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( // : // : )

HyMap

/ nm

S/N

HyMap

(RMSE < )

ATCOR-A

/

HyMap

:

:

( )

.HyMap

:

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AVIRIS

( )

Hyperion

( )

AVIRIS<sup>1</sup>

nm

ETM+

( )

Hyperion

( )

( )

( ) ( )  
( )

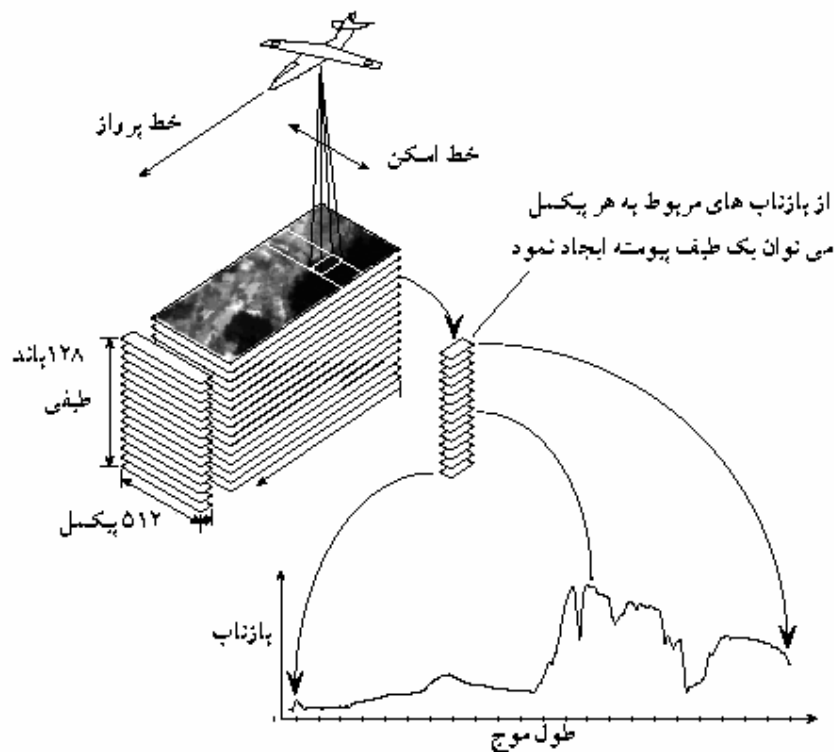
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( )

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Spectral Unmixing  
Spectral Angel Mapper  
Spectral Library  
Goodenough  
Neiemann  
Pinard and Bannari  
Dyk  
Ludwig  
Moorthy

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Airborne Visible/Infrared Imaging Spectrometer  
Spectral Signature  
Data Cube



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( )

HyMap<sup>3</sup>

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HyMap

$$R_\lambda = \sum_{i=1}^n f_i \times r_{i\lambda} + \epsilon_\lambda$$

$$\sum_{i=1}^n f_i = 1$$

$\lambda$

$i$

$R_\lambda$

$f_i$

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Linear Spectral Unmixing

Spectral Mixing

Endmember

Abundance

HyMap

HyMap

nm

( nm)

$l \times l$

GPS

$l$

( )

( )

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HyMap

Field of View

Instantaneous Field of View

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$\lambda$   $i$   $r_{i\lambda}$   
 $\lambda$   $\varepsilon_\lambda$

RMSE

RMSE

(.)



HyMap



HyMap

**HyMap**

HyMap

( )

( )

( )

HyMap

PARGE<sup>3</sup>

GPS

S/N<sup>1</sup>

( )

SNR

( )

$$SNR_i = \frac{\overline{DN_i}}{\delta_i}$$

( )

*i* noise signal :SNR<sub>*i*</sub>  
*i* DN<sub>S</sub> :DN<sub>*i*</sub>  
*i* DN<sub>S</sub> :δ<sub>*i*</sub>

HyMap

SNR  
SNR

( )

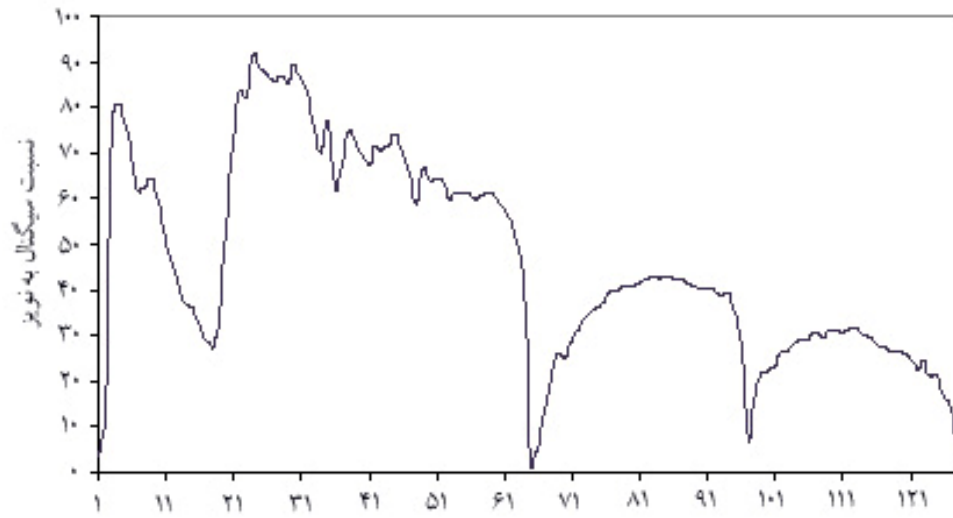
SNR

( )

