Remote estimation of vegetation fraction. Algorithm development and validation

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Our study of the optical properties of both leaves and canopies of higher plants documented very high correlation between paired reflectances (R) at 550 nm versus 700 nm (R_{550} vs. R_{700}) and 500 nm versus 670 nm (R_{500} vs. R_{670}) for a wide range of pigment contents and composition. Based on these fundamental optical properties, we attempted to estimate remotely vegetation fraction for selected plant canopies. For closed vegetation canopies with a wide range of canopy structures and pigment contents, both relationships (R_{700} vs. R_{550} and R_{670} vs. R_{500}) were linear with determination coefficients $r^2 > 0.95$ and points that were tightly clustered. Using the same coordinates to plot reflectances for a variety of soils and brightness, we found a high degree of covariance ($r^2 > 0.94$) and a distinct “soil line.” Therefore, these vegetation and soil lines define a two-dimensional spectral construct within which canopy reflectances may be located. We suggest using the coordinate location in this spectral space as a measure of vegetation fraction. Algorithms for assessment of vegetation fraction for irrigated wheat in a wide range of soil brightness were devised and validated. The root mean square deviation between predicted and measured values were less than 11 per cent.