Canopy shadow fraction estimation from AISA Eagle using spectral unmixing

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In northern latitudes where the Sun remains in low elevations most of the year, forest canopies are affected by significant shadowing. Shadowed surfaces exhibit different spectral characteristics than directly sunlit surfaces due to multiple scattering in the atmosphere and inside the canopy itself. Accurate determination of forest productivity, biophysical variables and structural parameters often require that we use sunlit and shadowed canopy fractions separately in the calculations, as well as take the magnitudes of both direct and diffuse radiation into account. It is also essential to establish the magnitude of the shadowed background and separate it from other components. In case of remote sensing measurements of forest canopies, high spatial resolution is required for an accurate distinction between the shaded and sunlit surfaces.

Since the reflected light in the optical domain can be considered a linear combination of different radiation signals, radiometric measurements can be decomposed to sunlit canopy, sunlit background, shaded canopy and shaded background that are often referred to as scene components [1]. The fractions of sunlit and shaded canopy can be calculated once their spectral characteristics are known individually. By doing this, we will be able to retrieve the ratio of shadowed to total canopy area. This quantity known as canopy shadow fraction is in many ways required for reliable determination of various biophysical and ecological variables characterizing vegetation.

Based on our hyperspectral AISA Eagle II measurements of Hyytiälä forest stands, we will review the methodology for decomposing spectral measurements into four scene components and calculation of canopy shadow fraction. We will focus on spectral mixture analysis, which has previously been successfully used by [1], [2]. Validation work will be conducted later.

References

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