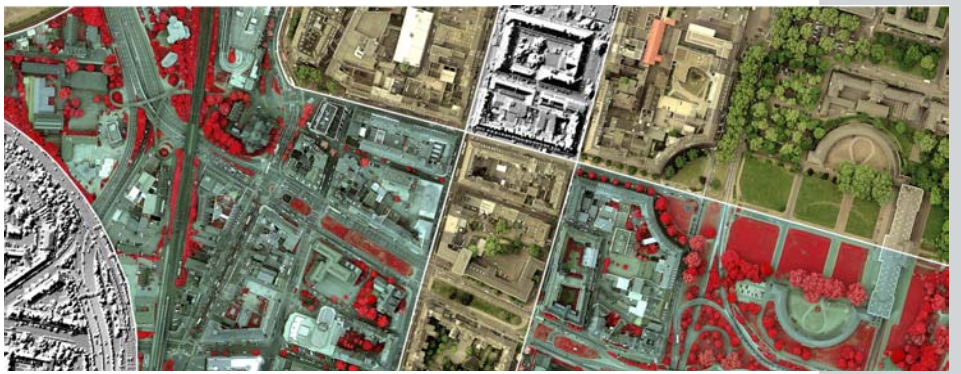
Accurate On-Time Geo-Information for Disaster Management and Disaster Prevention by Precise Airborne Lidar Scanning

The First International Symposium on Geo-information for Disaster Management



Katrin Schnadt
TopoSys GmbH

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Outline

- **Laser scanner system Falcon**
  - *Fiber optic laser scanner*
  - *Multispectral line scanner*

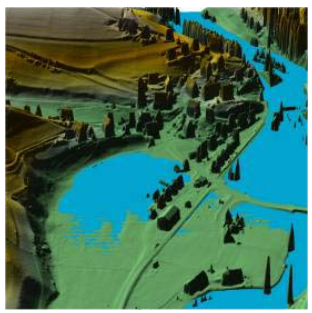
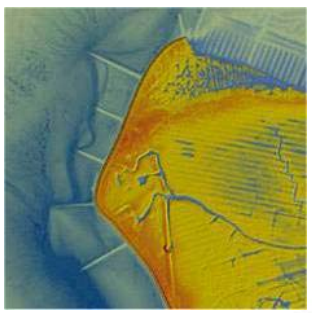
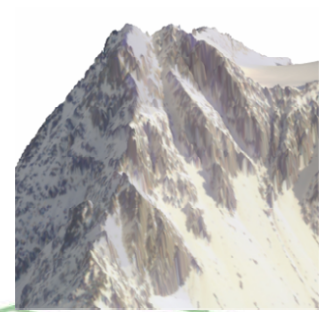
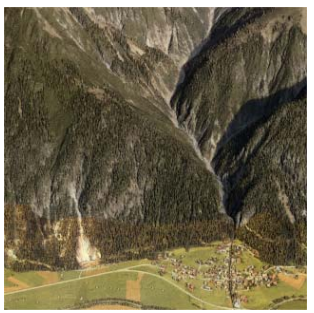
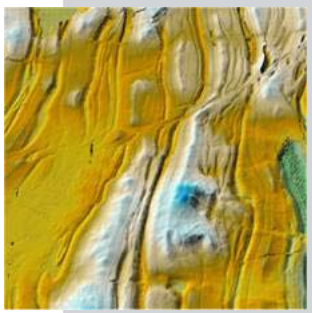
- **Topographic base data**
  - *Elevation models and image data*
  - *Derived products*

- **Use of geo-information in disaster prevention and management**

Background

- ***Disaster management needs accurate, up-to-date and rapidly available geo-information***
- ***Airborne laserscanning provides digital elevation and image data in high precision and reliability***

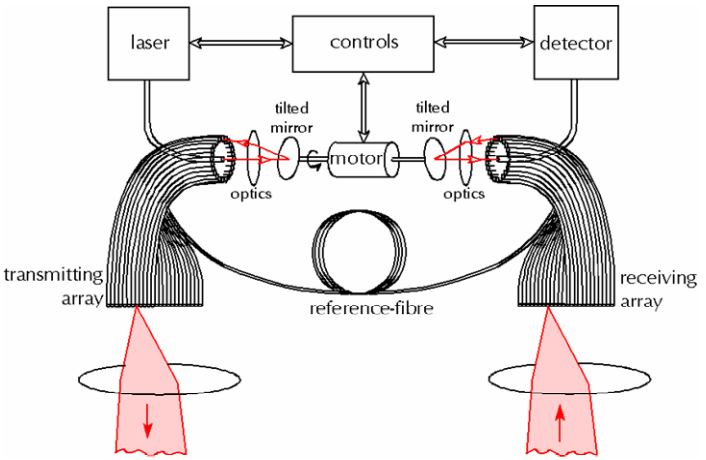
- **Hydraulic analyses and river modelling**
- **Coastline protection**
- **Monitoring of landslides and mountain hazards**
- **Inspection of volcanoes and areas with danger of collapse**

