



Large and small-scale multi-sensors remote sensing for dumpsites characterization and monitoring

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Remote sensing techniques are an ever-growing reliable means for monitoring, detecting and analysing the spatial and temporal changes of solid waste and landfill sites. In this paper, different UAV and satellite sensors are used to detect, characterize and monitor dumpsites in Sicily (Italy). In particular, data acquired and processed are (i) high-density point clouds detected from LIDAR sensor; (ii) optical photograms with a resolution of 3 cm; (iii) thermal photograms with a resolution of 5 cm/pixel and (iv) multispectral photograms with 5 cm/pixel. High spatial resolution UAV multispectral and thermal remote sensing allowed for the extraction of indicators, such as the Normalized Difference Vegetation Index (NDVI) and the Land Surface Temperature (LST), useful to characterize the changes in the vegetation and the skin temperature increase due to organic waste decomposition, respectively. On the other hand, the processing of UAV optical images to extract high-resolution orthophotos and their integration with high-density point clouds obtained from LIDAR, were used to provide the identification of the effective perimeter of the landfill body and the extraction of waste volumes. These products were integrated and compared with those obtained from different kinds of medium-to-high spatial resolution satellite images, such as from Landsat, Aster, Sentinel-2 and PlanetScope sensors. Results show that UAV data represents an excellent opportunity for detecting and characterizing dumpsites with an extremely high detail, and that the joint use with satellite data is recommended for having a comparison on different scales, allowing continuous monitoring. Additional SAR data methodologies will be investigated for evaluating the landfill body landslides over the years that could be integrated with high resolution satellite multispectral and hyperspectral images for monitoring dumpsites environmental impact.