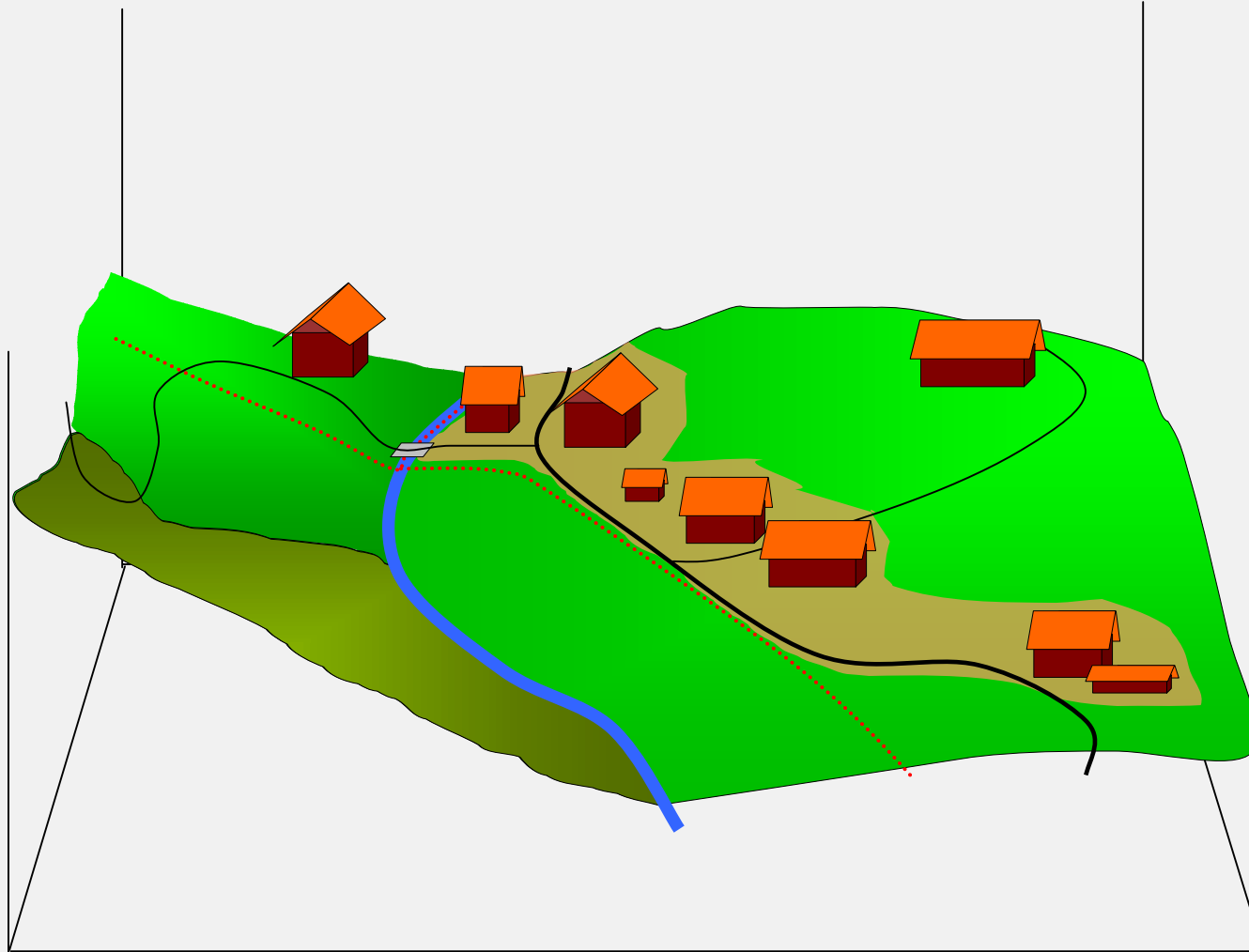
for

- federal offices
- cantonal offices
- cadastral surveying
- private users
- etc.