Falcon System

- ***Fiber optic laser scanner***

- **Pulse rate of 83,000 Hz**
- **Narrow viewing angle**
- **Recording of first and last echo**
- **Short echo separation of 1 m**
- **High overlap of measurements**
- **Wide beam**
- **Pixel size down to 50 cm**



- ***Multispectral line scanner***

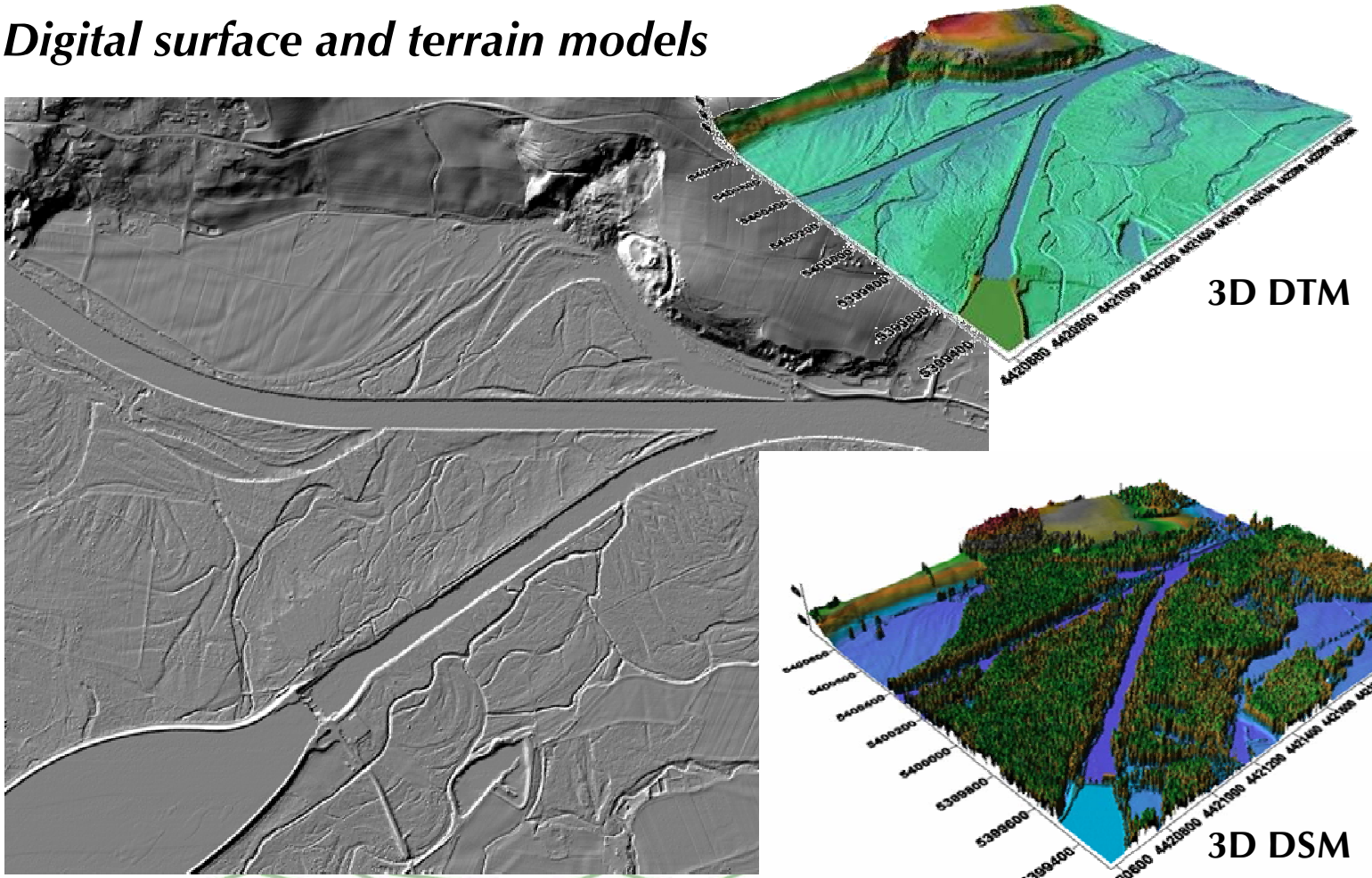
- **Light sensitive pixels reduced to only one line**
- **Precisely oriented with fiber scanner and IMU**
- **Four spectral channels (red, green, blue and near infrared)**
- **Pixel size down to 20 cm**

