Automated monitoring systems that can capture wetlands’ high spatial and temporal variability are essential for their management. SAR-based change detection approaches offer a great opportunity to enhance our understanding of complex and dynamic ecosystems. We test a recently-developed time series change detection approach (S1-omnibus) using Sentinel-1 imagery of two wetlands with different ecological characteristics; a seasonal isolated wetland in southern Spain and a coastal wetland in the south of France. We test the S1-omnibus method against a commonly-used pairwise comparison of consecutive images to demonstrate its advantages. Additionally, we compare it with a pairwise change detection method using a subset of consecutive Landsat images for the same period of time. The results show how S1-omnibus is capable of capturing in space and time changes produced by water surface dynamics, as well as by agricultural practices, whether they are sudden changes, as well as gradual. S1-omnibus is capable of detecting a wider array of short-term changes than when using consecutive pairs of Sentinel-1 images. When compared to the Landsat-based change detection method, both show an overall good agreement, although certain landscape changes are detected only by either the Landsat-based or the S1-omnibus method. The S1-omnibus method shows a great potential for an automated monitoring of short time changes and accurate delineation of areas of high variability and of slow and gradual changes.