# Object relationships



# Simplified visualisation of TLM



# Updating cycle of TLM

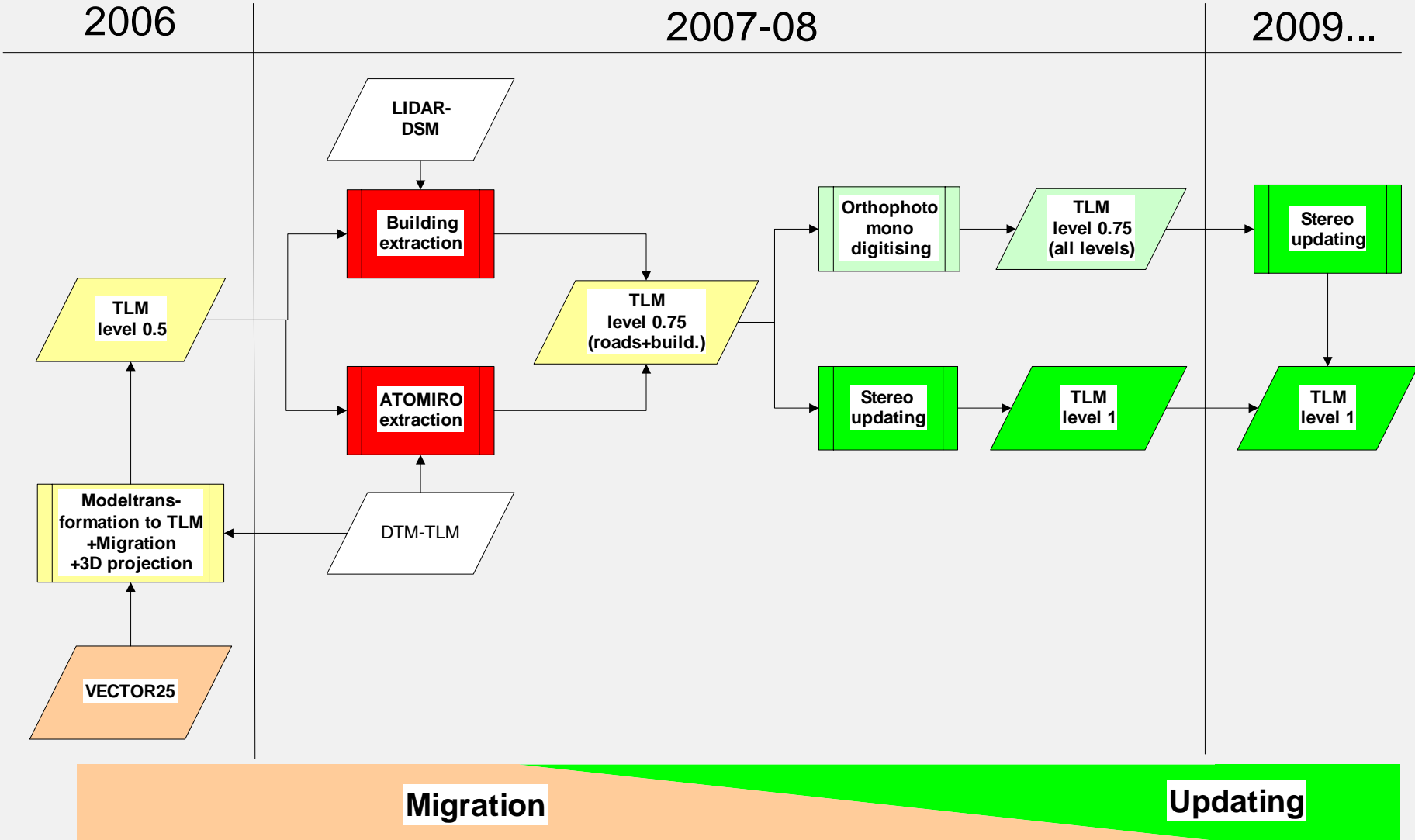
## Total revision

- periodic updating especially for map production: every year 1/6 of Switzerland

## Top up-to-dateness

- continuous updating of selected objects (roads, buildings, boundaries etc.).
- especially through the integration of data from reference partners.