Standard products line scanner

True ortho image mosaic RGB (left) and CIR (right)

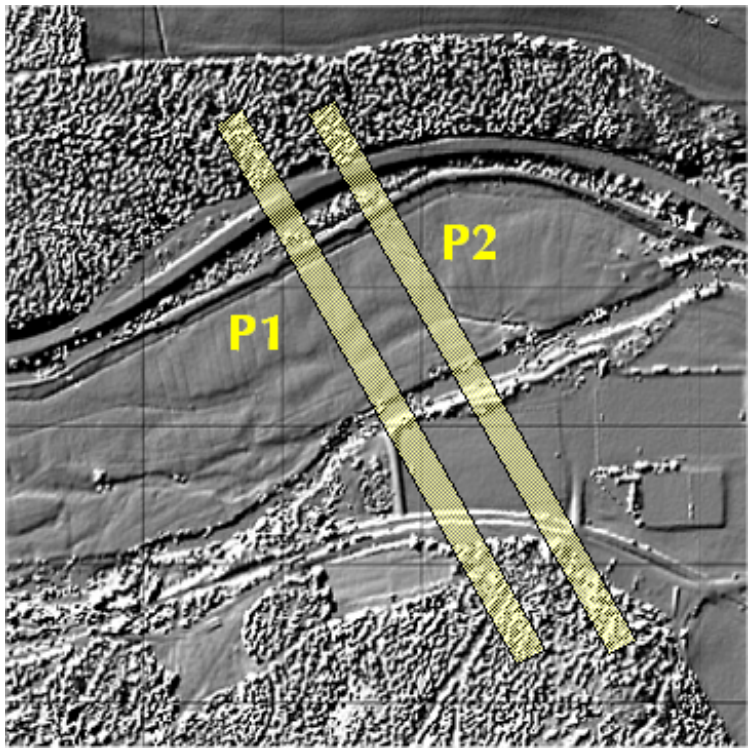
Standard products laser scanner

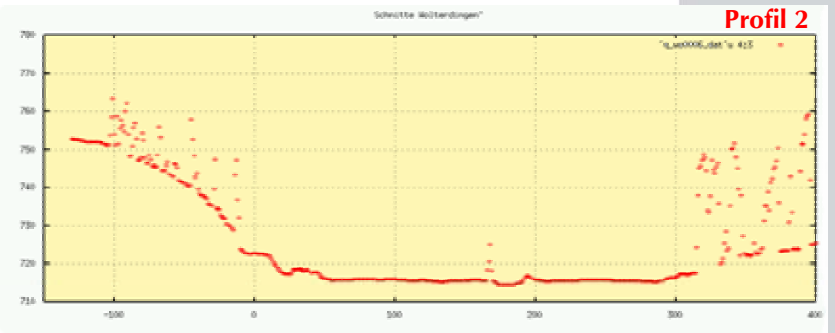
Digital surface and terrain models



Derived products

Cross sections

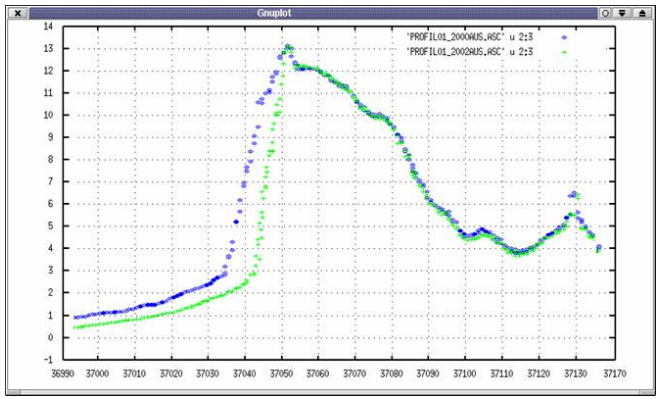




- Easy extraction of cross sections for 1D hydraulic simulations
- Use of area-wide digital elevation model for 2D simulations

