



Erkennung von von Pinus Sylvestris in Nadelmischwäldern des Nordschwarzwaldes mithilfe von Stereoluftbildpaaren und Satellitenbilder.

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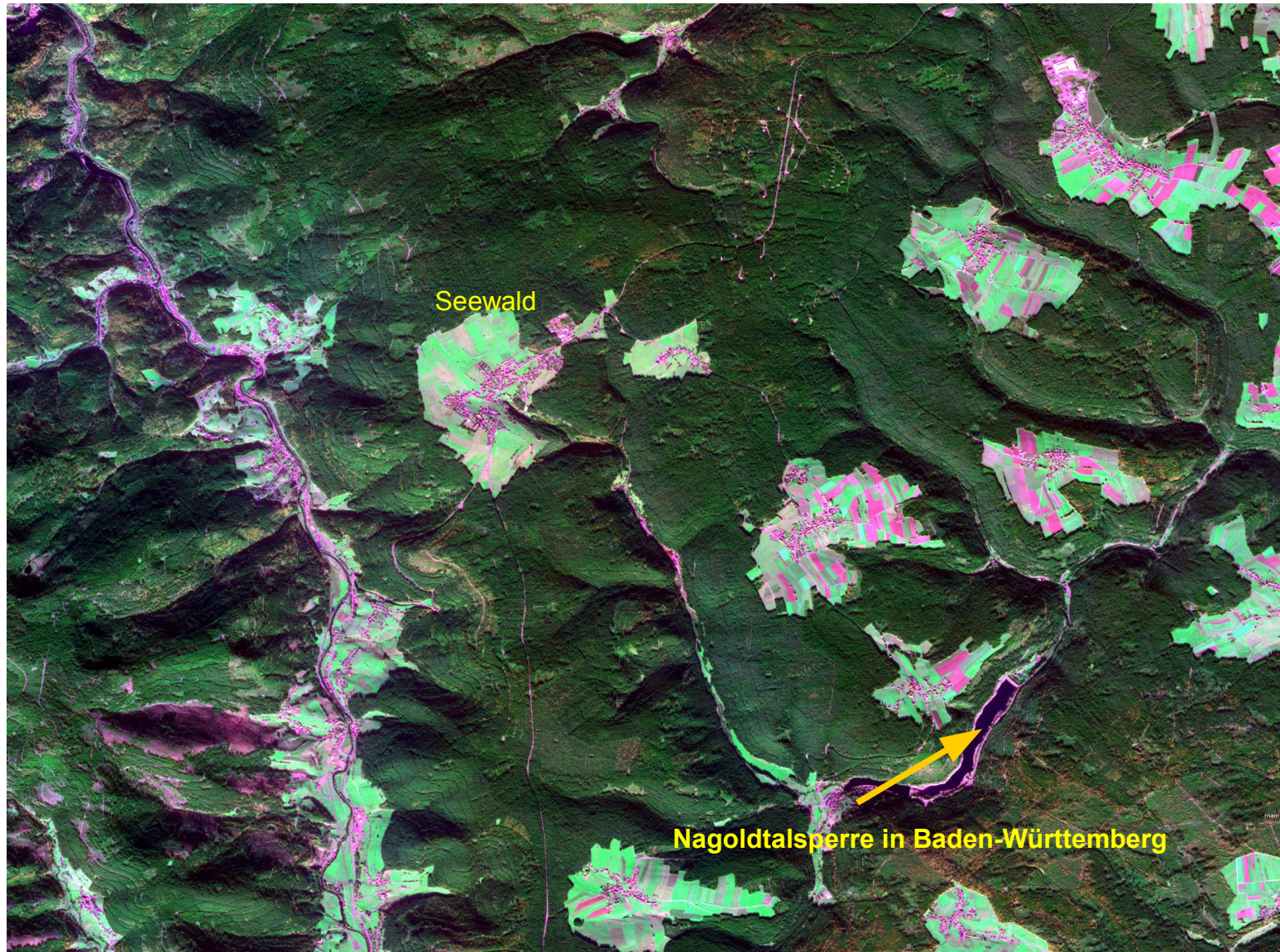
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ABSTRACT

