GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

AWF

Comparing digital elevation models for illumination correction of satellite images in mountainous landscapes of Anhui Province, China

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Bogor & Jakarta, Indonesia

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Background and objectives

- Sino-German Lin2Value project with the objective to develop a carbon monitoring system (MRV in REDD+) using a combination of ground-based forest inventory and remote sensing.

- Digital elevation models as important remote sensing product and useful for natural resource management.

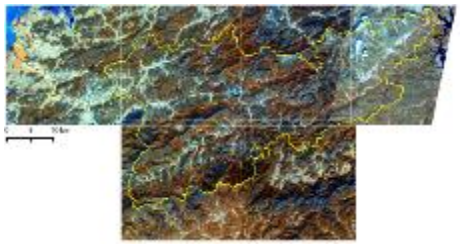
Specific research questions:

- How to optimize the pre-processing workflow of optical satellite images ?

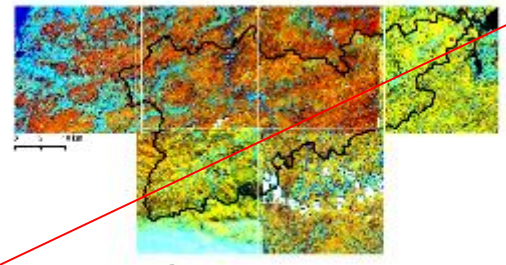
- Which role has the data quality of digital elevation models for georeferencing and illumination correction of RapidEye satellite images in steep mountainous terrain?

Study site and material

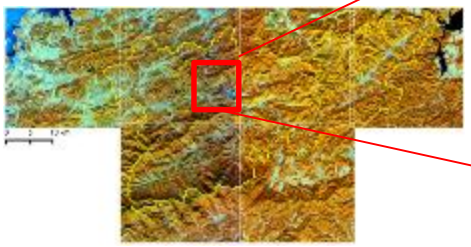
Six adjacent RapidEye L3A tiles (acquisition dates 2009-2013 from four seasons) completely cover the area of the county Shitai (1412 km^2) in Anhui Province, China.