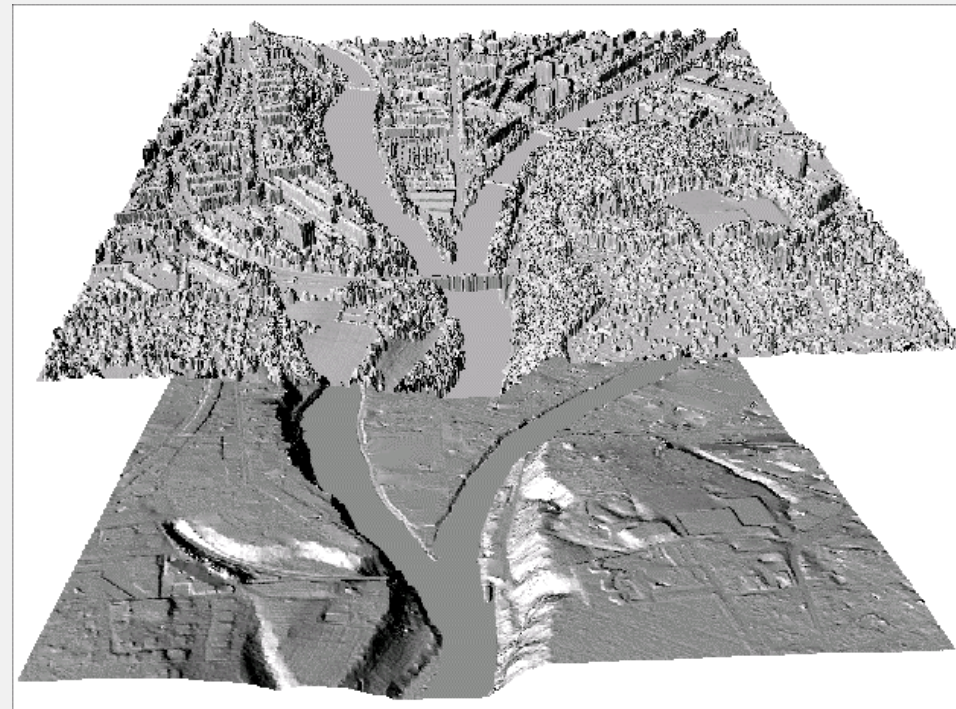
# From VECTOR25 to TLM



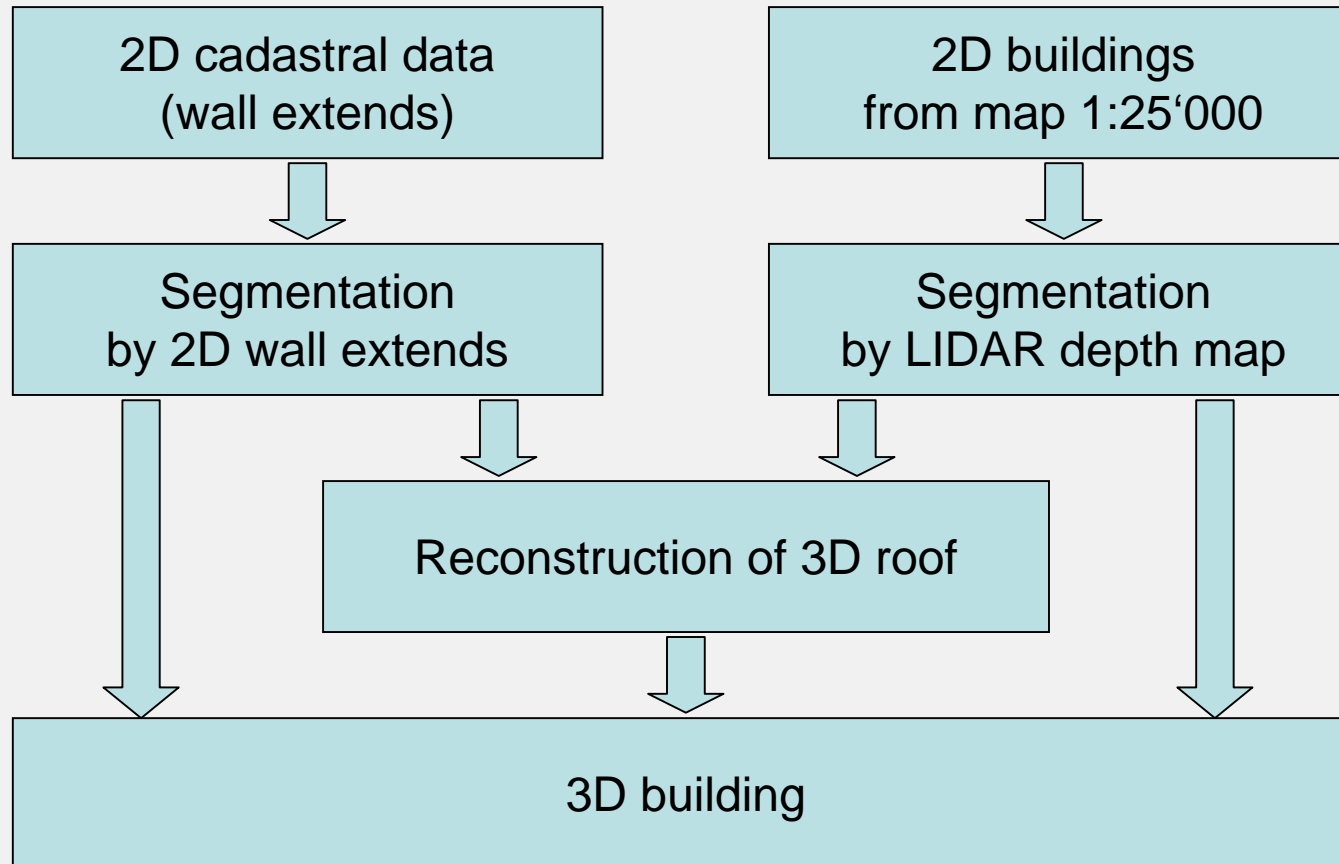
# DTM-AV and DOM

Data from Airborne LIDAR (2000-2005)

- **DOM (Surface Model)**
  - Accuracy in height:  $\pm 50$  cm ( $1 \sigma$ )  
Vegetation:  $\pm 150$  cm ( $1 \sigma$ )
  - Mean point density: 1 pt. /  $2\text{m}^2$
  - Accuracy of single points:  $\pm 20$  cm ( $1 \sigma$ )
  - Single points; 2m grid
- **DTM-AV (Terrain Model)**
  - Accuracy in height:  $\pm 50$  cm ( $1 \sigma$ )
  - Mean point density: 1 pt. /  $2\text{m}^2$
  - Accuracy of single points:  $\pm 20$  cm ( $1 \sigma$ )
  - Single points; 2m grid

