

Vegetation Forensics

Sherry Olson

703-983-6643 • slo@mitre.org

MOIE Sponsor: DASD/CDTDPO

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue to the left of the text.

MITRE
Technology
Program

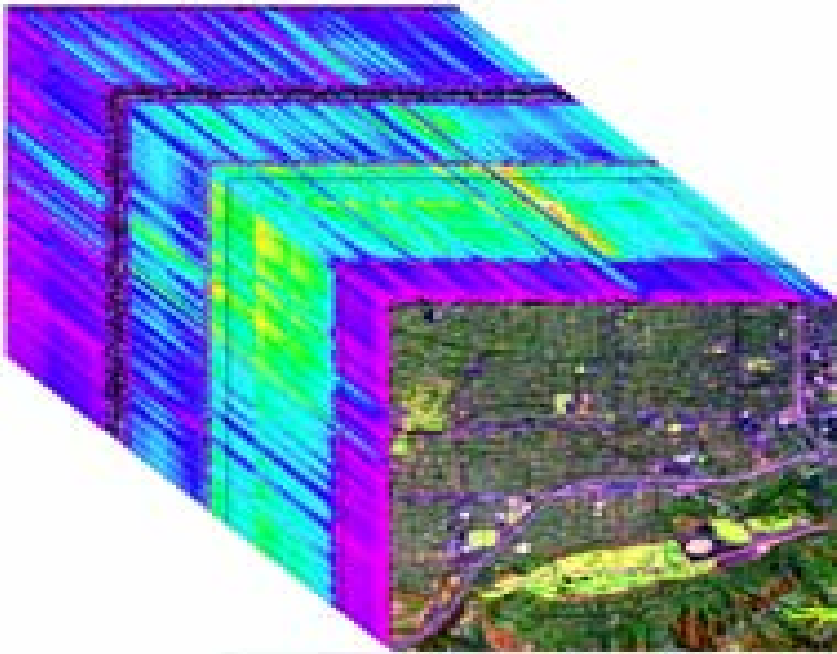
Problem

■ *Hard target problems:*

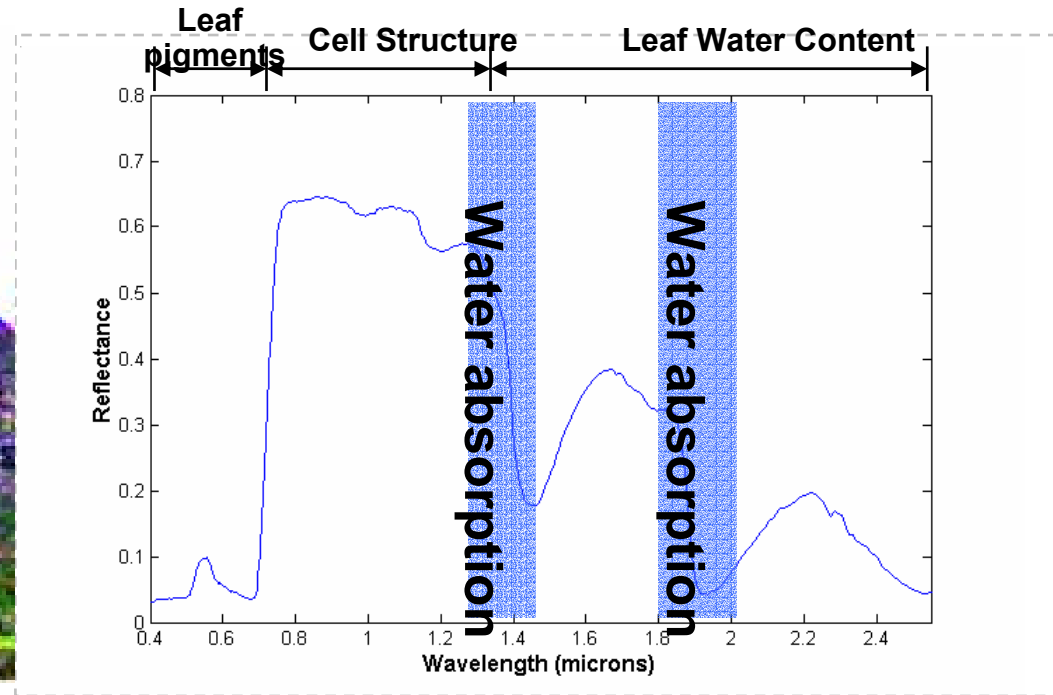
- Using current approaches, it is often difficult to directly detect adversary activity of interest to the national security community
- Difficulty of detection stems from the *clandestine and transient* nature of activities as well as active *denial and deception (D&D)* techniques employed
- Direct detection may be especially difficult, and *indirect* techniques via remote sensing may provide the greatest payoff