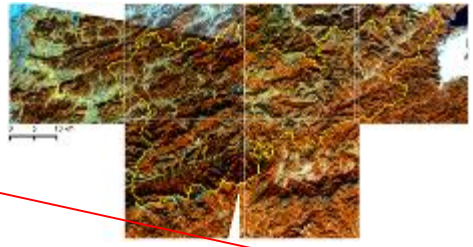
Spring



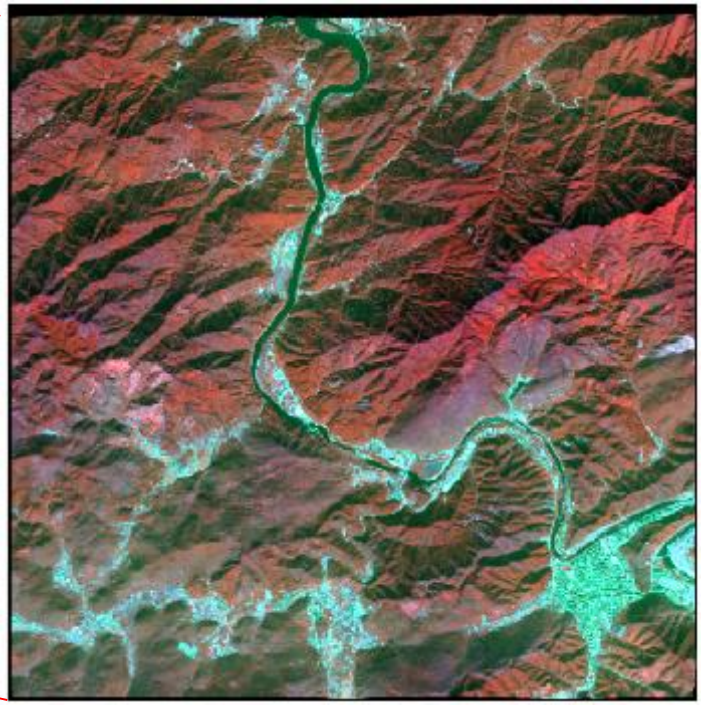
Summer



Autumn



Winter

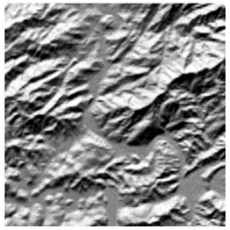


10km

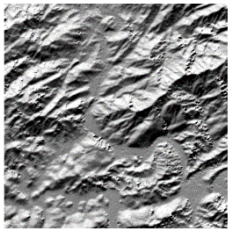
A very high spatial resolution multispectral Pleiades composite (RGB=431, 2013-11-07)

Digital elevation models (DEM)

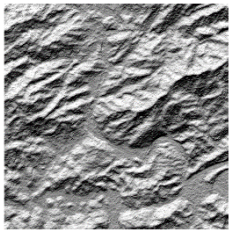
Strong influence of relief in Shitai county: altitude range 25 - 1727m and 38% of the area with slopes > 50%



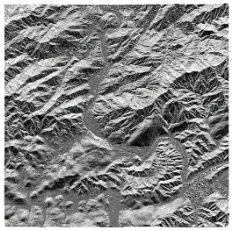
SRTM v4.1 (90m), SAR C-band interferometry,
http://www.cgiar-csi.org/data



SRTM-X (30m), SAR X-band interferometry,
http://eoweb.dlr.de:8080



ASTER GDEM v2 (30m), Stereo matching
http://earthexplorer.usgs.gov



Pleiades DEM (0.5m), Stereo matching
http://www.astrium-geo.com/en

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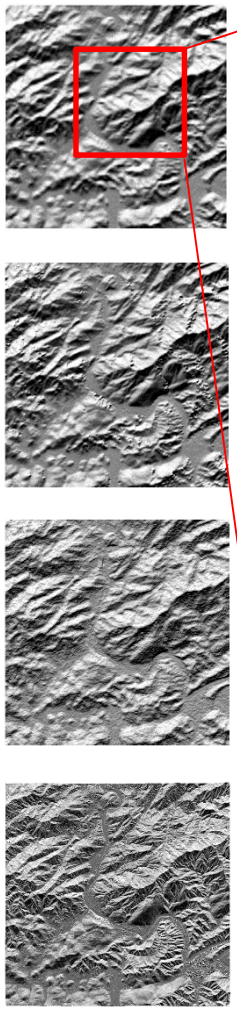