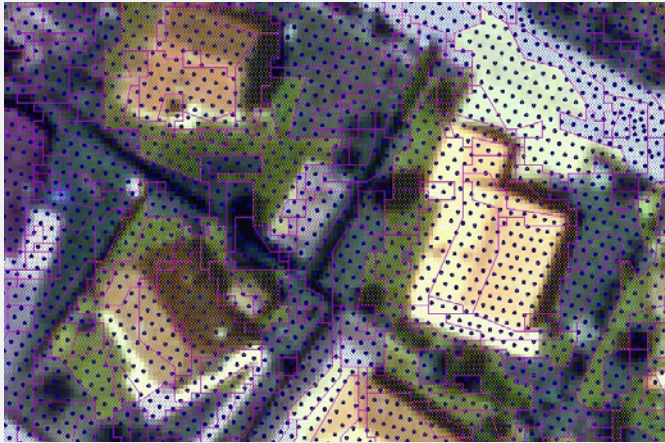


# Building Extraction

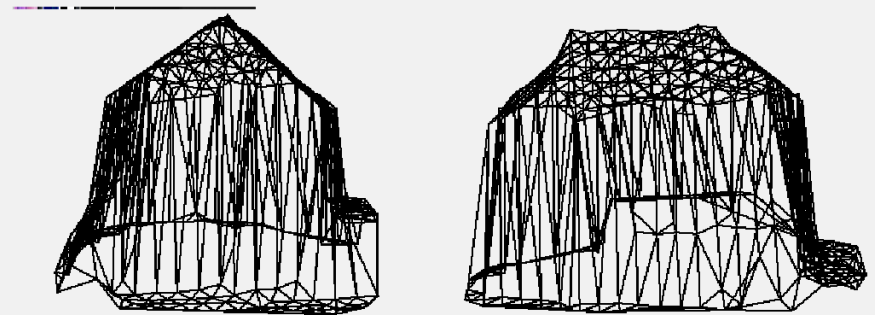


# Building extraction

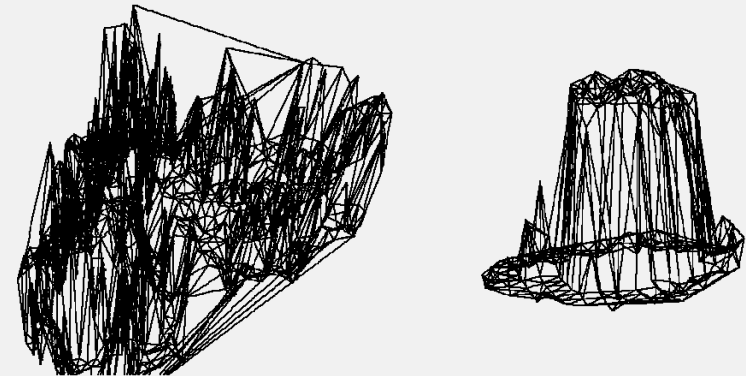
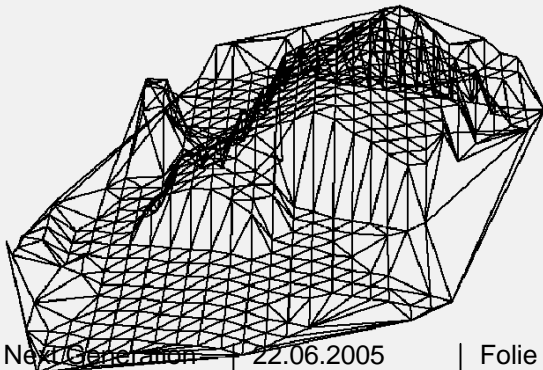
Export of point clouds



Local analysis of point clouds



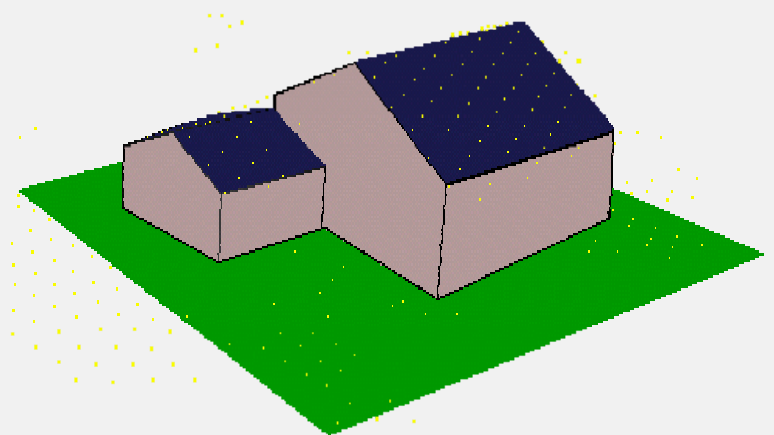
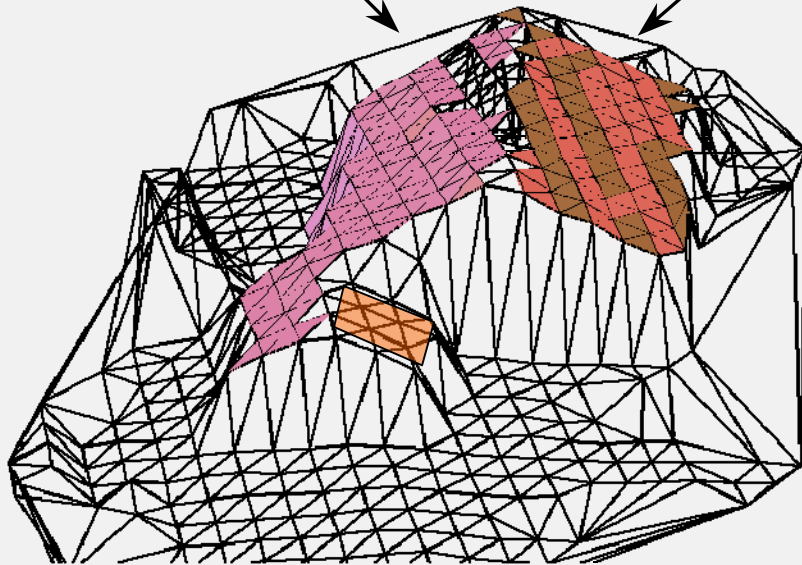
Delauney Triangulation



