

*Remote Sensing*  
**Editor-in-Chief**

Dear Editor-in-Chief,

3<sup>rd</sup> May 2024

I hope that the following research article will be considered for publication in *Remote Sensing*

**Discriminating Seagrasses From Green Macroalgae in European Intertidal areas using High Resolution Multispectral Drone Imagery.**

Intertidal seagrass meadows provide a wide range of ecosystem services to humanity. They are particularly vulnerable to the intensification of human activities in coastal areas, facing direct impacts from anthropogenic pressures. This has led to a worldwide decline and fragmentation of these critical habitats, which, in turn, can significantly undermine the ecosystem services that seagrass meadows provide. The critical role of seagrass meadows and the diverse ecosystem services they offer have spurred the development of enhanced global and regional initiatives to monitor Essential Oceanic Variables (EOVs) such as seagrass composition, and Essential Biodiversity Variables (EBVs) including taxonomic diversity, species distribution, population abundance, and phenology of seagrasses. Traditionally, seagrass status indicators have been determined through in situ measurements, yet obtaining these measurements in intertidal zones is notoriously difficult. Remote sensing techniques have proven effective in complementing in situ sampling, allowing for the near real-time and consistent retrieval of seagrass EOVs and EBVs over extensive meadows. However, this technique faces limitations in accurately mapping vegetation when taxonomically distinct species have identical pigment compositions.

This study addresses critical gaps in the remote sensing of coastal ecosystems, particularly in distinguishing between seagrass and green macroalgae in heterogeneous intertidal zones—a challenge that conventional satellite remote sensing techniques struggle to overcome due to their limited spatial and spectral resolution. Our research utilizes high-resolution multispectral imagery from unmanned aerial vehicles (UAVs) equipped with a ten spectral band sensor mirroring those of the MSI sensor of Sentinel-2 satellites. The findings from our nine drone flights across diverse intertidal habitats in France and Portugal demonstrate the precision of our deep learning classifier, which achieved an overall accuracy of 94% in discriminating between five taxonomic classes of intertidal vegetation across 9 different sites (536,000 validation pixels). This underscores the capability of multispectral remote sensing combined with a Neural Network classifier to accurately differentiate between types of vegetation that share similar pigment compositions.

This work applies the findings published by Davies et al. (2023) in *Remote Sensing of Environment* 290 to in situ drone data. The result of the current work has been used to train a Sentinel-2 classification

model, allowing the study of the phenology of seagrasses across 15° of latitude. This work has been submitted by Davies et al. in *Remote Sensing of Environment* and is currently under review.

For consideration of this manuscript, we would suggest the following reviewers:

- Antoine Collin for their expertise on drone remote sensing applied to coastal environments.  
Email: antoine.collin@ephe.psl.eu
- Dimitris Poursanidis for their knowledge of using remote sensing for seagrass meadows.  
Email: dpoursanidis@gmail.com
- Martin Gade for their knowledge of soft bottom habitat classification using remote sensing.  
Email: martin.gade@uni-hamburg.de

If we can be of assistance for further referee suggestions, please do not hesitate to contact me.

The first author Simon Oiry is also the corresponding author, and the work described, the production and authorship conform in every respect to Nantes University's policies on ethical and responsible behaviour in research. We confirm that this manuscript has not been published elsewhere and is not under consideration by another journal. All authors have approved the manuscript and agree with its submission to *Remote Sensing*.

We look forward to hearing from you in due course.

Yours sincerely,

Simon Oiry  
On behalf of all co-authors