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## Multispectral and Hyperspectral Imagery Analysis to Monitor and Verify Front-end Uranium Production

We are arguably approaching an era where more and more states may be interested in pursuing nuclear weapons. While export controls limit the sharing of technology and knowledge related to nuclear weapons development, much of the science behind these weapons can be found in the open-source. Because nuclear weapons designs are easier to obtain, the most effective strategy to prevent new states from building and testing such weapons is to restrict the acquisition or production of fissile material. The production of fissile material is often a closely held state secret; even for states that report production levels to the IAEA. Having a firm grasp on a state's fissile material production, capabilities, and activities can further inform whether a state has or is planning to develop and test nuclear devices. Uranium production can be difficult to verify without on-the-ground inspections. As more multispectral (MS) and hyperspectral (HS) sensors are developed and launched, data from these sensors can help verify uranium mining and milling activities. We did a proof-of-concept study on how MS and HS data can be used to monitor front-end uranium production and the potential for this to be implemented as a verification mechanism.

**Primary author:** LIU, Grace (James Martin Center for Nonproliferation Studies)

**Presenter:** LIU, Grace (James Martin Center for Nonproliferation Studies)

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