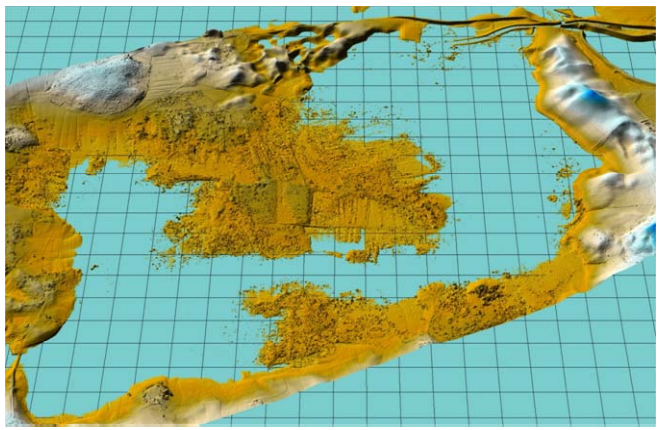
Derived products

Differences and volumes



Calculating the differences between 3D surface data acquired at different times

- **Identifying changes which occurred within the time span**
- **Determination of volumes of erosion and land subsidence**



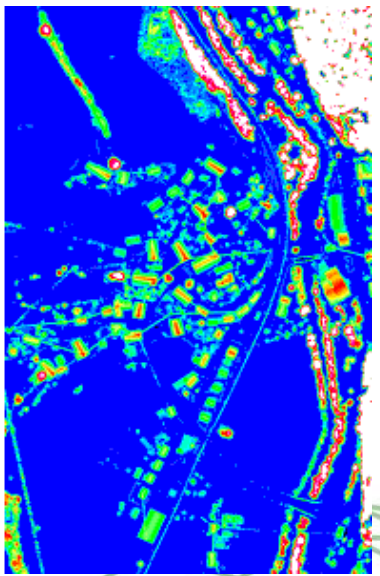
Subtracting 3D surface data of a basin from a fictitious plane or water level

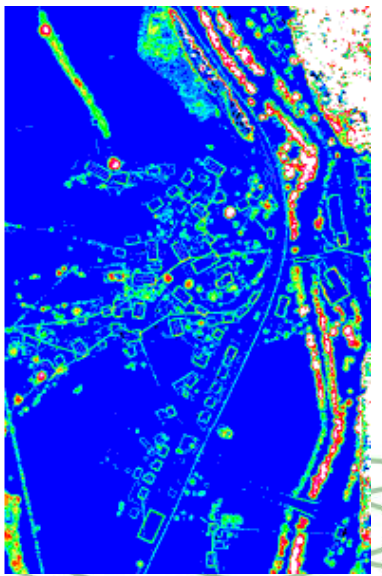
- **Calculation of capacities of reservoirs and storage lakes**
- **Determination of extend and boundary of potentially flooded areas**

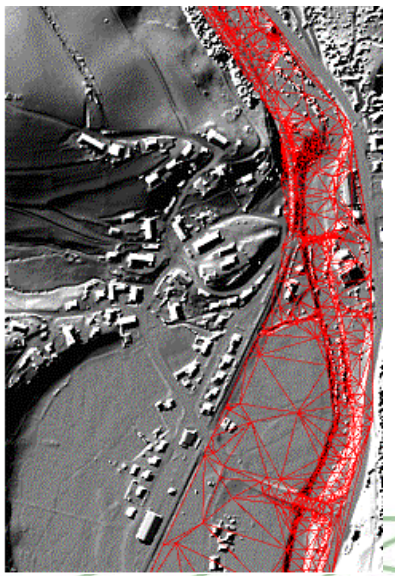
Derived products

Differences and TINs

- Calculating difference models DSM – DTM for determining the heights of objects and surface roughness (left)
- Calculating difference models first echo – last echo for extracting shape of buildings and trees (middle)
- Generating of Triangular Irregular Networks (TIN) for reduction of number of points and amount of data (right)

