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Abstract title

Opportunities of high-resolution optical remote sensing and lidar to monitor ecological processes in coastal habitats

Abstract text

Coastal ecosystems are important both as soft defense against flooding and as a source for biodiversity. Within this ecosystem are the ‘grey dunes’ which occupy the zone between the beach and mobile dunes and dune shrub, a widely distributed habitat type in the coastal systems of North-west Europe, including the Wadden Sea Islands in the Netherlands. A serious threat to the grey dune vegetation of the Wadden Sea Islands is the expansion of native and exotic woody species in the original coastal dune vegetation which has a considerable effect on species richness and diversity. Intensive monitoring programs for coastal areas using optical remote sensing and lidar deliver large amounts of high-quality data to observe and manage coastal dunes as a defense against the sea in the Netherlands. In addition, remote sensing techniques could provide useful information on the spatial distribution of woody and exotic species occurrence. Using this earth observation data in combination with available field data could increase the accuracy of vegetation mapping and monitoring in coastal areas. Especially, the use of an object-based classification method based on high-resolution imagery merged with lidar derived vegetation height data seems a promising method to characterize the process of shrub encroachment. In this study a remote sensing approach has been developed to deliver detailed and standardized maps of (invasive) woody species in the dunes of Vlieland, one of the Wadden Sea Islands in the Netherlands, using multispectral aerial photographs and vegetation height derived from lidar. Three classification methods were used: maximum likelihood (ML) classification using aerial photographs, ML classification combined with vegetation heights (ML+), and object-based (OB) classification. A detailed field data set was acquired consisting of 145 single-species patches with homogeneous shrub vegetation were identified and the mean height was measured by hand. The use of vegetation height from the LIDAR data increased the overall classification accuracy from 39% to 50%, but particularly improved for the taller woody species. The object-based

classification increased the overall accuracy of the ML+ from 50% to 60%. The object-based results are comparable to human visual analysis while offering a reproducible and automated analysis. Overall, the object-based classification delivers reproducible maps of the woody species that are useful for management and evaluation of alien and invasive species in dune ecosystems. KEYWORDS: Vegetation mapping, Alien species, Digital elevation model, Pixel-based classification, Object-based classification, Rosa rugosa, Prunus serotina, Hippophae rhamnoides, 'Grey dunes'

Additional Information

Topics

05 Remote sensing techniques for observation of vegetation

Presentation Preference

Oral

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