

## **Trends and issues in noise reduction for hyperspectral vegetation reflectance spectra**

### **ABSTRACT**

Hyperspectral remote sensing has been increasingly used by scientists for extracting information. Along with this technology, however, must come new tools and techniques that take full advantage of the information that may be provided by considering the complete spectrum of data that are offered by these sensors. Hyperspectral data contains such a large amount of data per spectrum and it is common to perform analysis based on derivative spectroscopy for hyperspectral data. Hyperspectral remote sensing allows the detector system to record up to thousands spectral channels with very fine sampling interval. Such detailed data besides the increase of information, contains a lot of noise. The sensors because of their narrow bandwidth are not able to capture a lot of energy and cause self-generated noise inside the sensor. Variations and atmospheric absorption of sun illumination also reduce the amount of recorded spectral signals. Derivative analyses, which are very useful for detecting spectral subtleness in vegetation, are very sensitive to noise. Therefore, smoothing is regularly necessary to reduce the noise before the derivative investigation. Smoothing methods may cause some loss of information or change the original spectral so they will produce incorrect results in subsequent analyses such as classification processes. Thus, smoothing techniques besides being computationally simple, should be used in the way that preserves the absorption and local spectral features like minima, maxima and inflection points. In this study, the effects of several smoothing methods on vegetation spectra have been considered and it is found that for this subject, wavelet methods work much better than the others.

**Keyword:** Wavelet transform, hyperspectral, noise removal