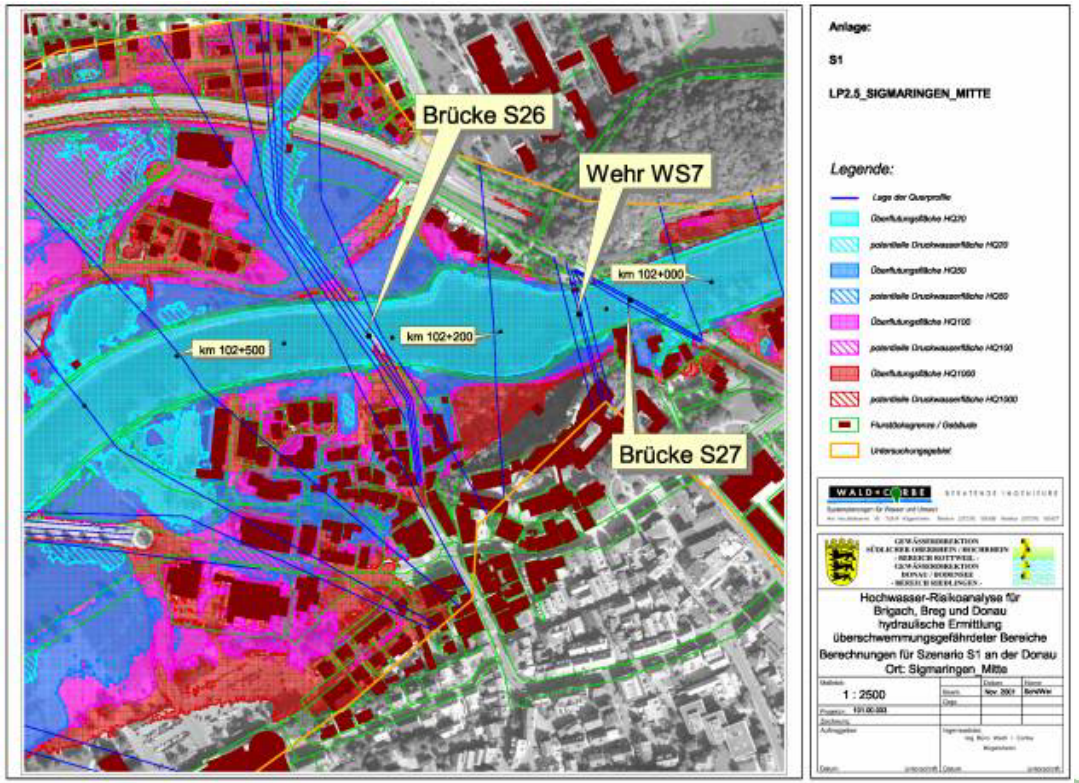




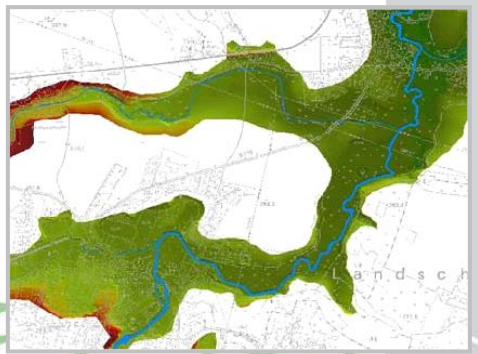


Disaster prevention

Regular data acquisition of areas of potential high risk (volcanic activity, subsidence, flooding) for generating topographic base data



- **Calculation of hydraulic simulations**
- **Determination of flooded areas**
- **Production of flood risk maps and risk analyses**
- **Forecasting different scenarios**
- **Monitoring water retention basins, dams and dikes**



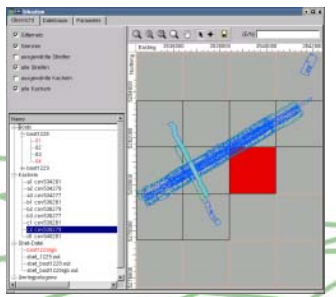
Disaster management

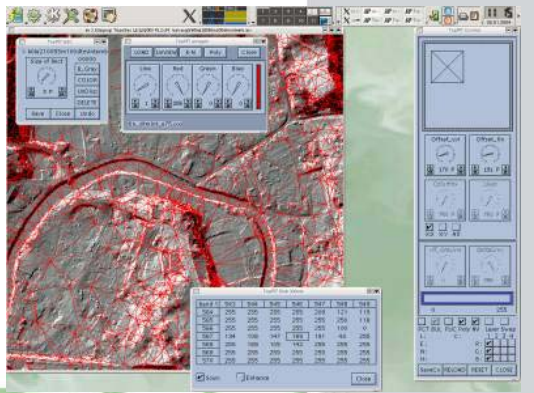
Data acquisition during an unexpected disaster possible due to fast operation of LIDAR system

- Sensor system mounted in airplane
- Ready for operation anytime
- Short reaction times

