Objective
A multi-angular and multi-temporal study of vegetation and soils using CHRIS hyperspectral data

Goals:
1. To examine the variations in spectral directional reflectance of vegetation (cotton).
2. To study spatial variability of soil spectra.
3. To correlate a selection of indices from different times and different angular measurements.

METHODOLOGY
- Image analysis & classification
- Multi-angular Multi-temporal Hyperspectral data
- Vegetation & Soil Spectra
- Calibration

Images and Spectral Data Collection
- Leaf/Cotton Spectra
- Soil Spectra
- Spectra for Cotton Varieties

Field Study Site
Centered at 148°51' E and 29°36' S

Twynam (Colly cotton)

CHRIS Multi-Angle Image Data Analysis
- Statistical analysis of image data (surface reflectance)
- Spatial analysis
  - Registration/geo-correction, ROI
- Spectral Analysis
  - End-member collection
  - Spectral library creation
  - Classification/spectral Mapping – e.g. MNF, SAM, PPI, Cont. Removed
  - Index calculations
- Multi-temporal analysis
- Functional Data Analysis (FDA)
Assumption of using Multi-angular CHRIS

- Different angle of acquisition has the different response and illumination.
- Multi-angular image can effect the spectral analysis results.
- CHRIS can be treated as Functional Data
- How BRDF effect on vegetation and soil.

How this effect, let we explore early findings the dataset analysis results.

- Multi-angular Data Plot (soil)

- Multi-angular Spectral Signature

- Spectral Endmember Mapping

- Minimum Noise Fraction (MNF) to determine inherent image data
- Pixel Purity Index (PPI) to determine “pure spectra pixels”
- Spectral Angle Mapper (SAM) to classify spectra to match reference
- Mixture Tuned Matched Filtering (MTMF) to performs matched filtering to add “infeasibility image result”
**MNF continued…**

Percentage of Total Variance of First 10 factors of 60 MNF Bands

- **PPI & n-D Visualizer**
  Multi-angle CHRIS Dataset

- **Continuum Removal of Multi-angle dataset**

- **Spectral Variation Within Paddocks (Soil)**

- **Multi-temporal Selected Index Value**
CONCLUSION

CHRIS Multi-angle dataset:

- The initial investigation has shown the 'angular-signature' variation and well explored.
- Provide alternative classifications
- Could provide better classification results
- Can be used for BRDF studies
- Data function analysis possible

The “Hyperspectral Cube” of Colly Cotton Site

HyMap (126 channels)  Airborne Hyperspectral

“CHRIS” (62 Channels)  Space-borne Hyperspectral