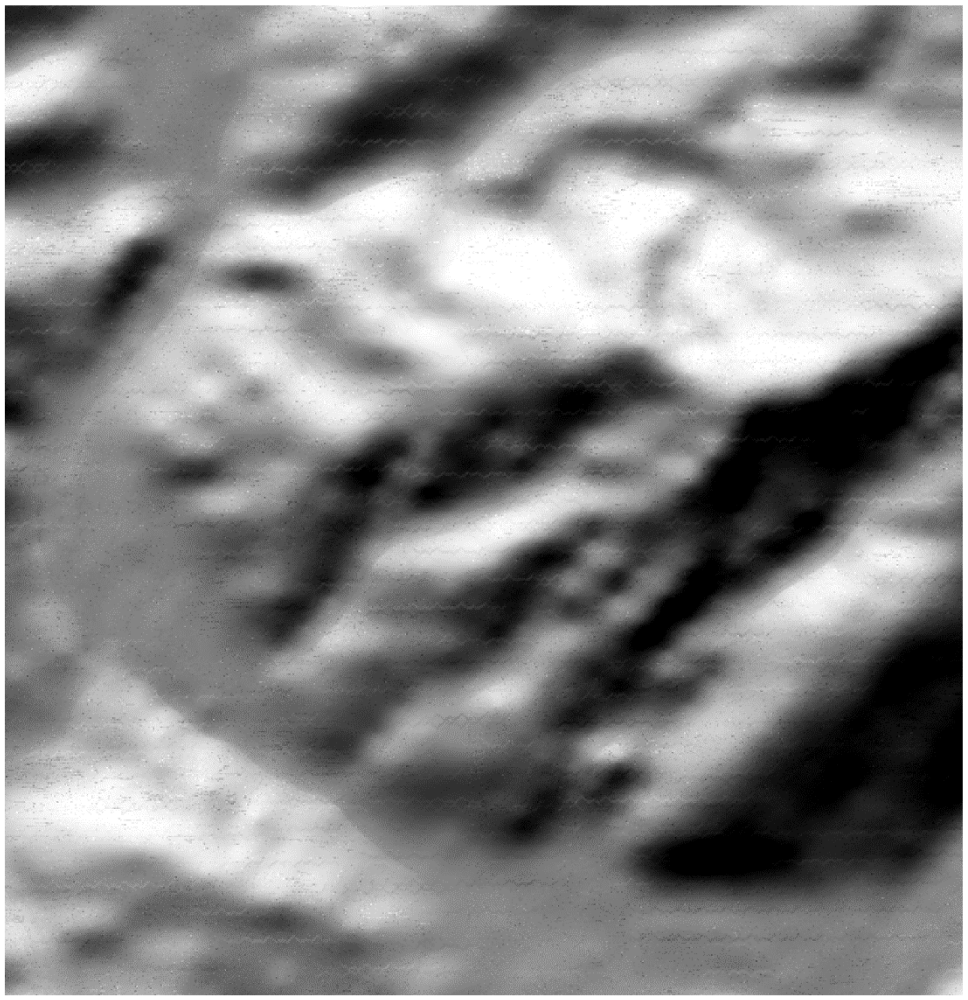

SRTM v4.1 (90m)

