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Space –based monitoring of archaeological looting using multitemporal satellite data

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Illegal excavations represent one of the main risk factors which affect the archaeological heritage all over the world, in particular in those countries, from Southern America to Middle East, where the surveillance on site is little effective and time consuming and the aerial surveillance is non practicable due to military or political restrictions. In such contexts satellite remote sensing offers a suitable chance to monitor this phenomenon..
Looting phenomenon is much more dramatic during wars or armed conflicts, as occurred in Iraq during the two Gulf Wars, where "total area looted was many times greater than all the archaeological investigations ever conducted in southern Iraq" (Stone E. 2008). Media reports described the massive looting in broad daylight and destruction of the Iraqi museums and other cultural institutions. Between 2003 and 2004, several buried ancient cities have been completely eaten away by crater-like holes (http://www.savingantiquities.org/feature_page.php?featureID=7), and many other archaeological sites would be pillaged without the valuable activity of the Italian Carabinieri, responsible for guarding archaeological sites in the region of Nassyriah.

To contrast and limit this phenomenon a systematic monitoring is required. Up to now, the protection of archaeological heritage from illegal diggings is generally based on a direct or aerial surveillance, which are time consuming, expensive and not suitable for extensive areas. VHR satellite images offer a suitable chance thanks to their global coverage and frequent re-visitation times.
In this paper, automatic data processing approaches, based on filtering, geospatial analysis and wavelet, have been applied to enhance spatial and spectral anomaly linked to illegal excavations to make their semiautomatic identification easier. Study areas from Middle east and Southern America have been processed and discussed.