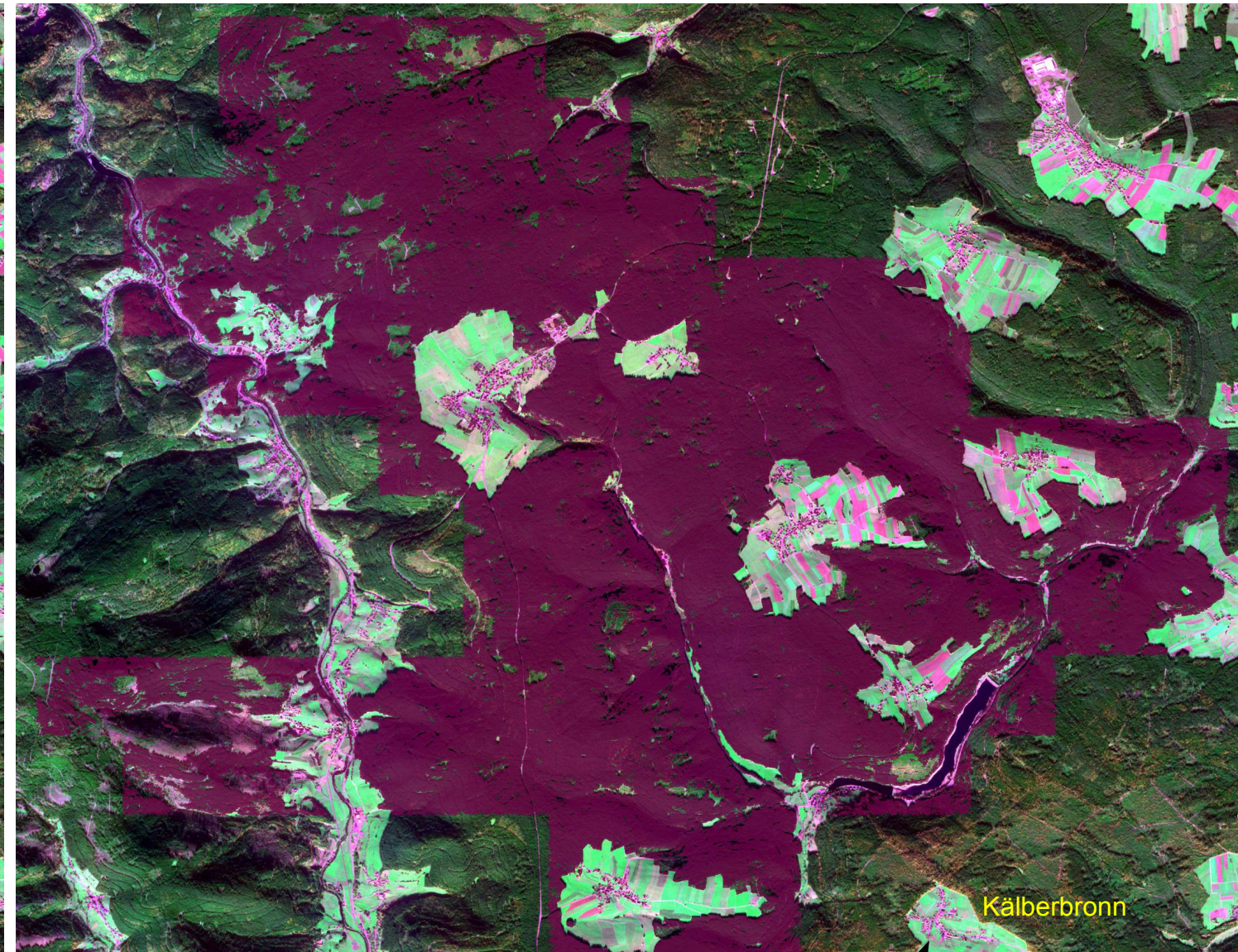
A recent development in remote sensing is the large availability of economical viable data gathered at national and regional level with has a reliable deliverance and constant quality. The acquisition frequency of two particular data sets over very large areas enables the development of a regular uniform GIS product for inventory and monitoring purposes that now comes within reach of new users for remote sensing products. The regional government of Baden-Württemberg requires a photogrammetrical coverage at a 3 years periodical interval, while large frequent seasonal coverage from BlackBridge 5 meter satellite imagery allows for spectral change detection at national scale. This development offers the opportunity to integrate very high quality nDSM (normalized Digital Surface Models) at 50 centimeter resolution to be merged over many hundreds of square kilometers with the dynamics on spectral properties of land cover classes at monthly/weekly intervals during the growing season. As Height is the crucial parameter for forest inventory, the synergy of the main product from stereo aerial imagery could potentially be extended with differentiation at stand or even tree-group level towards coniferous species.

