**Definition of Hyperspectral data (or imaging spectroscopy data)**

**Remote sensing data are considered hyperspectral when** the data are gathered from numerous wavebands, contiguously over an entire range of the spectrum (e.g., 400-2500 nm). Goetz (1992), defined hyperspectral remote sensing as: “The acquisition of images in hundreds of registered, contiguous spectral bands such that for each picture element of an image it is possible to derive a complete reflectance spectrum”. However, Jensen, 2004 defines hyperspectral remote sensing as: “The simultaneous acquisition of images in many relatively narrow, contiguous and/or noncontiguous spectral bands throughout the ultraviolet, visible, and infrared portions of the electromagnetic spectrum”.

Overall, the three key factors in considering data to be hyperspectral are:

1. **Contiguity in data collection**

Data is collected contiguously over a spectral range (e.g., wavebands spread across 400 to 2500 nm).

1. **Number of wavebands**

The n Number of wavebands by itself does not make the data hyperspectral. For example, if there are numerous narrowbands in 400-700 nm wavelengths, but have only a few broadbands in 701-2500 nm, the data cannot be considered hyperspectral. However, even relatively broadbands of with, say for example, 30 nm bandwidths spread equally across 400-2500 nm, for a total of ~70 bands, is considered hyperspectral due to contiguity.

1. **Bandwidths**

Often, hyperspectral data is collected in very narrow bandwidths of ~1 nm to ~10 nm, contiguously over the entire spectral range (e.g., 400-2500 nm). Such narrow bandwidths are required to get hyperspectral signatures. But, one can have a Combination of narrowbands and broadbands spread across the spectrum and meet the criterion for hyperspectral remote sensing.

**In summary**:

Remote sensing data is called hyperspectral when the data is collected contiguously over a spectral range, preferably in narrow bandwidths and in reasonably high number of bands

Such a definition will meet many requirements and expectations of hyperspectral data.

**Hyperspectral remote sensing is also referred to as imaging spectroscopy** since data for each pixel is acquired in numerous contiguous wavebands resulting in: (a) 3d image cube, and (b) hyperspectral signatures. The various forms and characteristics of hyperspectral data (imaging spectroscopy) is illustrated in Figure 1 to 7. The distinction between hyperspectral and multispectral is based on the narrowness and contiguous nature of the measurements, not the “number of bands” (Qi *et al.*, 2012).

**References**:

Goetz, A.F.H., 2009. Three decades of hyperspectral remote sensing of the Earth: A personal view, Remote Sensing of Environment, Volume 113, Supplement 1, 2009, Pages S5-S16,

ISSN 0034-4257, https://doi.org/10.1016/j.rse.2007.12.014.

Jensen, J.R. 2004. Introductory digital image processing: A remote sensing perspective (3rd edn.). New Jersey: Prentice-Hall.

Qi, J., Inoue, Y., Wiangwang, N., 2012. Hyperspectral sensor systems and data characteristics in global change studies. Chapter 3. Pp. 69-92. In Thenkabail, P.S., Lyon, G.J., and Huete, A. 2012. Book entitled: “Hyperspectral Remote Sensing of Vegetation”. CRC Press- Taylor and Francis group, Boca Raton, London, New York. Pp. 781.