Comparison of multispectral satellite sensors for surface lithological characterization, south of Kala-Chitta Ranges, Pakistan

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In recent years, advancement in remote sensing technology and methods has significant potential for distinguishing surface materials and producing effective lithological maps. In this study, the capabilities of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is compared with WorldView-3 (WV3) data for lithological mapping. For this purpose, southern part of the Kala Chitta Ranges is selected for which well published surface geological maps were already available. The area is characterized by complex lithological units including carbonates, sandstones and shales. The multispectral ASTER (4-VNIR, 15m and 6-SWIR, 30m) data acquired in (2007) together with commercially available WV3 (8-VNIR, 1.24m and 8-SWIR, 3.7m) data acquired in (2017) were processed and analyzed. Various image processing techniques including band rationing, principal component analysis (PCA) and spectral angle mapping (SAM) were used and abilities of both the sensors were evaluated for identifying different lithological units and geological formations. The results show that WV3 data, due to its higher spatial resolution and a wider spectral range can differentiate between different lithologies more accurately compared to ASTER data. The WV3 data has the ability to identify subtle differences in the spectral response of different lithological units that are not detectable by ASTER sensor. Moreover, the accuracy results of the lithological maps produced from VW3 and ASTER data were assessed and validated by comparing them with the existing maps and field data points. The accuracy assessment shows that the overall accuracy of WV3 is 20% higher than that of ASTER results.

Keywords: WorldView-3 (WV-3); ASTER