ATCOR-A<sup>4</sup>

HyMap

SNR



HyMap

HyMap

Noise

Signal

( )

( )

( )

( )

( )

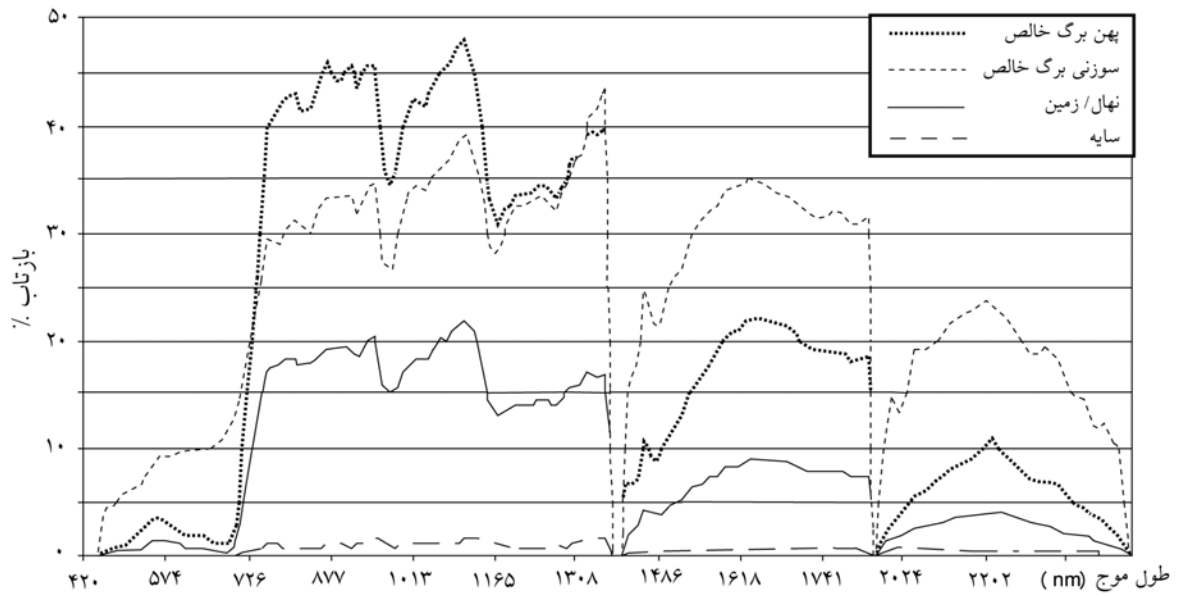
HyMap

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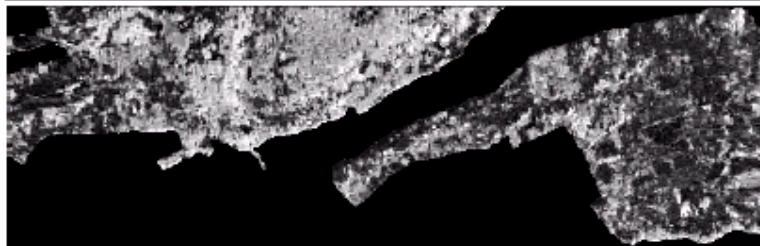
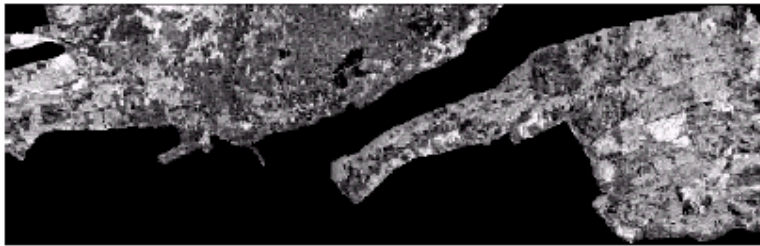
HyMap

Hill

Abundance Images



HyMap



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HyMap

( )

SNR

SNR



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## Application of Hyperspectral Data for Forest Stand Mapping

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### Abstract

In this investigation, HyMap data cube acquired in 1998 over a small forest area in central part of Switzerland was analyzed and evaluated. The HyMap sensor is a 128-channel high-resolution airborne imaging spectrometer that covers the wavelength from 450 nm to 2480 nm. Its pixel size is approximately 7.5 meters. The image has been acquired from 3000m above the earth surface. The research forest-site is a heterogeneous mixture of coniferous and deciduous species. Initially the HyMap data was evaluated qualitatively. Signal to Noise Ratios were very high except in 6 channels. Image orthorectification was performed with parametric method using a digital elevation model and navigation parameters. The resulted RMSE was less than 4 meters. The image was atmospherically corrected using ATCOR-A routine. In order to classify the forest according to mixture-grade of coniferous and deciduous, linear unmixing method was employed. The image based endmember collection approach was used to derive the spectra for selected endmembers (pure coniferous, pure deciduous, clear cutting and shadow). It was performed using airphotos and fieldwork. The fraction components derived from the unmixing model were compared with CIR-airphotos at a scale of 1:9000. The results showed that the potential of hyperspectral HyMap data and linear unmixing models are very high (95%) for forest classification purposes. Since the spectral mixing is actually non-linear, it is not easy to determine thresholds to classify the abundance images, which are derived from linear unmixing models. Therefore it is necessary to further research for appropriate methods.

**Keywords:** Hyperspectral Data, Spectral Unmixing, Mixed Pixel, Endmember, Abundance, HyMap