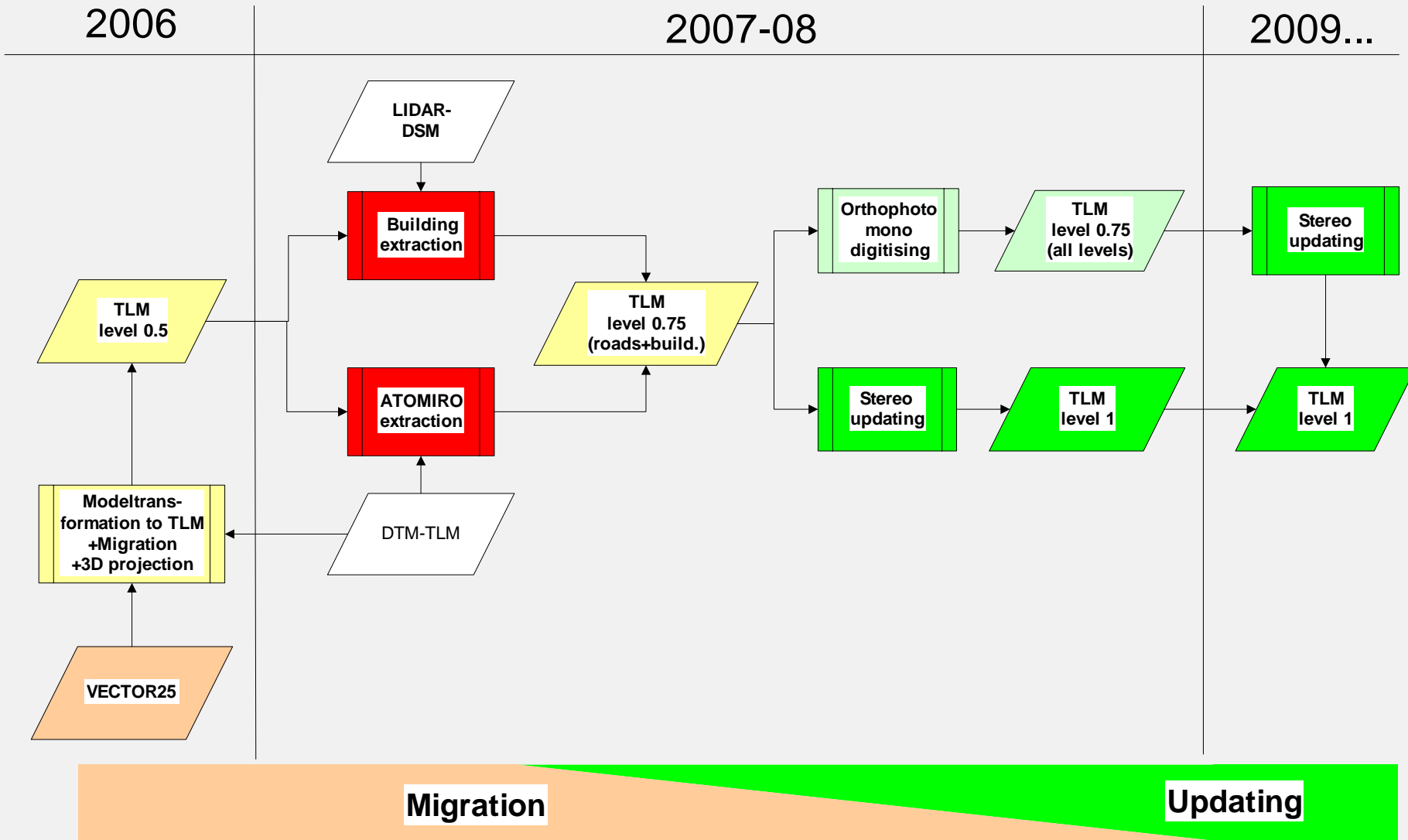
# Building extraction



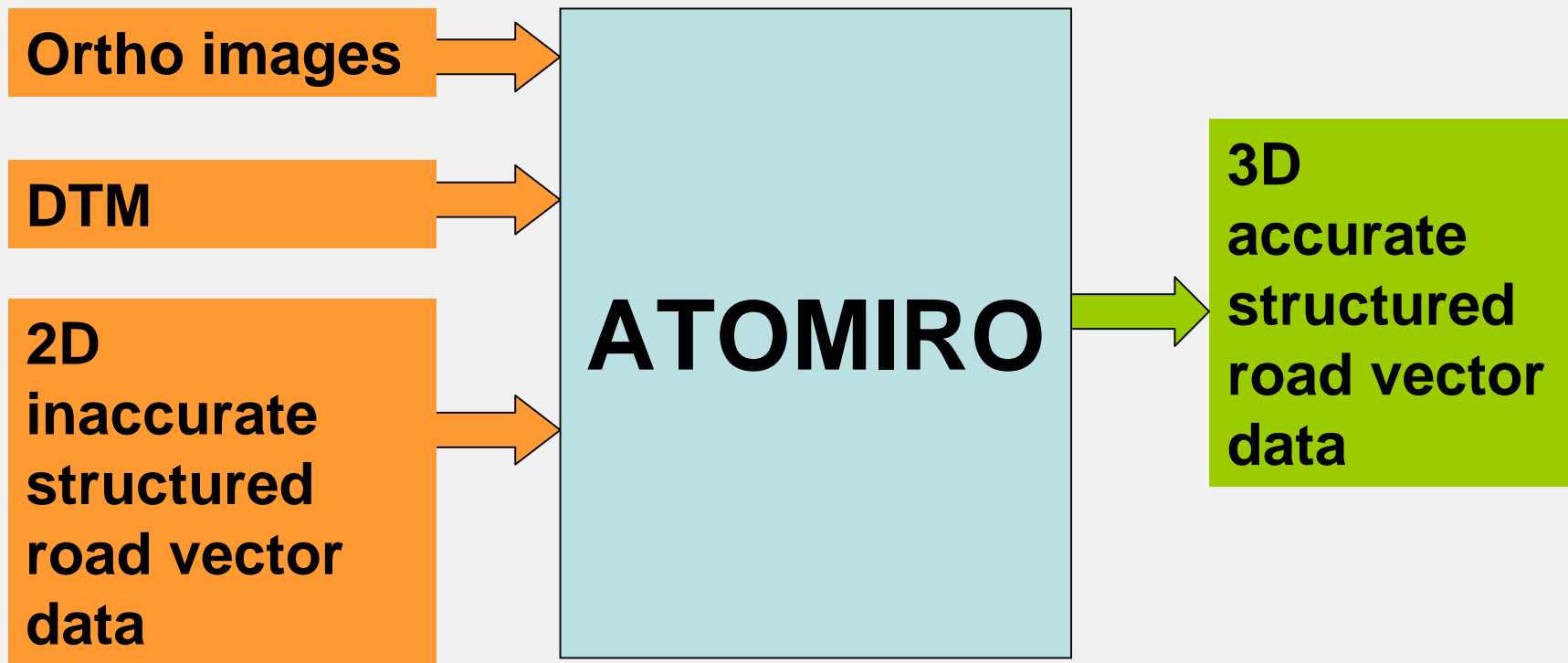
- Interpretation of identified cluster:
- 0 cluster: no building
  - 1 cluster with reasonable inclination: pent roof
  - 2 reasonable cluster: gabled roof