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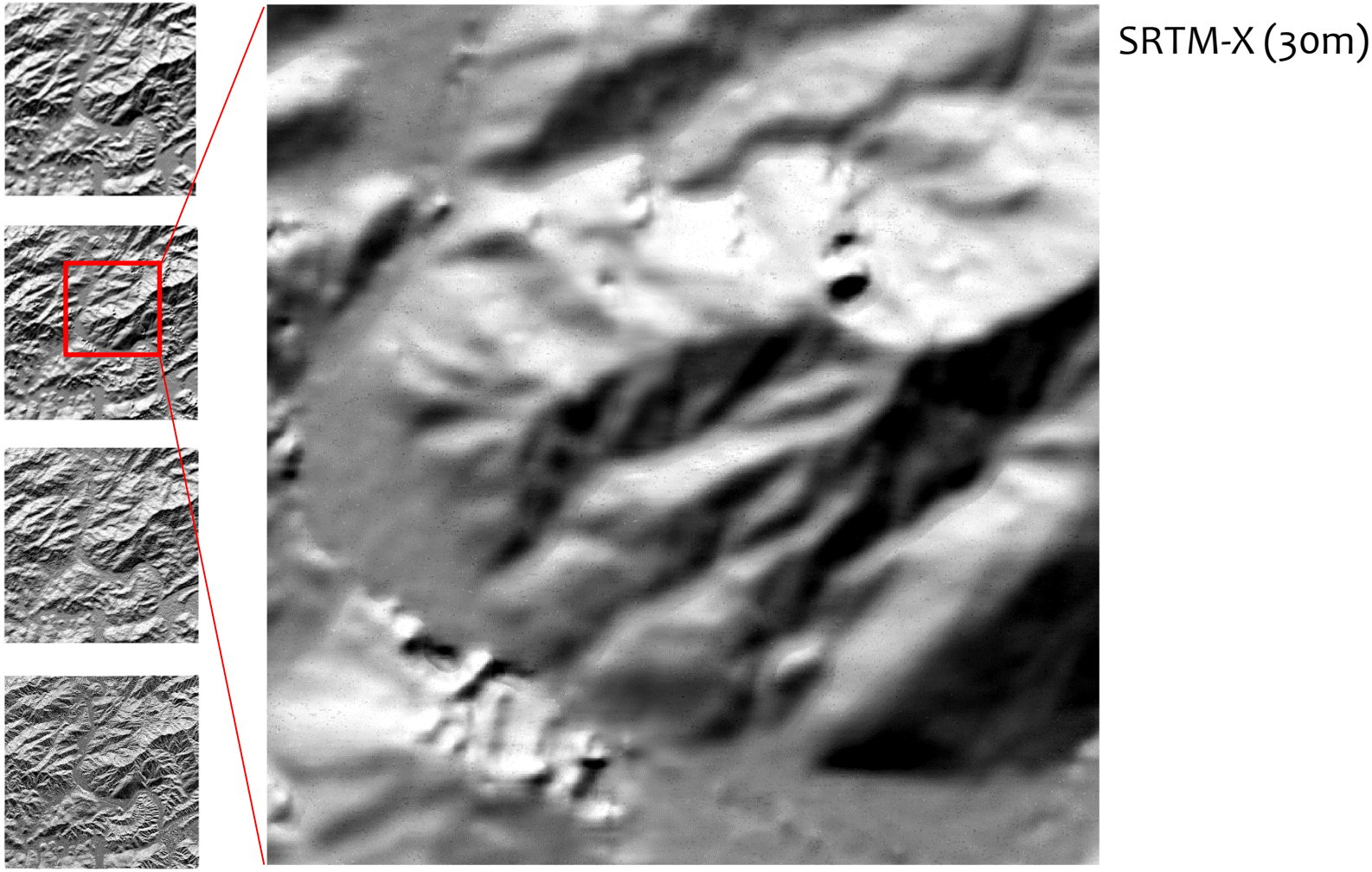

