

The Effectiveness of Water Indices in Detecting Soil Moisture as an Indicator of Mudflow in Arid Regions

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Abstract : This study aims to evaluate the performance and effectiveness of six spectral water indices - derived from Multispectral sentinel-2 data - to detect soil moisture and inundated area in arid regions to be used as an indicator of mudflow phenomena to predict high-risk areas. Herein, the validation of the performance of spectral indices was conducted using threshold method, spectral curve performance, and soil-line method. These indirect validation techniques play a key role in saving time, effort, and cost, particularly for large-scale and inaccessible areas. It was observed that the Normalized Difference Water Index (NDWI), Modified Normalized Difference Water Index (mNDWI), and RSWIR indices have the potential to detect soil moisture and inundated areas in arid regions. According to the temporal spectral curve performance, the spectral characteristics of water and soil moisture were distinct in the Near infrared (NIR), Short-wave Infrared (SWIR1,2) bands. However, the rate and degree differed between these bands, depending on the amount of water in the soil. Furthermore, the soil line method supported the appropriate selection of threshold values to detect soil moisture. However, the threshold values varied with location, time, season, and between indices. We concluded that considering the factors influencing the behavior of water and soil reflectivity could support decision-makers in identifying high-risk mudflow locations.

Keywords : spectral reflectance curve, soil-line method, spectral indices, Shaheen cyclone

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