  - > 2 reasonable cluster: combined roof



# From VECTOR25 to TLM



# ATOMIRO input and output data



# Results (ATOMIRO=Red, VECTOR25=Blue)



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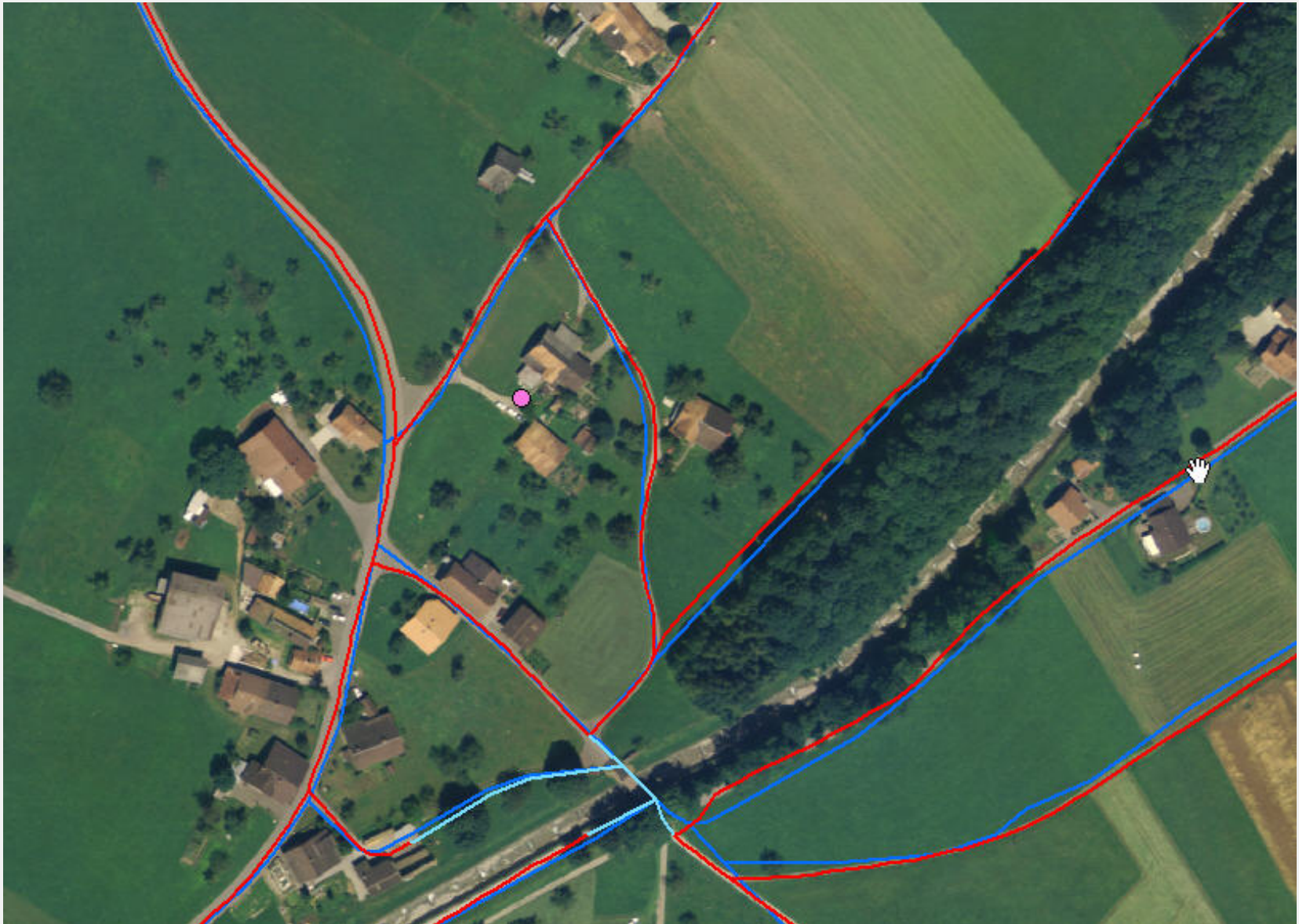
# Results (ATOMIRO=Red, VECTOR25=Blue)



