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High-resolution UAV multispectral imagery for water-quality monitoring in coastal regions

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The concentrations of parameters such as Chlorophyll-a (*Chl-a*) and Total Suspended Solids (*TSS*) in seawaters have already been used as indicators of the water quality, the biogeochemical status of surface waters, and nutrient availability. Unmanned Aerial Vehicles (UAVs) have gained global popularity as a remote-sensing tool as they address the optical challenges of water-quality studies in coastal regions. In this work, we evaluate the applicability of a 5-band multispectral sensor mounted on a UAV to derive scientifically valuable water parameters (*Chl-a* and *TSS*). The performance of the OC-2 and OC-3 algorithms for *Chl-a* estimation, as well as the *TSS* estimation method by Nechad et al. (2010), are tested in two different sites along the Mediterranean coastline. This study provides water quality details on the centimetre-scale and improves the existing approximations that are available for the region through Sentinel-3 OLCI imagery at a much lower spatial resolution of 300 m. The *Chl-a* and *TSS* values derived for the studied regions were within the expected ranges and varied between 0 to 3 mg/m^3 and 10 to 20 mg/m^3, respectively. In addition, a novel Python workflow for the manual generation of an orthomosaic in aquatic areas based on the sensor's metadata, without the need to resort to commercial photogrammetric software, is proposed. Linear regressions were also applied to compare the Remote Sensing reflectance (Rrs) retrieval methods tested, suggesting strong R^2 correlations between 0.83 and 0.91 for the "deglinting" method.