SRTM-X (30m)

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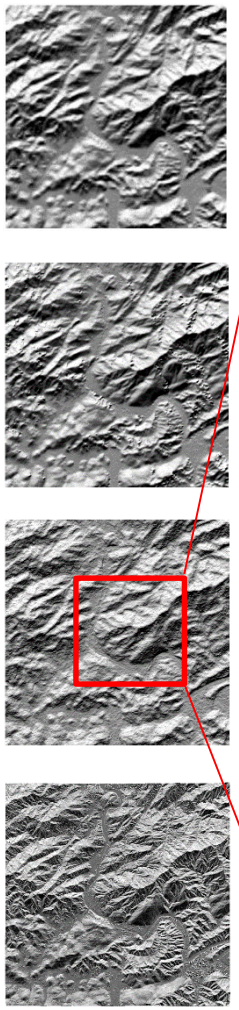

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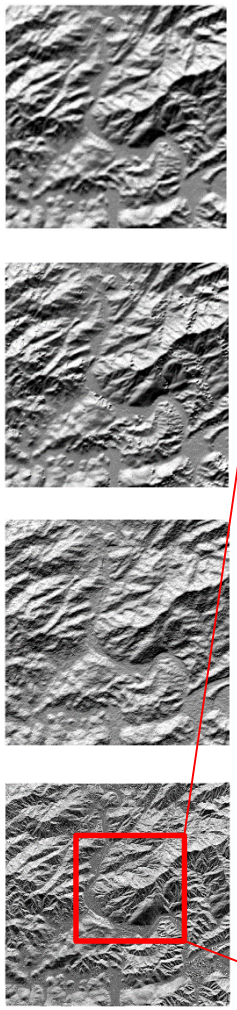
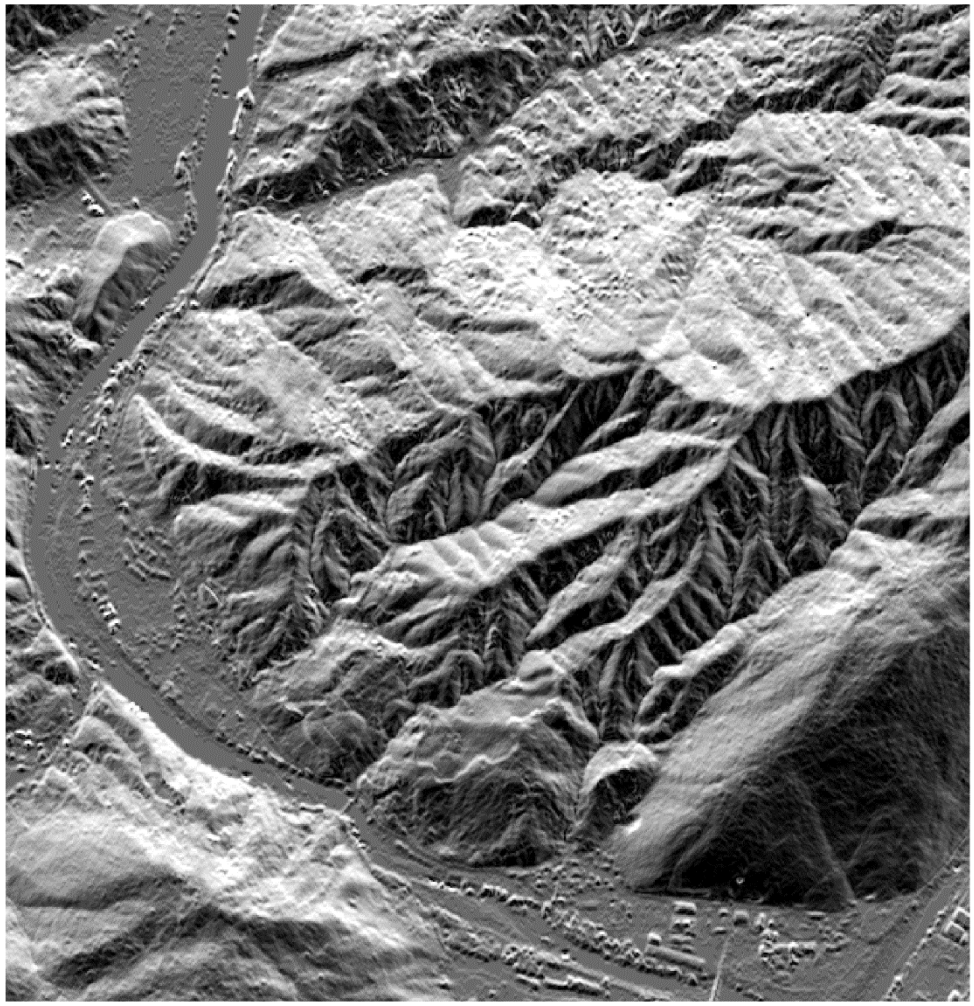


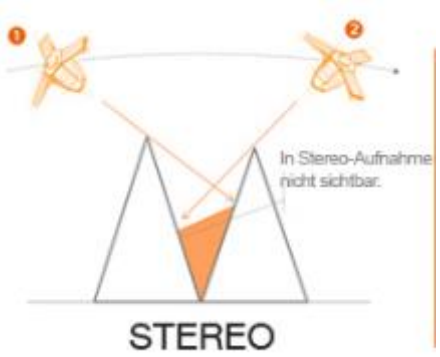


Pleiades DEM (0.5m)

