



## Soil organic carbon mapping from remote sensing: The effect of crop residues

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Since the onset of agriculture, soils have lost their organic carbon to such an extent that the soil functions of many croplands are threatened and there is therefore a strong demand for mapping and monitoring critical soil properties and in particular soil organic carbon (SOC). Pilot studies have demonstrated the potential for remote sensing techniques for SOC mapping in croplands, given their large spatial coverage and high temporal resolution. It has however been shown that the assessment of SOC may be hampered by crop residues. In this study we tested the effect of the threshold for the cellulose absorption index (CAI), on the performance of SOC prediction models for bare cropland soils. Airborne Prism Experiment (APEX) hyperspectral images covering an area of 230 km<sup>2</sup> in the Belgian Loam Belt were used together with a local soil dataset. We used the partial least square regression (PLSR) model to estimate the SOC content based on 104 georeferenced calibration samples, firstly without setting a CAI threshold, and obtained a satisfactory result ( $R^2=0.49$ ,  $RPD=1.4$  and  $RMSE=2.14$  g kgC<sup>-1</sup> for cross-validation). However, a cross comparison of the estimated SOC values to grid-based measurements of SOC content within three fields revealed a systematic overestimation for fields with high residue cover. We then tested different thresholds of CAI in order to mask pixels with high residue cover, by eliminating calibration samples used in the PLSR model based on this threshold. The best model was obtained for CAI threshold of 0.8 ( $R^2=0.59$ ,  $RPD=1.5$  and  $RMSE=1.76$  g kgC<sup>-1</sup> for cross-validation). These results reveal that the purity of the pixels needs to be assessed beforehand in order to produce reliable SOC maps. Preliminary results indicate that an index based on the SWIR bands of the MSI Sentinel 2 sensor is also capable of detecting crop residues. However, the application under moist conditions and for different types of residues needs to be confirmed.