Analyzing Satellite Scaling Bias Using Drone Data, Application to Microphytobenthos Studies

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Introduction

MPB

The present study focuses on microphytobenthos (MPB) colonizing estuarine intertidal zones. MPB refers to photosynthetic unicellular microalgae forming biofilms at the sediment surface during low tides. This group includes diatoms, euglenids, cyanobacteria, and chlorophyta (Underwood 2001). They can be associated to mud and sand, i.e. inorganic particles with size between 4 and 63µm, and 63 and 2000µm, respectively (Wentworth 1922). In these soft-bottom sediments, MPB can be the main primary producer, notably in turbid estuaries.

Ecological services

MPB provides several ecosystem services (Hope, Paterson, and Thrush 2020). In addition to its contribution to carbon fluxes, estimated between 30 and 230 g C/m^2/year (Heip et al. 1995; Park et al. 2024), it stabilizes the sediment through the secretion of extracellular polymeric substances (EPS) (Gibbs 1983; Riethmüller et al. 2000; Stal 2010; Huiming, Hongwei, and Minghong 2011; Fang et al. 2012; Gerbersdorf et al. 2020), and therefore reduces coastal erosion (Hope, Paterson, and Thrush 2020). It is a key element of food webs (Deppe 1999; Aberle-Malzahn 2004; Dauvin and Desroy 2005), and it plays an important role in nutrient cycling, increasing water quality. It can also be used as a bioindicator of water quality (Oiry and Barillé 2021).

Spatial structure

The MPB exhibits spatial variability at different scales

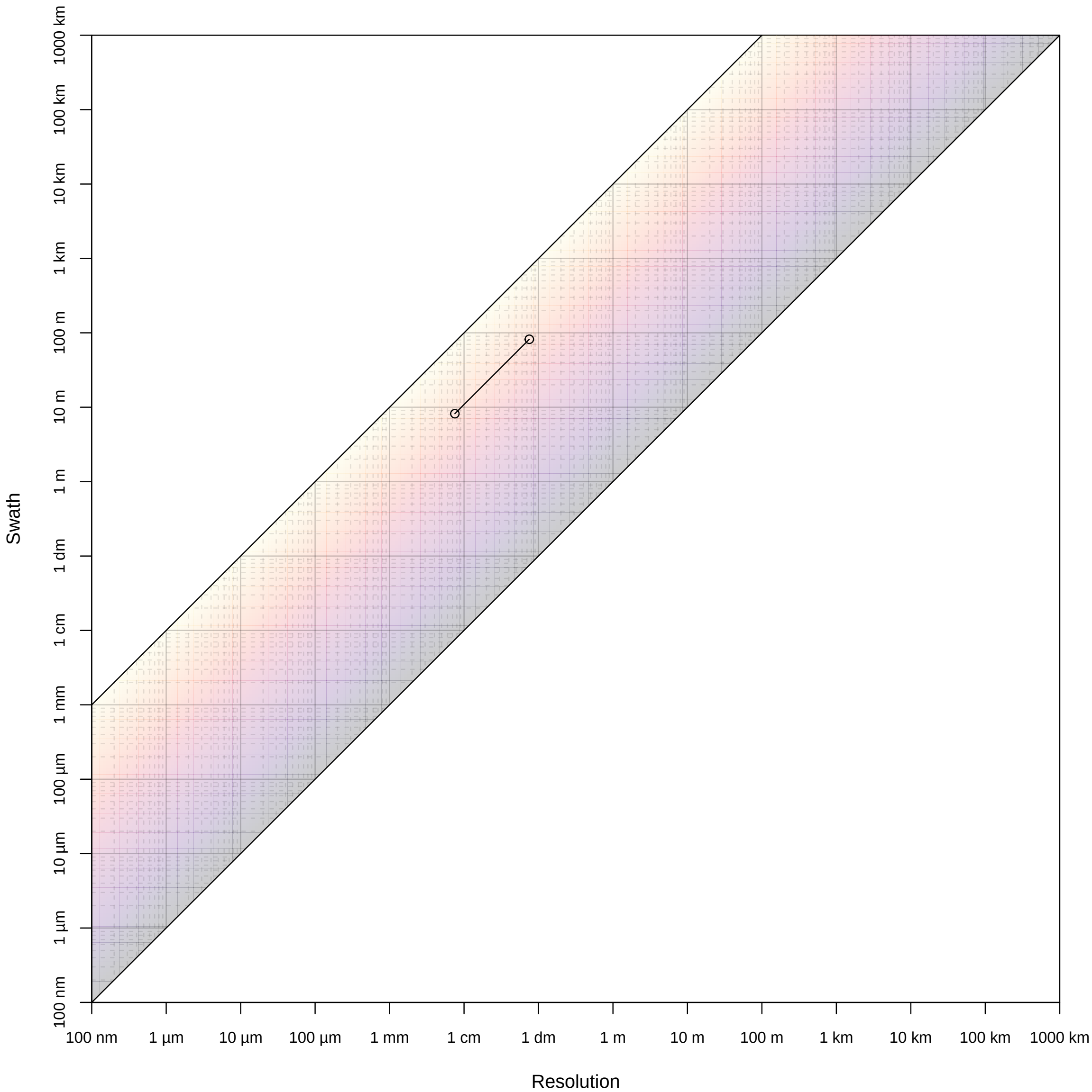

Figure 1: Resolutions of x different sensors cross represented with the different spatial scales of MPB

Source: Article Notebook

MPB & RS

The use of a proxy

NDVI can be transformed into biomass following Equation 1

$$B_{a,b,c}(NDVI) = \frac{1}{c} ln \left(\frac{b}{a + b - NDVI} \right) \tag{1}$$

Bias

Present study

Material and methods

Simulating a satellite dataset from a drone dataset

The choice has been made to simulate coarser dataset from drone fine-scale

Results

Discussion

References

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