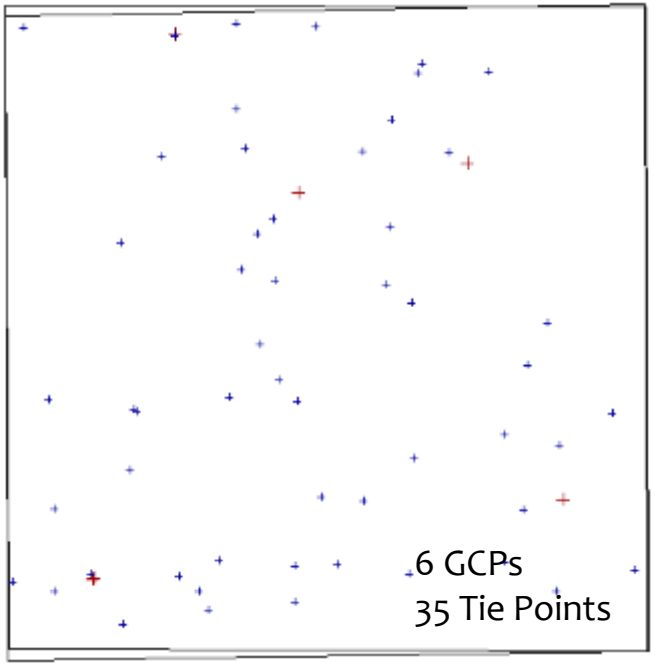
Stereo matching

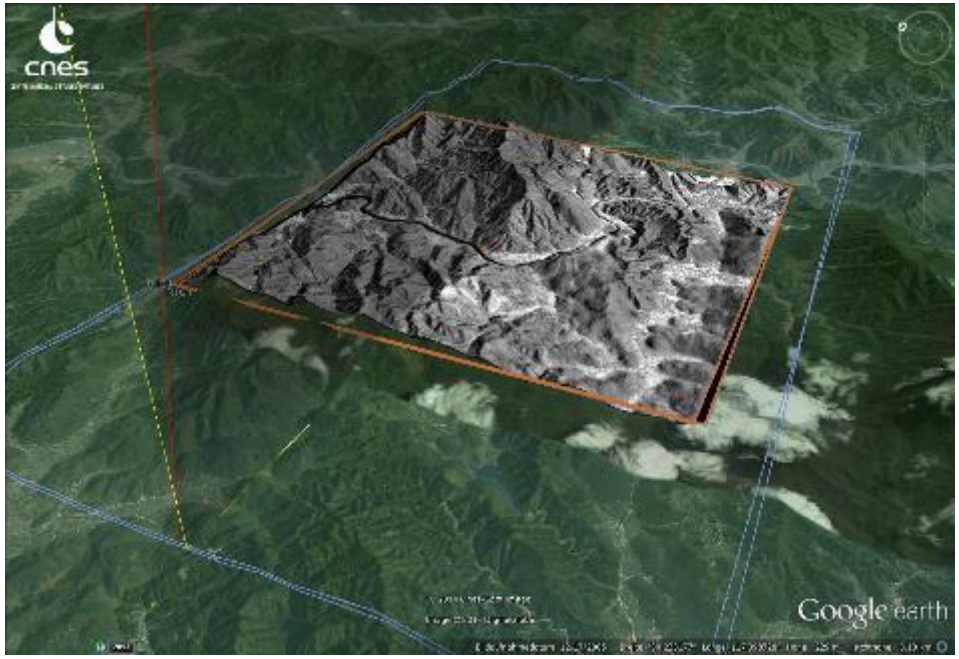
Digital surface models can be efficiently generated with automatic image matching from optical stereo images

Pleiades offer high resolution stereoscopic coverage capability



Product used for DSM Extraction: Panchromatic image (0.5 m)





