


Editorial

# Application of Remote Sensing Methods to Monitor Coastal Zones

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In this Special Issue “Application of Remote Sensing Methods to Monitor Coastal Zones” nine original research papers were published, with topics covering a wide range of ranging of remote sensing applications including coastal topography, bathymetry, land cover, and nearshore hydrodynamics. With the increasing number of studies showing that climate changes and particularly sea-level rise will radically redefine the physical condition of the nearshore zone of the 21st century [1,2], it is crucial to increase the efforts to monitor this area. Sandy beaches and dunes are a natural buffer in the first line of defense against erosion processes. In this Special Issue, three publications were dedicated to innovative methodologies to measure 3D beach/dune topography. The paper published by [3] presents a novel low-cost methodology that uses a GoPro-equipped DJI Phantom 2 quadcopter to routinely survey upper beach and coastal dune morphological changes. This methodology can be replicated elsewhere, and high-resolution (0.1 m) and accurate Digital Surface Model (DSM) can be inferred at high frequency (e.g., before and after a storm). The publication of [4] presents a detailed comparison between an extensive in-situ RTK-GPS survey performed simultaneously with UAV image acquisition. The comparison between the two methods highlights how the complexity of the surveyed surfaces (including beach, dune, road, and walkways) affects the accuracy of the generated 3D digital surface model (DSM). A distinct approach is presented by [5] who details the algorithms implemented on observations from a shore-based 3D terrestrial LiDAR system to automatically retrieve 3D beach/dune topography and wave transformation/runup, simultaneously. This system is capable of recording continuous, high frequency (hourly), and high-resolution datasets, which provide opportunities for analyses of coastal morphodynamic processes at a wide range of temporal and spatial scales. The publication presented by [6] demonstrates how a short-term deployment of a 2D LiDAR can provide useful information to understand wave runup processes on a steep sandy beach with a low tide terrace. Aspects such as the lack of dependence between offshore wave characteristics and runup during low tide conditions or berm erosion and formation can be further investigated with this type of instrument, which singularly allows simultaneous beach morphology and hydrodynamics monitoring.

Measurements of nearshore bathymetry are considerably more challenging to obtain than beach/dune topography, although crucial for a comprehensive understanding of the sediment exchanges in the nearshore system. The publication by [7] presents an error evaluation of the depth inversion based on wave kinematics detection from video imagery. In addition to the novel method to estimate errors in bathymetric estimations, this paper provides a demonstration of the potential of this methodology by presenting a three-year time-series of bathymetry estimations at a tropical sandy beach with low tide terrace under tropical cyclone (typhoons) and monsoon forcing. The paper published by [8]

presents a video-based methodology that allows the automatic identification of shoaling, surf, and swash zones on coastal video images. This method allows a detailed description of the spatial and temporal variation of wave transformation domains in the nearshore zone and can possibly improve existing algorithms for wave breaking height and celerity estimations.

In addition to beach/dune erosion, landslides are one of the most frequent and serious geological disasters that can take place in the nearshore zone. The paper published by [9] shows a novel methodological approach to measure real-time dynamic deformation of rocky cliffs using high-precision ground-based real aperture radar (GB-RAR). Land displacements and potential landslides are monitored continuously to realize the real-time diagnosis and early warning systems.

In addition to the physical condition of the nearshore zone, in this Special Issue two publications present distinct methods to map vegetation in the coastal region. The paper published by [10] presents a low-cost smartphone-based image classification for *Sargassum* algae detection and monitoring. The method proves to have accuracy in the range between 75% and 96% and to be effective in a warning system. Using high spatial resolution (2 m) WorldView-2 satellite multispectral imagery, [11] presents an object-based image classification method to identify seagrass meadow distributions with 94% accuracy. This study concludes that WorldView-2 satellite imagery is a suitable data source for seagrass distribution mapping over large areas.

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**Conflicts of Interest:** The authors declare no conflict of interest.

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