Identification of archeological sites threatened with obliteration using space-borne and ground penetrating radars data in site of Tulul al-Ukhaidir, Iraq

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Abstract

Many archeological sites and cultural heritage in Iraq have suffered from disappearance as a result of climate factors and human interventions. In this study, principal component analysis (PCA) was used to interpret the dual-polarimetric ALOS image for the purpose of identifying the archeological remnants in the site of Tulul al-Ukhaidir. The results led to the identification of 21 potential sites, four of them in the right shoulder of Wadi Al-Abyadh (white valley), and 17 in the left shoulder. Nine sites were appeared as not covered and clearly visible after comparing them with the recent high-resolution image and the field observations, which were in the form of hills containing scattered stone remains, brick walls, and the remains of ancient archeological structures, whereas 12 sites nominated as potential archeological remains, which were completely covered with loose sand. 3D ground penetrating radar (GPR) investigation was performed in site P5 using a 250 MHz shielded antenna covering an area of 9 × 42.5 m, in order to verify the results of ALOS imagery and to characterize and depict the potential subsurface of the buried objects. The results of the GPR survey revealed a number of anomalies interpreted as demolished walls appeared on shallow depths begin approximately 0.15 to 0.3 m below surface, continue down to various depths, and have a width ranging from 0.5–5 m. One of the important anomalies that has been distinguished is the fence (sur) at a depth of about 0.2 m and it has a width reach of 7 m.

Keywords

ALOS PALSAR Principal component analysis 3D GPR Ukhaidir fortress Qasr Bani Muqatil Wadi Al-Abyadh

Notes

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