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Mapping agricultural phenology using repetitive optical remote sensing over a peri-urban region

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This study explores the potential of multi-temporal optical remote sensing, with high revisit frequency, to derive missing information on agricultural practices necessary to model soil organic carbon content, over the agricultural lands in the Versailles plain in the western Paris suburbs. This study comes besides past and ongoing studies on the use of radar and high spatial resolution optical remote sensing to monitor agricultural practices in this study area (e.g. Vaudour et al. 2014).
Agricultural statistics, such as the Land Parcel Identification System (LPIS) for France, permit to know the nature of annual crops for each digitized declared field of this land parcel registry. However, within each declared field, several cropped plots and a diversity of practices may exist, being marked by agricultural rotations which vary both spatially and temporally within it and differ from one year to the other. Very high spatial resolution Pléiades satellite data has allowed delineating crops plots, and identifying crops within declared fields, revealing this fine spatial crop pattern. Here we evaluate the potential of high observation frequency remote sensing to differentiate seasonal crops (e.g. winter barley from spring barley) and to evaluate key phenological moments. In particular, in addition to a dataset of field observations, we use three datasets at three complementary spatial resolutions: the CNES SPOT4-TAKE5 at ten meters in the 2013 winter and spring, the Landsat data at 30m, and the large-swath PROBA-V central camera data at 100m available since May 2013. The analysis of each dataset is done first on a pixel-based approach and second on a within-plot approach on the basis of the above described crop map.
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