STRATEGY

The experiences within landConsult and it's international expert group already have proven the ability to create forest inventory and monitoring data based upon superior remote sensing data. The LiDAR first and second pulse data for example deliver the superior nDSM making single tree detection possible. For a practical case however, more economical approaches are required. Depending on data in the public domain or those at very reasonable budget per Km². The nDSM creation from ortho-imagery at 25 cm allows for single tree detection as a budget friendly alternative to LiDAR. Differentiation among coniferous crowns however requires additional spectral information at best using various coverages during the season. The nDSM at 50 cm is now a standard product with a main emphasis on forest inventory. The spectral differences among BlackBridge imagery for the forest mask and separation of broadleaved versus coniferous forest can be considered a standard product. Comparable to CORINE quality coverage with the largest advantage of adding standing stock volumes to this LULC and Clutter data type. Differentiation among coniferous stand, especially Picea-Abies versus Pinus is still experimental. The presented case study gives a short overview.



Left: The False colour Composite RGB=Red/NIR+RedEdge/Green. Next: A 29000*24000 nDSM>5 meter Height in Magenta, over a 2900*2400 BlackBridge 5 meter scene, 18/05/2013 aquisition, containing forest cover and settlements.



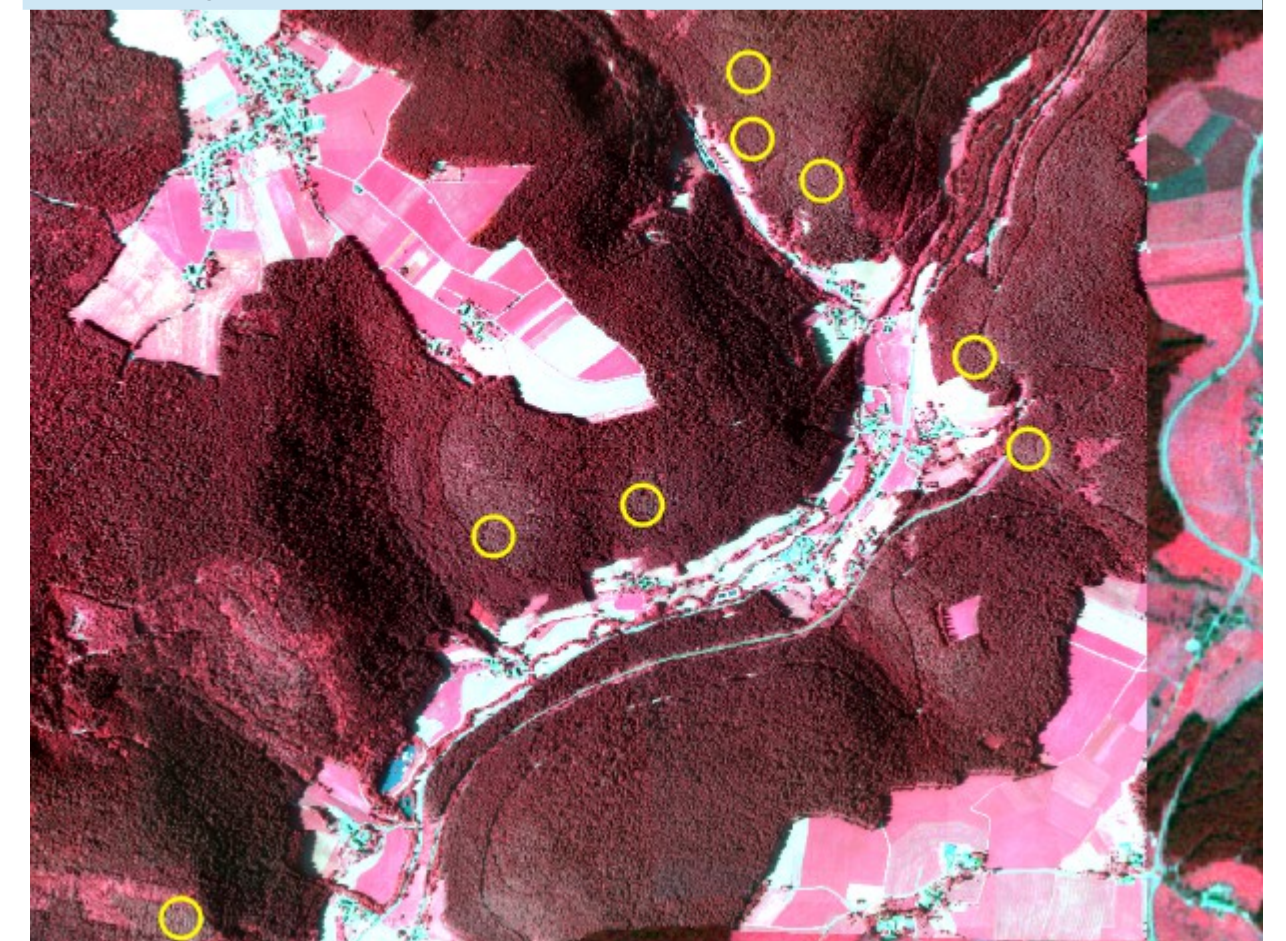
Detail of the village Seewald, north of the Nagoldtalsperre Dam seen in the left images with the height model in grayscale values. At this scale level, individual tree-crowns can be detected.



