Synergy of TerraSAR-X and SPOT data for Object-based crop classification in South Africa

* Masroor HUSSAIN1, Wolfgang LUECK1

1. PCI Geomatics, 490 Boulevard Saint-Joseph, Gatineau, Québec, Canada, QC J8Y 3Y7 hussain@pcigeomatics.com, luck@pcigeomatics.com

ABSTRACT

The remote sensing based analytics have seen, over the last decade, many remarkable improvements in geometric, spectral, radiometric and temporal resolution; enabling the operationalisation of applications for early crop type mapping. The geographic object-based image analysis (OBIA) technique, for classification, based on the image segmentation have been studied mainly using high-resolution optical satellite images to extract various thematic information. Early detection of crop types however remains a challenge because of frequent cloud covers and stronger bare soil spectral response in optical data. SAR imagery, that is not subject to cloud cover and detects structural changes as crops emerge from the ground, have been seldom combined with optical imagery due to its high level of speckle. This study demonstrates the use of a time-series of high resolution optical – SPOT 2/4 - and radar - TerraSAR-X dual-polarimetric images (HH and HV polarisation), for improved crop type classification over the south-western part of South Africa. The data was fed into a four-step processing chain performing an object-based classification. The four steps included: (a) image segmentation, (b) object feature calculation, (c) object-based supervised classification, and (d) the evaluation. For this purpose, the region-growing segmentation of PCI Geomatica (2017) was used for creating the image objects. Using the statistical and geometrical features extraction capability of the Geomatica, the attributes of TerraSAR-X and SPOT images were robustly computed to obtain the best separability among classes. The machine learning classifier - support vector machine (SVM) - in Geomatica was used for supervised classification. The SVM algorithm internally evaluates the features space to examine the best feature(s) contributing towards the class separability. The classification results were evaluated with the PCI’s software to gage the classification accuracy. This results showed that the integrated use of optical and radar data is appropriate in an object-based classification framework, leading towards improved crop type classification with mean accuracies around 90%.