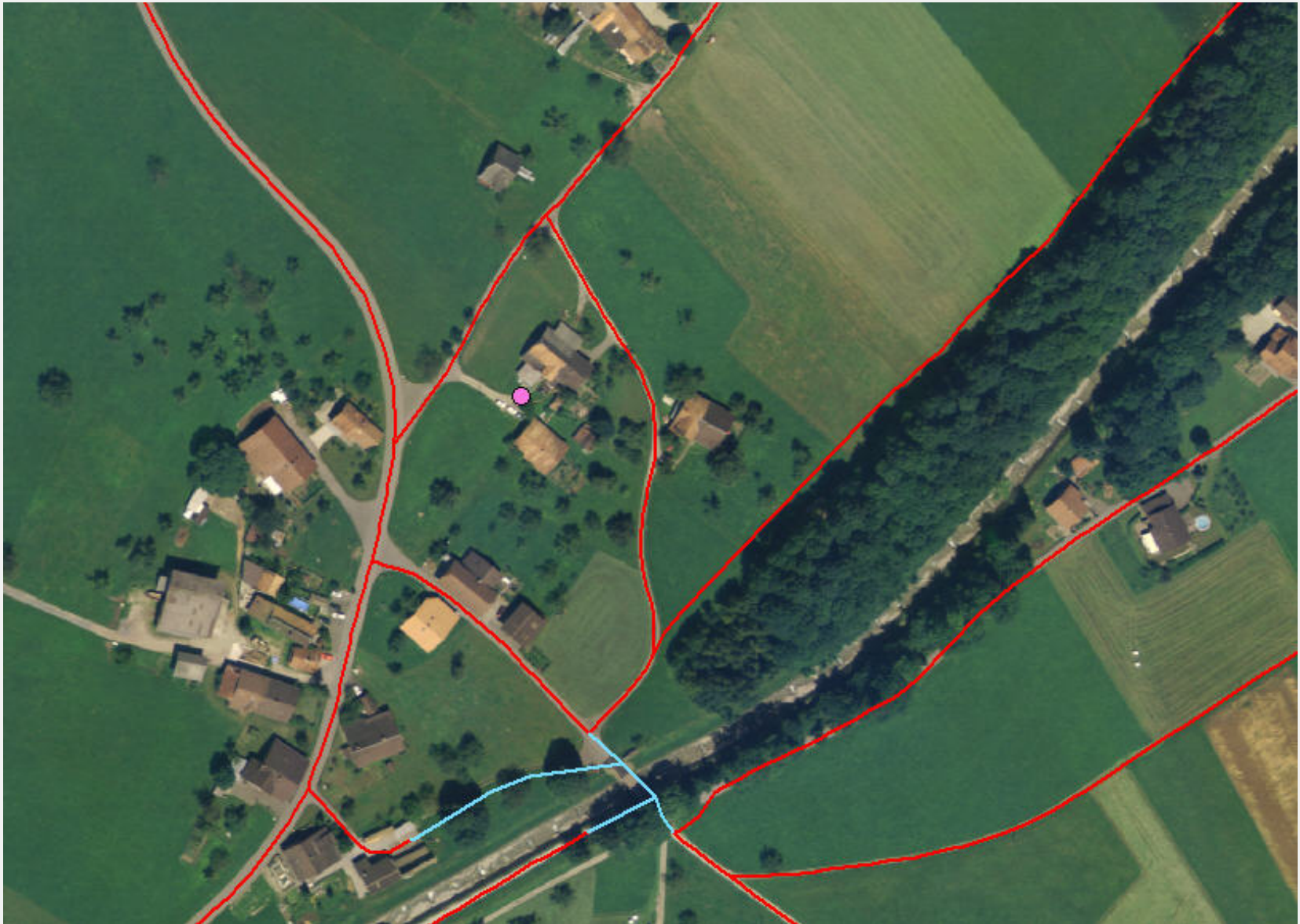
# Results (ATOMIRO=Red, VECTOR25=Blue)



