Multi-Modal Remote Surveillance of Localized Terrestrial Processes: Resolution, Event Characterization, Data Processing, and Analysis

Pavel V. Tsvetkov
Texas A&M University
tsvetkov@tamu.edu

Abstract:

The effort is focused on science and technology of predictive and on-demand characterization of localized developments on the Earth surface, subsurface and within the atmosphere. The use of remote platforms, such as satellites, offers significant access pathways for evaluations of point events and processes virtually in any location in 3D from subsurface up to the upper atmosphere. There are ways to monitor continuously or on-demand as needed driven by specific needs. The project accounts for capabilities of high TRL observational platforms and combines them with lower TRL sensors and predictive methods including fusion and machine learning to yield a robust multi-modal surveillance and prediction capability. Signature-based process evaluations are expected to yield methods that will be widely applicable to instances when signatures are leveraged to interpret local phenomena remotely. The effort began with the focus on cube satellite platforms due to their cost efficiency and on-demand surveillance capabilities. Once architectures were developed, the focus shifted to process signatures. Terrestrial structures like fuel cycle facilities and nuclear power plants of various sizes were chosen to serve as surrogate objects of interest. The corresponding signature data libraries were produced to support methods and technology development. These signatures are expected to be either pre-existing or being developed on demand and in an automated manner from within the surveillance platforms. The data feed characteristics, transmission parameters, and sensor resolution options as well as various noise perturbations are accounted for to assure robust interpretation capabilities for events, phenomena and features of interest. This talk will provide the status update including an overview of ongoing studies, accomplishments and plans.