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Identification of Nuclear Activities Using Satellite Imaging

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Satellite imagery is now a very performing tool for the monitoring of human and industrial activity. Due to the multiplicity of modalities, its scope is very broad and it participates actively in the monitoring of proliferation activities. In this paper, we focus on quantitative or pseudo quantitative exploitation of indicators or afferent signatures of these activities extracted from various type of satellite images.

We have developed automatic algorithms for the detection of changes, in complement to visual examination of time series, which provide information on modifications of buildings or vehicle positions and on the ground. Such algorithms can be applied to visible or RADAR imaging, this latter being operational in all weather or illumination conditions. We first describe a technique based on 3D changes analysis applied first to an urban environment and then to the estimation of volumes of material dredged from digged underground galleries. We also present the possibilities brought by RADAR imagery from acquisitions in interferometric mode; in this case, the amplitude signal is analyzed.

Upstream of the nuclear cycle, monitoring of the production of uranium or other materials of interest is affordable by hyperspectral imaging. This latter, due to the richness of analysis on fine and densified spectral bands, allows quantifying emissions of gaseous effluents and categorizing mineral deposits; we illustrate examples of both applications in the paper.

Country or International Organization

France

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