Background

Hyperspectral Remote Sensing of Vegetation Health



AVIRIS Hyperspectral Data Cube
of Pasadena, CA



Typical Vegetation Reflectance Signature

Objective

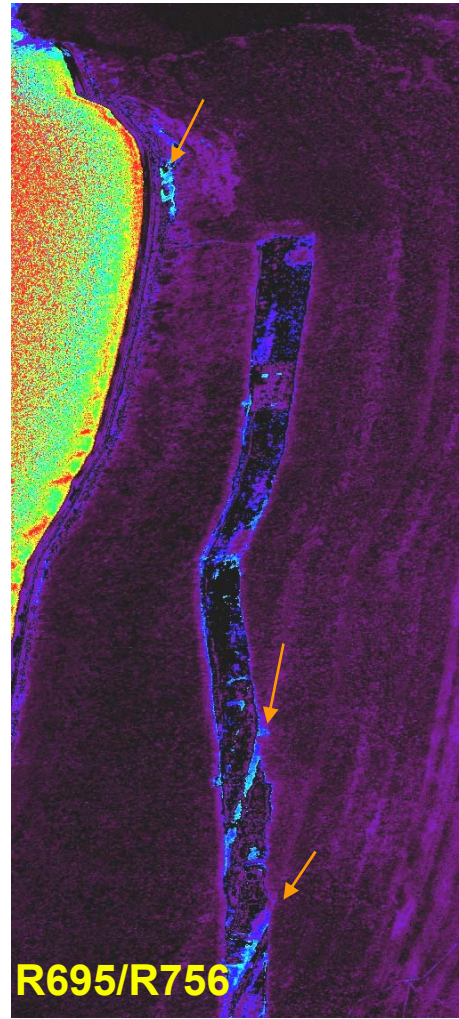
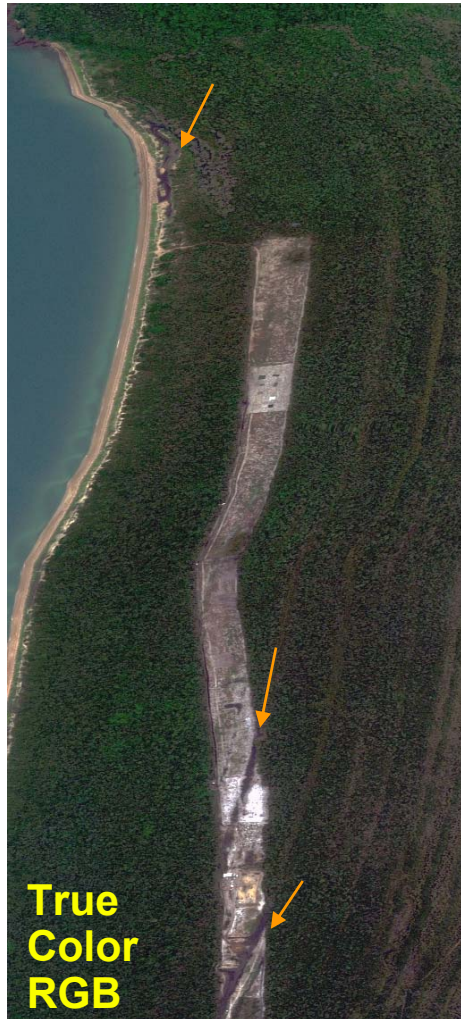
- **To use hyperspectral remote sensing of vegetation stress as an indirect indicator of nefarious activity**
- **To extend current research to determine the level and type of stress detectable for activities of interest to national security with an initial focus on counternarcotics applications**

Activities

- Reviewed current literature
- Implemented several standard vegetation indices
- Tested these indices for uniformity on data from several hyperspectral sensors and computed statistics
- Began testing on stressed vegetation signatures

Highlight

Vegetation Fluorescence Band Ratio



1.0



Water, sand, soil,
and other inorganic
materials appear
red and yellow.

Green regions
suggest stressed
vegetation.

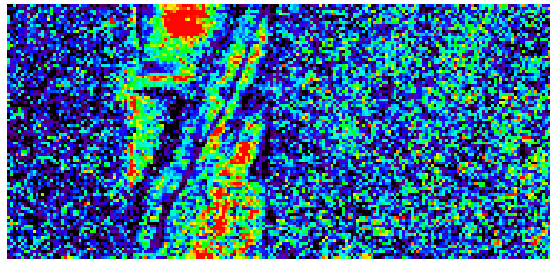
0.0

Highlight

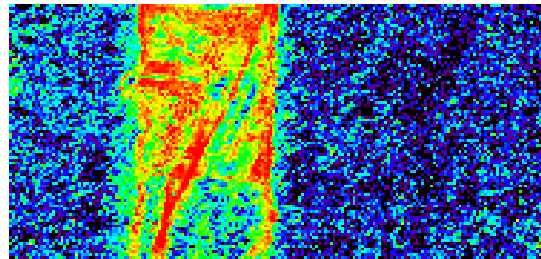
Comparison of Vegetation Indices



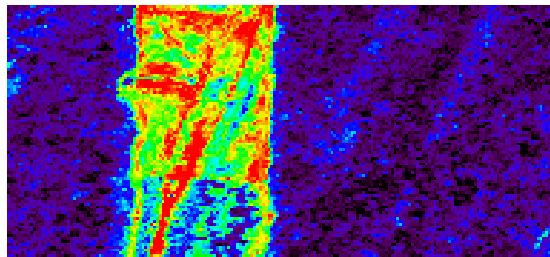
True Color



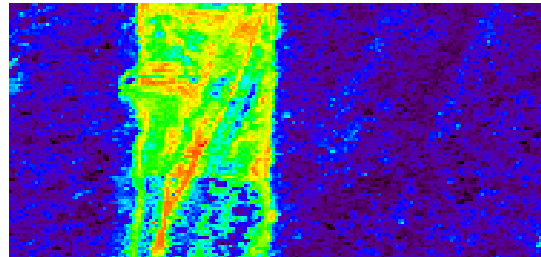
B695/B543



B695/B636



B695/B756



$(B772 - B680) / (B772 + B680)$

Distressed



Healthy

Impacts

- For difficult problems, hyperspectral remote sensing of vegetation stress offers the potential for indirect sensing of activities
- This effort will provide insight into the feasibility of
 - detecting stress remotely
 - detecting early, non-visible, signs of stress
 - relating the type of stress to a class of stress agent

Future Plans

Stressed Vegetation Studies

