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On the potential of multi-source remote sensing data in characterizing the Total Suspended Matter variability in inland waters.

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The assessment of TSM spatiotemporal variability plays a key role in inland water management, considering how these fluctuations affect water transparency, light availability, and the physical, chemical, and biological processes. All the above-mentioned topics highlight the need to develop innovative methodologies of data analysis that are able to handle multi-mission and multi-source remote sensing data, fostering the implementation of integrated and sustainable approaches. Sentinel-2A multispectral instrument (MSI) and Landsat 8 operational land instrument (OLI) data offer unique opportunities for investigating certain in-water constituents (e.g., TSM and chlorophyll-a) mainly owing to their spatial resolution (10–60 m). Furthermore, the joint use of these sensors offers the opportunity to build time series with an improved revisiting time thus enabling limnologists, aquatic ecologists and water resource managers to enhance their monitoring efforts. In this framework, the potential of MSI–OLI combined data in characterizing the multi-temporal (2014–2018) TSM variability in Pertusillo Lake (Basilicata region, Southern Italy) has been evaluated in this work. In particular, a customized MSI-based TSM model (R^2=0.81) has been developed and validated by using ground truth data acquired during specific measurement campaigns. The model was then exported on OLI data through an inter-calibration procedure (R^2=0.87), allowing for the generation of a TSM multi-temporal MSI–OLI merged dataset. The analysis of the derived multi-year TSM monthly maps has shown the influence of hydrological factors on the TSM seasonal dynamics over two sub-regions of the lake, the west and east areas. The western side appears more affected by inflowing rivers and water level fluctuations, whose effects tend to longitudinally decrease, leading to less sediment within the eastern sub-area. The achieved results highlight how the proposed methodological approach (i.e. in situ data collection, satellite data processing and modeling) can be exported in other inland waters that deserve to be investigated for a better management of water quality and monitoring systems.