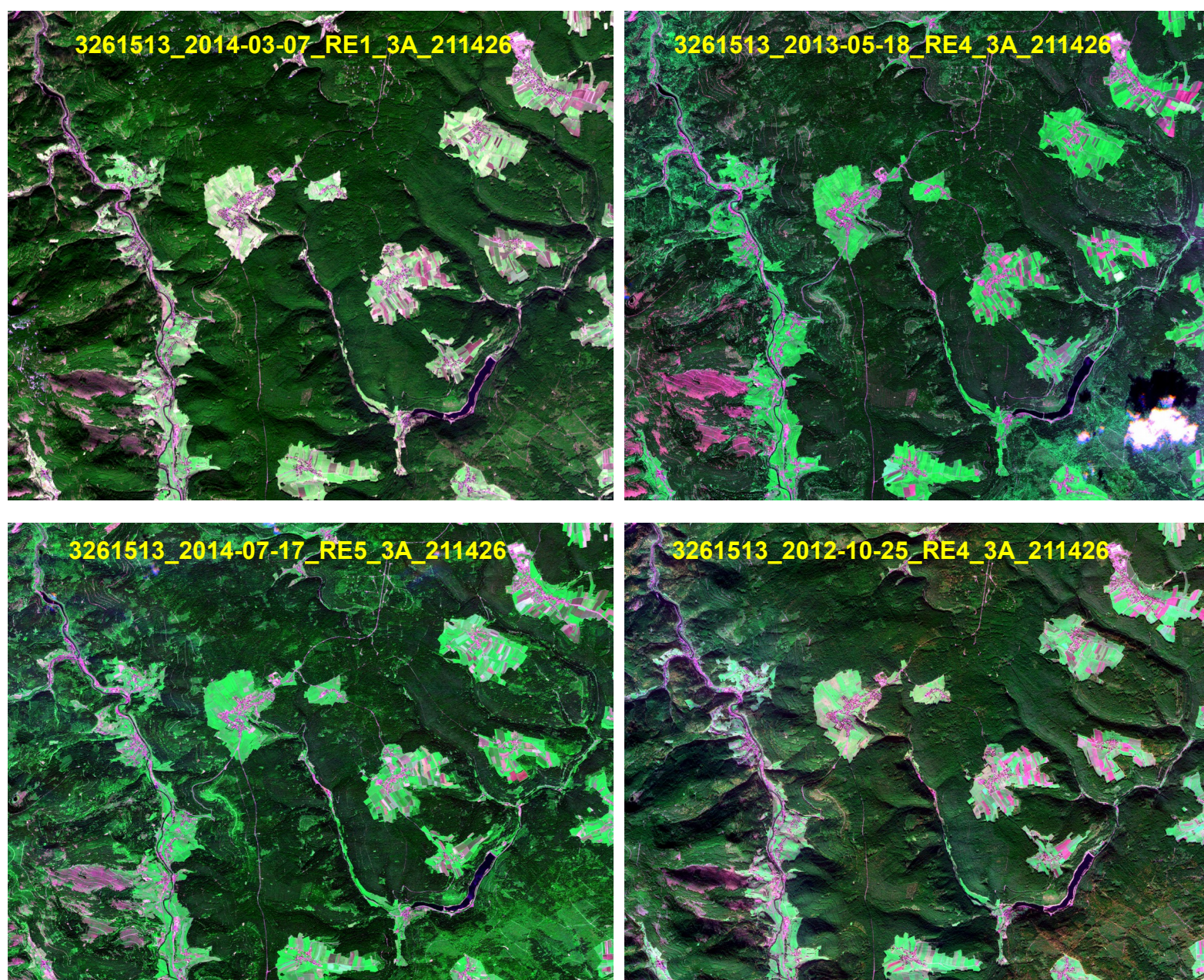
Old Pine is often dominant in the top_layer as a remnant of earlier pioneer phases. In the understorey, Picea (and Abies) take over. The moment old Pine cover is removed, the stand spectral values change in the BlackBridge season imagery stacks.



Detail color composite of the village Schömburg in NIR/R/G, this Vexcel 25cm orthophoto is an ideal basis for the creation of the nDSM. Such imagery is taken every 3 years but can not be selected on ideal seasonal nor exact aquisition time optimal for forest species differentiation. Therefore spectral profiling throughout the season is required. Most econommally derived from satellite data such as BlackBridge.

