Change detection in multitemporal polarimetric SAR images

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ABSTRACT

Change detection using synthetic aperture radar (SAR) data is a very important application in remote sensing. Due to the all-weather capabilities of the SAR data, the acquisition of data is secured under almost all weather conditions, and hence a very robust change detection product can be made. A number of different methods have been published for change detection in bi-temporal data, where changes between two images can be detected. With the large number of operational SAR satellites, e.g. Sentinel-1, Radarsat-2, TerraSAR-X, and Cosmo-SkyMed, multitemporal data acquisitions with several images are more likely than bi-temporal acquisitions. This situation calls for a method that can detect changes in such multitemporal data sets, in order to extract relevant information from the time series.

Therefore, we published last year a new method for change detection in multitemporal, polarimetric SAR data. Based on an omnibus likelihood ratio test statistic for the equality of several covariance matrices following the complex Wishart distribution with an associated p-value and a factorization of this test statistic, change analysis in a time series of a data set of multilook, polarimetric SAR data in the covariance matrix representation can be carried out. The omnibus test statistic and its factorization detect if and when change occurs.

In this presentation, the change detection method have been applied to a series of 12 multitemporal Radarsat-2 images of an agricultural test site in Flevoland in the Netherlands. A large number of different crops are present in this data set, and hence the potential for the method to detect different change scenarios can be shown. In the presentation, the p-values will be interpreted forming a set of time segments of no change for the individual fields. The results will be visualized on field scale, and also the potential of using the time segments in a classification scheme will be discussed.