Wetland monitoring using classification trees and SPOT-5 seasonal time series

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Résumé en anglais	Multiseason reflectance data from radiometrically and geometrically corrected multispectral SPOT-5 images of 10-m resolution were combined with thorough field campaigns and land cover digitizing using a binary classification tree algorithm to estimate the area of marshes covered with common reeds (Phragmites australis) and submerged macrophytes (Potamogeton pectinatus, P. pusillus, Myriophyllum spicatum, Ruppia maritima, Chara sp.) over an area of 145,000 ha. Accuracy of these models was estimated by cross-validation and by calculating the percentage of correctly classified pixels on the resulting maps. Robustness of this approach was assessed by applying these models to an independent set of images using independent field data for validation. Biophysical parameters of both habitat types were used to interpret the misclassifications. The resulting trees provided a cross-validation accuracy of 98.7% for common reed and 97.4% for submerged macrophytes. Variables discriminating reed marshes from other land covers were the difference in the near-infrared band between March and June, the Optimized Soil Adjusted Vegetation Index of December, and the Normalized Difference Water Index (NDWI) of September. Submerged macrophyte beds were discriminated with the shortwave-infrared band of December, the NDWI of September, the red band of September and the Simple Ratio index of March. Mapping validations provided accuracies of 98.6% (2005) and 98.1% (2006) for common reed, and 86.7% (2005) and 85.9% (2006) for submerged macrophytes. The combination of multispectral and multiseasonal satellite data thus discriminated these wetland vegetation types efficiently. Misclassifications were partly explained by digitizing inaccuracies, and were not related to biophysical parameters for reedbeds. The classification accuracy of submerged macrophytes was influenced by the proportion of plants showing on the water surface, percent cover of submerged species, water turbidity, and salinity. Classification trees applied to time series of SPOT-5 images appear as a powerful and reliable tool for monitoring wetland vegetation experiencing different hydrological regimes even with a small training sample (N = 25) when initially combined with thorough field measurements.
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