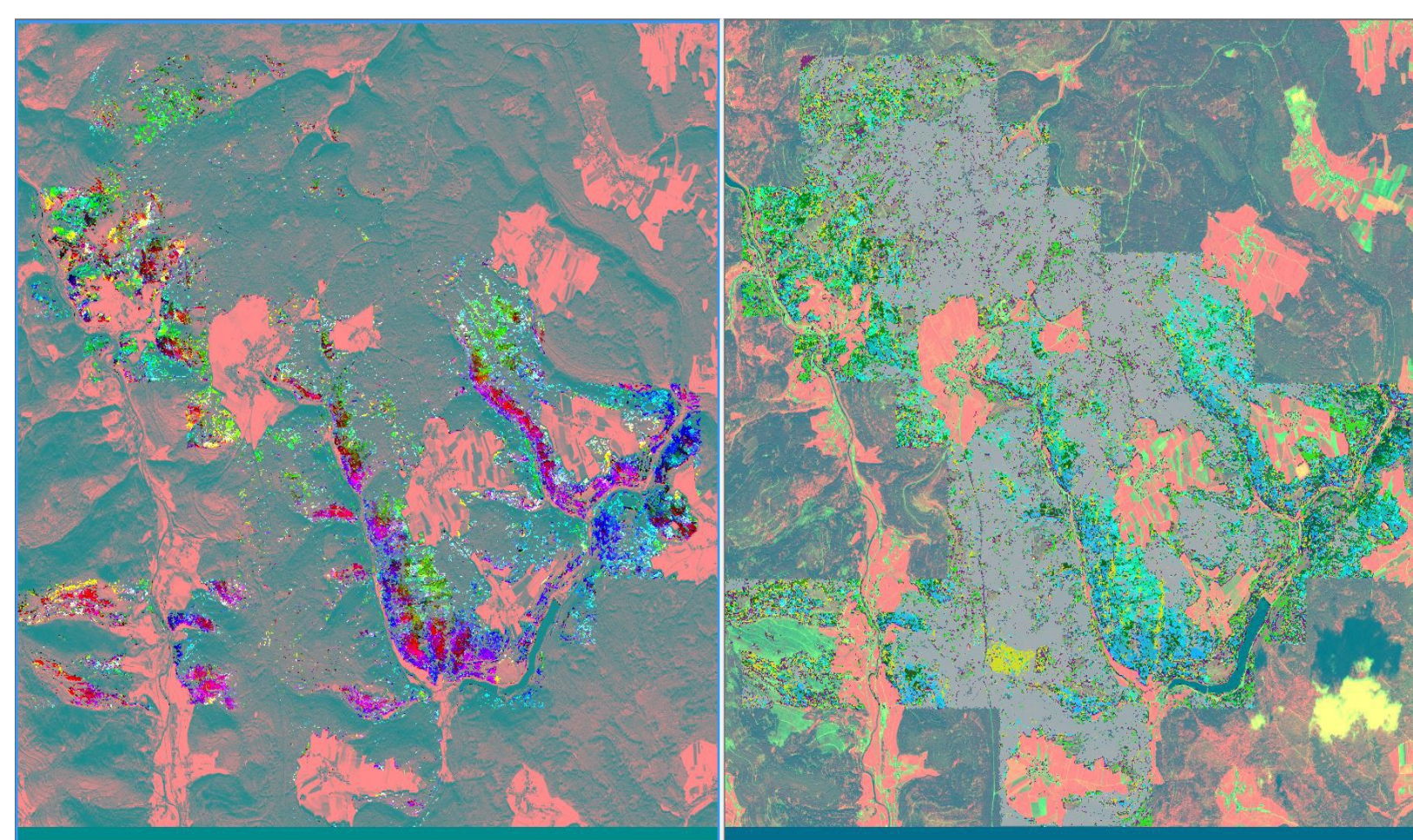


PCA only for coniferous crowns for Pinus detection



The seasonal changes in BlackBridge imagery allow for spectral profiling of object classes. This is an additional information to the classification of the single crown detector derived from Vexcel 25 cm data and the 50cm nDSM. In this stage of the research it is used for a simple broadleaved forest cover detection over 17.000 km². The initial research reveals the complexity of southern slope illumination and stands of Pinus located mainly on dry southern slopes.

The effect of the south exposition reduces the discernability among coniferous stands.



The broadleaved mask in greenish tones over the Red/Nir+RedEdge/Green composite of Mai 2013 based on the differences within season of NIR and RedEdge. Due to the initial nDSM >5 meter, the classification de-facto takes place within a forest mask. Clouds and Forest edges require more attention, so failures of commission might be reduced by an additional cleaning of the nDSM.