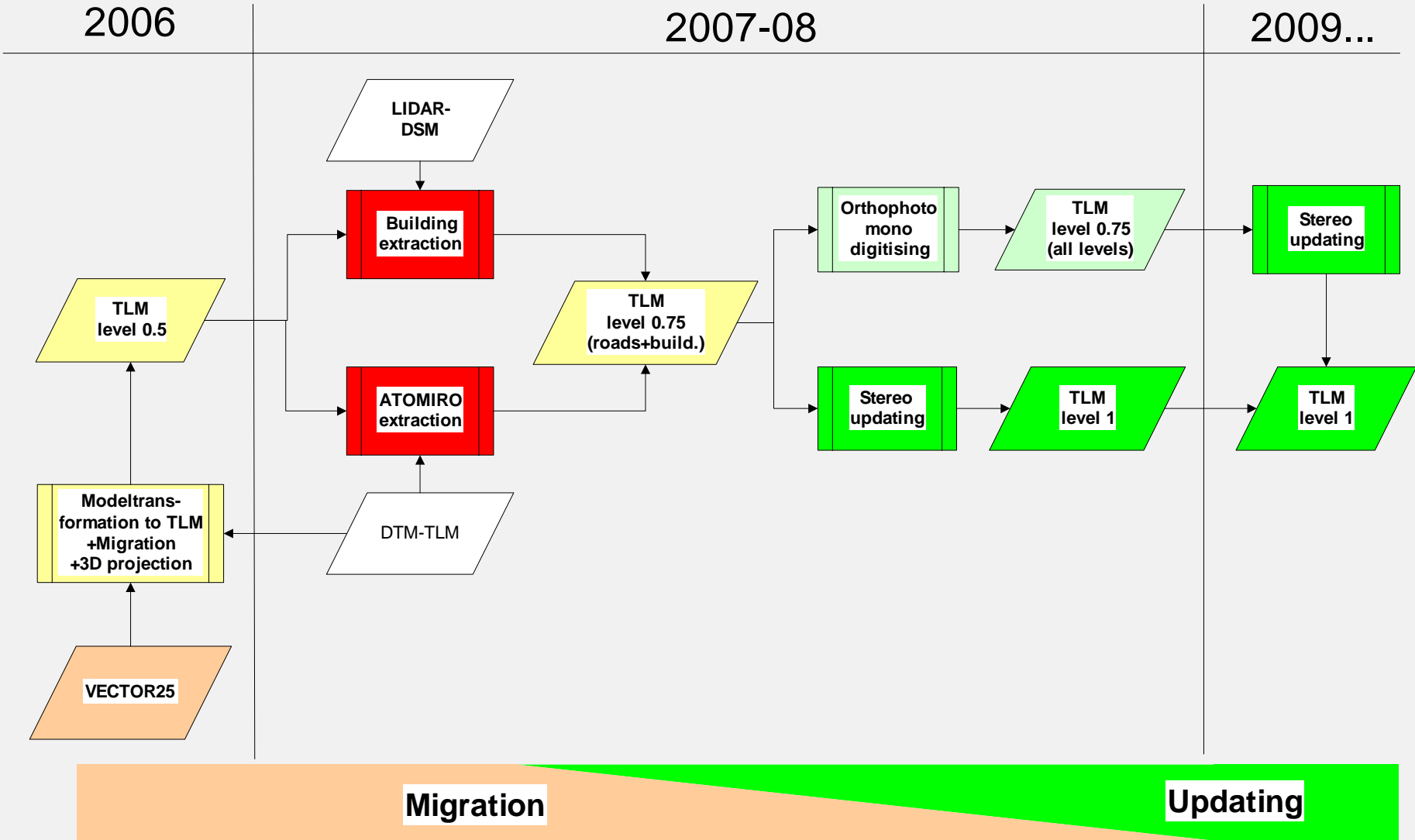
# Results (ATOMIRO=Red, VECTOR25=Blue)



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# From VECTOR25 to TLM



# Changes as compared to today:

- TLM is the base landscape model of Switzerland (not a cartographic model=> no displacement of elements, no cartographic generalisation).
- the data in TLM will be more up-to-date (through periodic total revision and continuous updating).
- the TLM data will be more accurate ( $\leq 1\text{m}$ ).
- the TLM data will be in 3D (TLM und "DTM-TLM").
- TLM can handle future content specific extensions (Data model).