3D visualization and perception

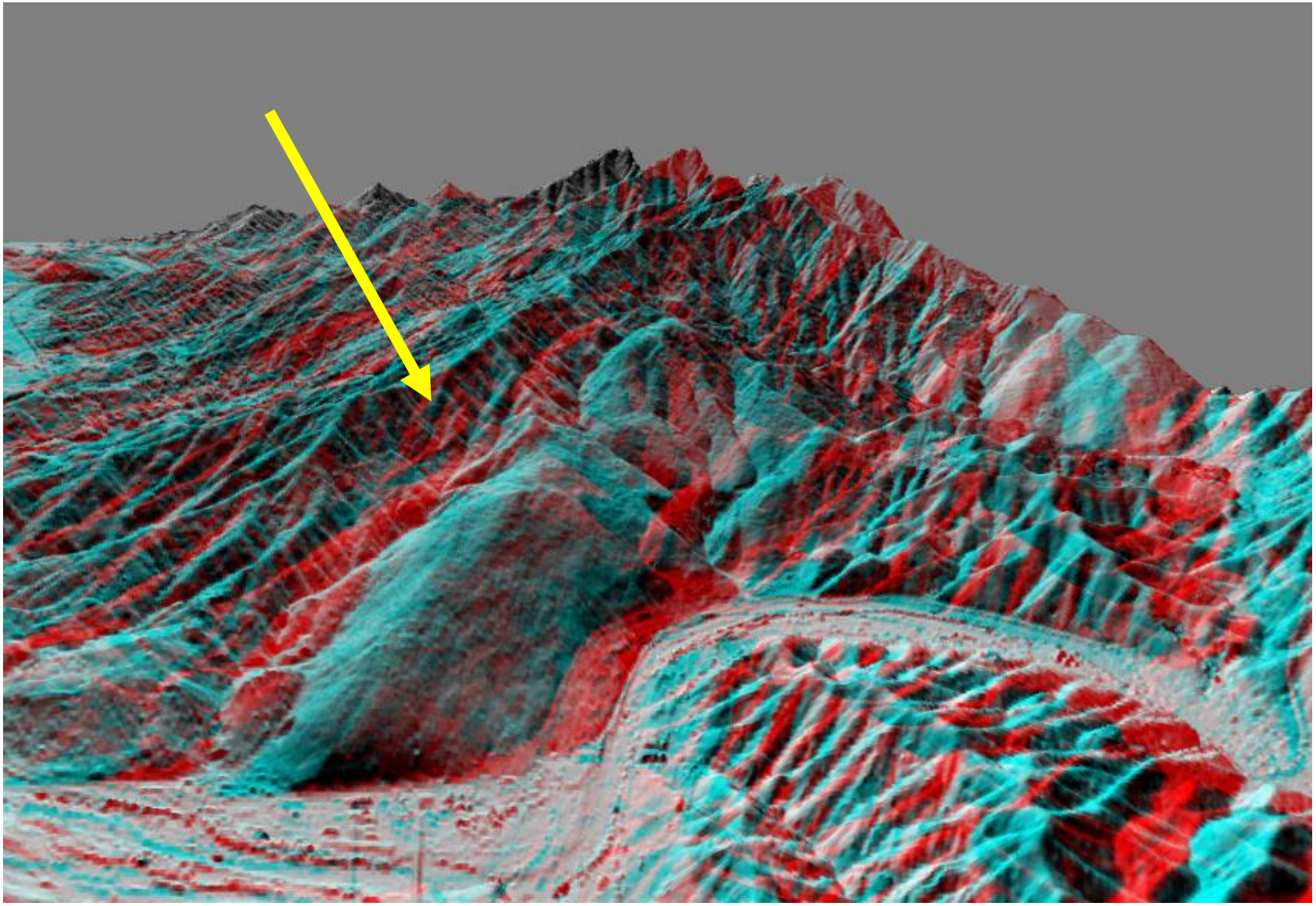
True illumination angle: 170°

Simulated illumination angle: 315°

Where is the ground inventory plot located?

