ABSTRACT

The Carpathian Basin (including Hungary) is characterized by various hydrological extremes, both in space and time. One of these hydrological extreme is inland water, which can become more frequent in the future, especially in the lowland regions and can cause damages in water management. Increasing the frequency of extreme weather events. Monitoring of the risk of inland water is a complex water management problem, however evaluating radar data could be a good solution for this, because it can provide accurate, timely and easily accessible information to improve the management of the environment, including water management.

The aim of this study was to evaluate Sentinel 1 radar data to monitoring inland water inundation one of sample area in the Great Hungarian Plain. During in our research, monthly radar data processing was made in the year of 2015 to examine the flooded parts in the vicinity of the Lake Tisza (Figure 1).

RESULTS

For the year 2015, the wetlands were defined and compared them with the inland water section boundaries used in the Kvassay Plan (Figure 2) to compare and evaluate their territorial relationships (Figure 3 A, B).

OBJECTIVES

The traditional surveys of hydrological situations are increasingly being supplemented by the analysis of satellite imagery, which plays an important role in the Copernicus program (Westermo, 2013). One of the most up-to-date radar applications is (satellite) radar interferometry. By this method, the earth’s surface can be seen in very small magnitudes (even millimeters), vertical displacements. Extensive surveys allow any part of the Earth to be applied, cost-effective and time-efficient (no fieldwork required). It can be used to predict natural disasters.

The European Space Agency (ESA), within the framework of the Copernicus Program, has undertaken to develop the European Radar Observatory, which includes the development of service and application of two satellite SAR (Synthetic Aperture Radar) systems. Sentinel 1 data may be suitable for catheter repair support, marine observation, ice observation and interferometric applications, such as landslide detection (Ruiz et al., 2012).

MATERIAL AND METHODS

During the research, radar recordings were processed in the ESA Sentinel Application Platform (SNAP) 2.0 software environment. The steps for processing are shown in Figure 7. The program supports all major SAR data formats, so I could open downloaded compressed files as zip files. All polarizations are fixed in 2 bands (amplitude and intensity). During the research, I worked on amplitude values (1). As a first step in the preprocessing, the calibration, the recording was carried out in which I selected the polarization (VV) to be processed, resulting in the Sigma0_VV channel (2), and then a single product speckle filtering (3). This was followed by a Range Doppler terrain correction (4). Finally, a binary transformation was carried out in which the waters and non-waters were separated according to the channel histogram (5).

In the histogram, the reflection coefficient is visible in logarithmic scale. Low values correspond to water, while high values show non-wet areas. Based on the histogram, I selected a threshold that I can separate from each other. This limit was 2.21E-2.

During the segmentation, I applied the following relationship:

$$255 \times (\text{Sigma0}_\text{VV} <2.21\times10^{-2})$$

The term Sigma0_VV <2.21E-2 was a logical value. A value less than 2.21E-2 will be the true (ie value 1), whereas the higher values will be false (i.e., 0 values). So I separated the wet and non-wet areas from January to December 2015 in the area of Szolnok-Turi Plane.

RESULTS

For the year 2015, the wetlands were defined and compared them with the inland water section boundaries used in the Kvassay Plan (Figure 2) to compare and evaluate their territorial relationships (Figure 3 A, B).

MAJOS REFERENCIAS
