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Prediction of soil organic and inorganic carbon concentrations in Tunisian samples by mid-infrared reflectance spectroscopy using a French national library

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Mid-Infrared Reflectance Spectroscopy (MIRS, 4000–400 cm^{-1}) is being considered to provide accurate estimations of soil properties, including soil organic carbon (SOC) and soil inorganic carbon (SIC) contents. This has mainly been demonstrated when datasets used to build, validate and test the prediction model originate from the same area A, with similar geopedological conditions. The objective of this study was to analyze how MIRS performed when used to predict SOC and SIC contents, from a calibration database collected over a region A, to predict over a region B, where A and B have no common area and different soil and climate conditions. This study used a French MIRS soil dataset including 2178 soil samples to calibrate SIC and SOC prediction models with partial least squares regression (PLSR), and a Tunisian MIRS soil dataset including 96 soil samples to test them. Our results showed that using the French MIRS soil database i) SOC and SIC of French samples were successfully predicted, ii) SIC of Tunisian samples was also predicted successfully, iii) local calibration significantly improved SOC prediction of Tunisian samples and iv) prediction models seemed more robust for SIC than for SOC. So in future, MIRS might replace, or at least be considered as, a conventional physico-chemical analysis technique, especially when as exhaustive as possible calibration database will become available.