Data processing immediately after survey flight

- Time for calculating elevation data equivalent to duration of survey flight
- Processing of image data
- Extraction of disaster-oriented information, e.g. water-land boundary

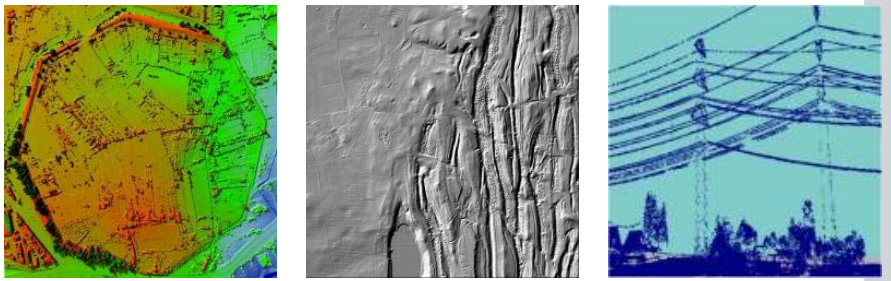




Conclusions

- **LIDAR technique**

- *Fiber based laser scanner provides high resolution and reliable surface and terrain data*

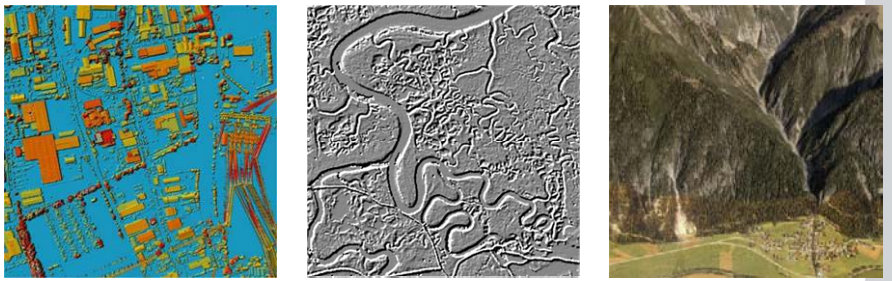


- *Optical line scanner provides image data in four channels simultaneously*

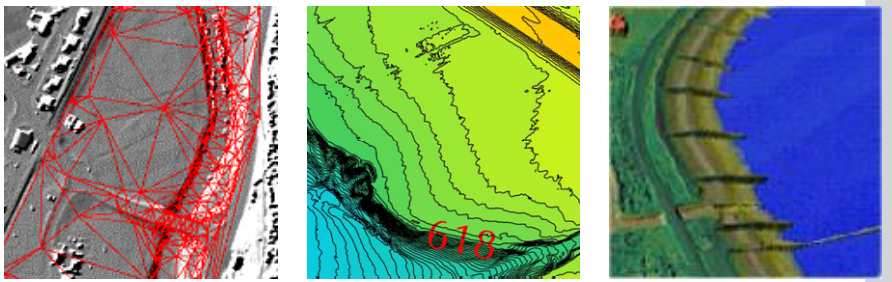
Conclusions

- **Geo-information**

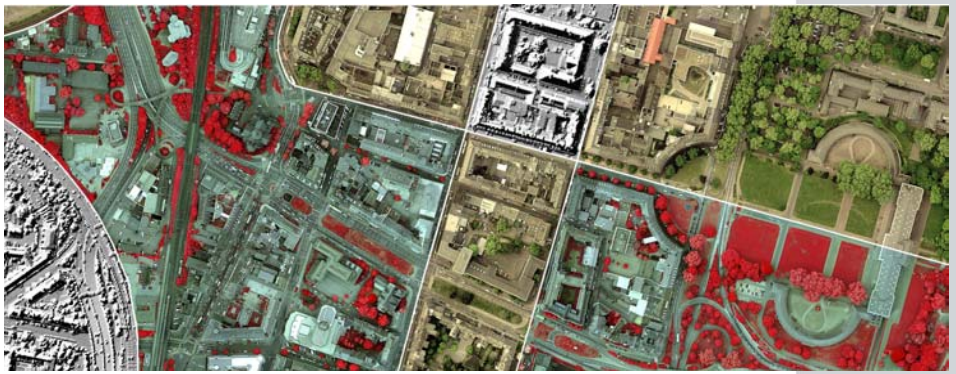
- *Calculation of topographic base data and true ortho image data*



- *Deriving application-oriented products for disaster prevention and management*



Thank you very much



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