A Valley
B Ridge

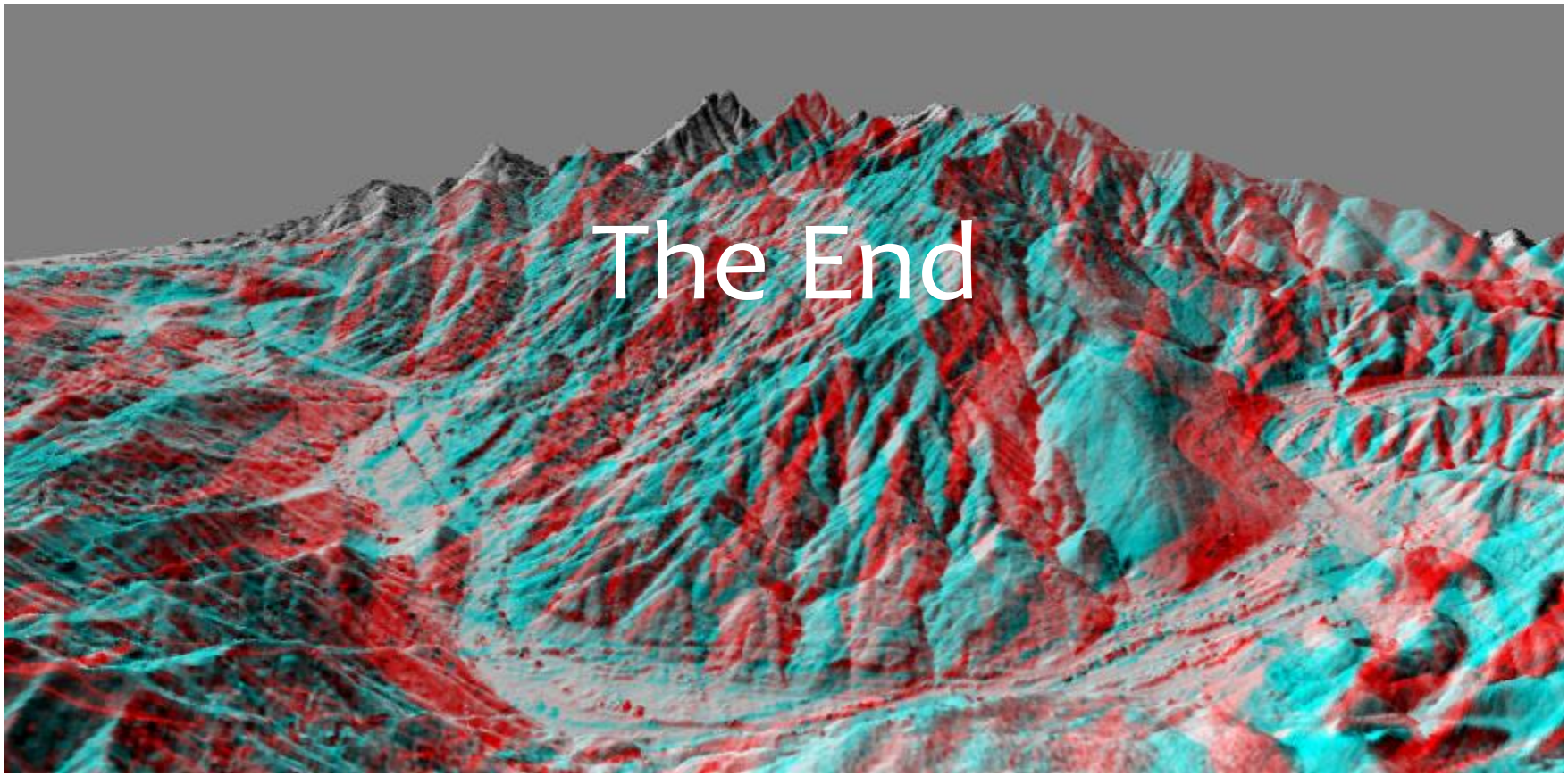
3D visualization and perception



Conclusion

- Illumination correction and digital and elevation models should be utilized to enhance RapidEye satellite images in mountainous terrain.
- The different degrees of detail of digital elevation models have an influence on the quality of illumination correction.
- Digital elevation models are crucial for ecophysiological zoning and management of mountain forests.

Acknowledgements



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Lin²Value