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## Assessment of PRISMA imaging spectrometer data for the estimation of topsoil properties of agronomic interest at the field scale

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On the 22 March 2019 the Italian Space Agency (ASI) launched the PRISMA satellite, having onboard a hyperspectral imager covering the 400-2500 nm range with 234 spectral bands and about 10 nm of bandwidth. The ground spatial resolution is 30 m, plus a panchromatic camera with 5 m spatial resolution. One of the potential application areas of this scientific mission is for precision agriculture applications, among which the mapping of field-scale variability of topsoil properties is of particular interest.

PRISMA clear-sky hyperspectral images were acquired in autumn and spring 2019 on the Maccarese farm in Central Italy, in the framework of the PRISCAV project, which is aimed at a first assessment of the PRISMA data. An intensive soil sampling campaign was performed, using a ground sampling scheme adapted to PRISMA and Sentinel-2 spatial resolutions, in the fields where bare soil was exposed at the satellite acquisition dates. Soil texture (clay, silt, sand), carbonates, pH and soil organic carbon (SOC) for the collected soil samples were then determined in the laboratory.

The dataset was then used to test calibration and validation of PLSR (Partial Least Squares Regression) and RF (Random Forest) models developed using PRISMA surface reflectance data. To this aim, several pre-treatment tests were performed, including pan-sharpening at 5 m using PRISMA panchromatic data as well as Sentinel-2 multispectral data.

The results show that the good results could be obtained in particular for clay estimation. The best-performing algorithm for topsoil properties retrieval using PRISMA hyperspectral data was RF algorithm as compared with PLSR.