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This study was carried out in the framework of the Prostock-Gessol3 and the BASC-SOCSENSIT projects, dedicated to the spatial monitoring of the effects of exogenous organic matter land application on soil organic carbon storage. It aims at identifying the potential of airborne hyperspectral AISA-Eagle data for predicting the topsoil organic carbon (SOC) content of bare cultivated soils over a large peri-urban area (221 km2) with both contrasted soils and SOC contents, located in the western region of Paris, France. Soils comprise hortic or glossic luvisols, calcaric, rendzic cambisols and colluvic cambisols.
Airborne AISA-Eagle data (400-1000 nm, 126 bands) with 1 m-resolution were acquired on 17 April 2013 over 13 tracks which were georeferenced. Tracks were atmospherically corrected using a set of 22 synchronous field spectra of both bare soils, black and white targets and impervious surfaces. Atmospherically corrected track tiles were mosaicked at a 2 m-resolution resulting in a 66 Gb image. A SPOT4 satellite image was acquired the same day in the framework of the SPOT4-Take Five program of the French Space Agency (CNES) which provided it with atmospheric correction. The land use identification system layer (RPG) of 2012 was used to mask non-agricultural areas, then NDVI calculation and thresholding enabled to map agricultural fields with bare soil. All 18 sampled sites known to be bare at this very date were correctly included in this map. A total of 85 sites sampled in 2013 or in the 3 previous years were identified as bare by means of this map.
Predictions were made from the mosaic spectra which were related to topsoil SOC contents by means of partial least squares regression (PLSR). Regression robustness was evaluated through a series of 1000 bootstrap data sets of calibration-validation samples. The use of the total sample including 27 sites under cloud shadows led to non-significant results. Considering 43 sites outside cloud shadows only, median validation root-mean-square errors (RMSE) were $\sim$4-4.5 g. kg^{-1}. An additional set of 15 samples with bare soils led to similar RMSE values. Such results are only slightly better than those resulting from an earlier study with multispectral satellite images (Vaudour et al., 2013). The influence of soil surface condition and particularly soil roughness is discussed.