EGU21-2991
https://doi.org/10.5194/egusphere-egu21-2991
EGU General Assembly 2021

Remote sensing approach for the fluvial avulsion processes detection and mapping

Giulia Iacobucci[1], Francesco Troiani[1], Salvatore Milli[1,2], Daniela Piacentini[3], Paolo Mazzanti[1], Marta Zocchi[1], and Davide Nadali[4]

[1]Earth Sciences Department, Sapienza University of Rome, Roma, Italy (giulia.iacobucci@uniroma1.it)
[2]Institute of Environmental Geology and Geoengineering (IGAG), National Research Council, Montelibretti (RM), Italy
[3]Department of Pure and Applied Sciences, University of Urbino "Carlo Bo", Urbino (PU), Italy
[4]Department of Ancient Sciences, Sapienza University of Rome, Roma, Italy

The study of the riverscape dynamic in lowland areas is crucial for reconstructing the morphoevolution of the drainage network, especially where human activities have always been strongly connected to the river system. Not surprisingly, the Lower Mesopotamian Plain (LMP) represents the ideal study area, being a large floodplain where the Tigris and Euphrates rivers with their distributaries deposited a large volume of sediments during the Holocene. Here, a complex drainage pattern, characterized by paleochannels, levees and crevasse splays developed, representing the expression of several fluvial avulsion processes during the time. Indeed, the presence of recent and ancient crevasse splays in a given area suggests frequent seasonal floods, but at the same time, their formation and growth represent, in the LMP, an important process that conditioned the location of several human settlements since the 6th millennium BC. In this area, about 200 examples of active and abandoned crevasse splays, with various sizes, have been recognized exclusively through a remote sensing approach. The scarce elevation ranges of the LMP represent the main challenge in the detection and mapping of the crevasse splays features (i.e., channels, levees and deposits), in addition to the definition of the floodplain extension and the anthropic impact on channel networks.

Therefore, the research aims to integrate multi-sensor remote sensing data such as optical multispectral imagery and digital elevation datasets for improving the detection and mapping of crevasse splays. Landsat 8 imagery is adopted for computing two spectral indices (NDVI and Clay Ratio) and carrying on different supervised classification methods (i.e., Mahalanobis, Maximum Likelihood, Minimum Distance and SAM). Each method has been evaluated through the computation of the confusion matrix, assessing the Overall Accuracy, K coefficient, Producer Accuracy and User Accuracy. Elevation data used in the topographic analysis to determine the local micro-relief geometry are derived from two different global DEMs available at the ground resolution of 1 arcsec (AW3D30 and GDEM2). Topographic analysis has been performed to complete and validate the supervised classification results.

The outputs successfully demonstrate the potential of the integration of multispectral imagery

analysis and topographic analysis from DEM for detecting and mapping with a satisfactory detail the avulsion processes and for distinguishing their state of activity. The methodological approach is a promising technique for flood hazard and risk mapping, as well as for monitoring flood dynamics, especially within arid and semi-arid zones where flawless water management is essential for guaranteeing sustainable crops, livestock and avoiding wasting water.