

## Tutorial 10

# Information extraction from high resolution optical satellite sensors

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## Section 9

# Conclusions and outlook

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## Conclusion 1

The number of high resolution optical space system is growing permanently, the ground resolution is improved and will improve in future . 0.45m GSD is available, 0.41m GSD will come this year, 0.33m GSD is announced and 0.25m GSD proposed  
→ competition space to aerial images

Maps up to 1 : 5000 can be generated with space images . this will be improved with better ground resolution

Orientation without ground control permanently improved

Growing number of space sensors → better choice for optimal images

Stereo sensors are improving the possibility for automatic image matching

Very high resolution SAR-systems are available in space with up to 1m / 3m GSD . not same information contents like optical images, but usable for mapping, not influenced by clouds

With IfSAR generation of height models . from air available as NEXTMap (RMSZ=1m), from space starting 2009 with TanDEM-X (proposed RMSZ=2m)

## Conclusion 2

Qualified digital elevation models can be generated by automatic matching images taken from space and by InSAR

With the free of charge available SRTM C-band DSM a homogenous height model is available for main part of world but mostly only with a spacing of 3 arcsec causing a loss of morphologic information in mountainous areas

Even with lower accuracy of height models generated by stereo models of space images more morphologic information may be available

Optimal condition for matching if images from same orbit - if from different orbits, problems may occur if large time interval and change of vegetation and shadows

Advantage of near infrared or at least extended pan for matching in forest area

With very high resolution space images even 3D-city models can be generated but optimal results not with the largest convergence angle

Matched height models as well as SRTM data are DSMs with height values of the visible surface . reduction of DSM to DEM required by filtering

## Conclusion 3

Bottle neck for matching: stereo models taken from same orbit

ASTER with 15m GSD, SPOT HRS with 5m GSD in orbit direction and the new Cartosat-1 with 2.5m GSD guarantee with 2 views always a stereo coverage. ASTER has limited resolution, SPOT HRS-images are not available - only the height models, Cartosat-1 is just starting with operation

Very high resolution space image models (IKONOS, QuickBird and OrbView-3) are not so often available because of limited satellite rotation speed causing a loss of capacity if stereo models are taken, improvement by fast rotating WorldView-1

More images from stereo systems (Cartosat-1 and ALOS/PRISM) and high resolution InSAR

Orthoimages. fast generation, not reduced geo-coded information

Conditions for object extraction improved with the higher ground resolution. competition to aerial images

Large scale topographic mapping and map update based on very high resolution space images without problems

## Conclusion 5

Generation of orthoimages simple and fast . accuracy dominated by accuracy of used DEM and incidence angle of used image ( $SL = Sh * \tan v$ )

Automatic object extraction for lower resolution (10m GSD) should be supported by seed points

Automatic object recognition . no problem with accuracy, only problem of completeness . more complete if better ground resolution