Contribution ID: **257** Type: **Roundtable Member**

Exploitation of high frequency acquisition of imagery from satellite constellations within a semi-automated change detection framework for IAEA safeguards purposes

The development of constellations of small satellites that offer not just daily imaging, but possibly tens of images per day for any site, has the potential to fundamentally change the monitoring of nuclear fuel cycle related sites using remote sensing. Many organizations are currently building such constellations of satellites, including Planet, BlackSky and Earth-i. These constellations are already providing vast quantities of data, but the imagery's spatial, spectral and radiometric properties are not equivalent to that of precision satellites, for example those operated by DigitalGlobe and Airbus. We therefore evaluate the usefulness of high-frequency acquisition imagery for safeguards applications, and propose a semi-automated change detection framework. The framework includes automated procedures for importing of images, ortho-rectification, three-dimensional projection, and normalization of imagery to a common reflectance format. After pre-processing, new images will be compared to the large data stack of hundreds or even thousands of previously acquired images of the site. Differentiating safeguards-relevant change from other spurious or changes of less interest will require methodological development in time-series analysis, expert and machine learning methods, and GIS integration. Once changes have been identified using automated methods, the locations will be flagged, with a rating according to the type of change, and the specific nuclear fuel cycle stage. Alerts will then be sent to the image analyst responsible for the site, for expert review. The analyst will evaluate the accuracy of the alert, thus allowing the system to learn. Implementing the proposed system will require overcoming not only technical, but also procedural challenges, including dealing with issues such vendor data licensing and data security. The benefits of a semi-automated change detection system could include greater efficiencies in dealing with the large volumes of imagery, more rapid response to changes, and a richer view of site activities such as traffic volume and movement.

Which "Key Question" does your Abstract address?

TEC3.2

Topics

TEC3

Primary author: Prof. WARNER, Timothy (West Virginia University)

Co-authors: Mr KESKINEN, Antero (Geospatial Analyst); Mr RUTKOWSKI, Joshua (Forschungszentrum Juelich); Mr DUCKWORTH, Sam (IAEA)

Presenter: Prof. WARNER, Timothy (West Virginia University)

Session Classification: [TEC] Collection, Processing and Analysis of Satellite and Open Source Imagery Data

Track Classification: Leveraging technological advancements for safeguards applications (TEC)