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Estimation of maize sowing dates from Sentinel 1&2 data, over South Piedmont

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Information of crop sowing dates is important to enhance the accuracy of crop models and for the assessments of crop requirements during the growing seasons. The sowing calendars of densely harvested areas are often driven by heterogeneous factors like annual crop rotations, crop switches and the alternation of winter and summer products over the same fields. Remote sensing is widely used for agricultural applications, especially to maximize crop yields through precision farming tools. Indices combining optical and infrared bands are particularly suitable for the crop classification algorithms and the plant health monitoring. Synthetic Aperture Radar (SAR) is often used in agriculture to classify irrigated and rainfed fields, due to its high sensitivity to soil water content. Despite SAR data are also used to identify changes in the ground roughness, this information has been rarely combined with optical data to identify crop sowing dates at the field scale.

In this study, SAR data from Sentinel-1 and NDVI derived from multispectral (MSI) acquisitions of Sentinal-2 have been used to identify the sowing dates of maize over a densely harvested pilot area in South Piedmont (Italy). NDVI data have been used to identify maize fields together with the agricultural geodatabase provided by the Piedmont public authority. The moisture-induced noise of SAR data has been filtered to avoid the impact of precipitation on the radar signal during the bare soil phase. Combining the VH and VV bands acquired by Sentinel-1 it was possible to identify the moment when maize plants break through the soil in each field.

Results show a good alignment with the information of sowing periods acquired from local farmers, also in terms of multiple growing seasons due to the presence of different maize types. The distribution of sowing dates points out that most of the maize is sown during the second half of May, while the other fields are sown even a month later after the harvesting of winter crops. The method proposed in this study may lead to significant applications in the agriculture monitoring, providing useful information for crop-related management policies. The combined use of SAR and NDVI data has the potential to improve the crop models for the benefit of yields and food security.