EGU2020-17852
https://doi.org/10.5194/egusphere-egu2020-17852
EGU General Assembly 2020

Extracting flash floods distribution and frequencies in arid regions using post flood spectral indices

Sivan Isaacson[1], Stanley R. Rottman[2], and Yael Storz-Peretz[1]
[1]Desert floods research center, Dead Sea and the Arava Science Center, Tamar regional council, Israel
[2]Department of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel

Deserts are characterized by high spatial and temporal variability of precipitation resulting in high spatio-temporal variation of floods occurrences. Adjacent drainage basins or even adjacent channels within a single basin may differ significantly and unpredictably in the number of floods per year. Moreover, common river planforms, such as alluvial fans and braided channels are often subjected to high rates of sediment transport and morphological changes, leading to a frequent shifting of the flow. These arise the need for high spatial and temporal resolution mapping of the dynamics of flash floods occurrence and distribution in the active channels. Because of the short duration (few hours to one day) of flash-floods that characterize arid ephemeral streams (wadis), a post- flood index must be applied.

Based on ground monitoring of floods during two hydrological seasons 2017-2018 and 2018-2019 in the Arava vally, Israel , we marked the dates of all flood events and downloaded pre and post satellite images sentinel-2 (A and B) and of Landsat-8) for each event. The combined temporal resolution of both satellites in this area varies from one to five days. We used spectral indices that were originally developed for mapping open water bodies (NDWI, MNDWI) or for monitoring vegetation vigor (NDVI, LSWI). In order to eliminate the varying lithology background effect, we used a normalized time difference equation.

The results show that all bands and indices are sensitive to the flow events. Using single bands change detection is subjected to noise, causing from changes in reflectance that are not due to flood impact. By using the LSWI and MNDWI, this noise considerably eliminates. The results indicated high signal of flood extent when using the MNDWI and LSWI indices even three days after the flood.

This type of monitoring is essential for infrastructure planning, drainage management and river rehabilitation as well as ecological interface. It is also the base for validating models predicting flash floods which save humane lives and properties.