Geophysical Research Abstracts
Vol. 16, EGU2014-3948, 2014
EGU General Assembly 2014

Potential of very high spatial resolution Pleiades images for discriminating between crops at early growth stage and bare agricultural soils

Emmanuelle Vaudour (1,2), Paul-Emile Noirot-Cosson (2,1), Olivier Membrive (2,1), Dalila Hadjar (2,1)

(1) AgroParisTech, UMR 1091 EGC, F-78850 Thiverval-Grignon, France (emmanuelle.vaudour@agroparistech.fr), (2) INRA, UMR 1091 EGC, F-78850 Thiverval-Grignon, France

This study was carried out in the framework of the Optical and Radar Federated Earth Observation (ORFEO) accompaniment program of the French Space Agency (CNES). It is also part of the other projects (Prostock-Gessol3, BASC-SOCSENSIT) aiming at spatially monitoring the effects of exogenous organic matter land application on soil organic carbon sequestration, and necessitating for this purpose the gathering of spatial data about crops and crop successions as inputs into mechanistic crop models. The aim of this study was to assess the contribution of very high spatial resolution (VHSR) Pleiades images (2 m –spatial resolution) to the mapping of different crops at various growth stages and various bare soil surface conditions related to tillage operations over an agricultural region in the western peri-urban suburbs of Paris: the Versailles plain (Yvelines, France).
About 300 field observations describing soil surface conditions or crop phenological stages were collected at $\sim$150 agricultural fields spread over 21 km^2, synchronously with the Pleiades images acquisitions of 3 and 24 April 2013. Field data were GIS-structured and used as a basis for delimitating within-field training and test zones. The performance of various classifiers was compared either on the spectral bands with or without NDVI or on the principal components of a series of spectral and textural features of an object-based classifier (ENVI FX®): the Bayesian maximum likelihood classifier (ML), the neural network classifier (NN), the support vector machine classifier with polynomial function kernel (SVM).
The overall accuracy of the SVM classifier computed on the 4 spectral bands and the NDVI and followed by a median filter and class recombination according to crops reached about 78% for the Pleiades image of 3 April and 82% for that of 24 April. Tillage operations were very well detected (>77%, user's or producer's accuracies) as well as winter cereals (>70%, user's or producer's accuracies). Both Pleiades images enabled to perfectly discriminate between early stage winter cereals and bare cropped soils. They brought unique information about within-field spatial heterogeneity of crop varieties, seedbed preparation and crop development stages and enabled to detect practices of organic amendment application.