Table S1. AVIRIS-ng flightlines used for this analysis. Both short name (this analysis) and full flightline ID (archived on the JPL database) are provided. 15 lines total.

Short Name	Flightline ID
Gilroy	ang20200918t232303
Kern_1	ang20200724t191126
Kern_2	ang20200924t213537
Kings	ang20200924t200728
Lodi_1	ang20200907t203701
Lodi_2	ang20200918t210935
MaderaFresno	ang20200924t203044
Napa_1	ang20200918t215728
Napa_2	ang20200918t220357
Napa_3	ang20200918t221604
Solano	ang20200918t204940
Tulare_1	ang20200903t201645
Tulare_2	ang20200903t203648
TulareKings	ang20200924t193402
Yolo	ang20200918t203620

Table S2. Mutual information matrix. Higher mutual information implies a stronger relationship. Bootstrapping by random selection of 30% of data values resulted in MI variability on the order of 0.01 or less.

Mutual Information (MI)

	Fv	**DVI**	**NDVI**	**NIRv**	**SR**	**EVI**	**EVI2**
Fv	12.01	1.44	0.69	1.41	0.69	1.25	1.34
DVI	1.44	12.01	0.77	2.45	0.77	1.60	1.80
NDVI	0.69	0.77	12.01	0.98	11.34	1.20	1.25
NIRv	1.41	2.45	0.98	12.01	0.98	2.01	2.77
SR	0.69	0.77	11.33	0.98	12.01	1.20	1.25
EVI	1.25	1.60	1.20	2.01	1.20	12.01	2.30
EVI2	1.34	1.80	1.25	2.77	1.25	2.30	12.01

Table S3. Correlation matrix. All Pearson correlation coefficients are significantly different from the uncorrelated null hypothesis ($p < 0.01$).

Pearson Correlation (ρ)

	Fv	**DVI**	**NDVI**	**NIRv**	**SR**	**EVI**	**EVI2**
Fv	1.000	0.950	0.837	0.949	0.806	0.940	0.949
DVI	0.950	1.000	0.826	0.992	0.818	0.973	0.982
NDVI	0.837	0.826	1.000	0.860	0.913	0.904	0.910
NIRv	0.949	0.992	0.860	1.000	0.873	0.986	0.990
SR	0.806	0.818	0.913	0.873	1.000	0.886	0.882
EVI	0.940	0.973	0.904	0.986	0.886	1.000	0.993
EVI2	0.949	0.982	0.910	0.990	0.882	0.993	1.000

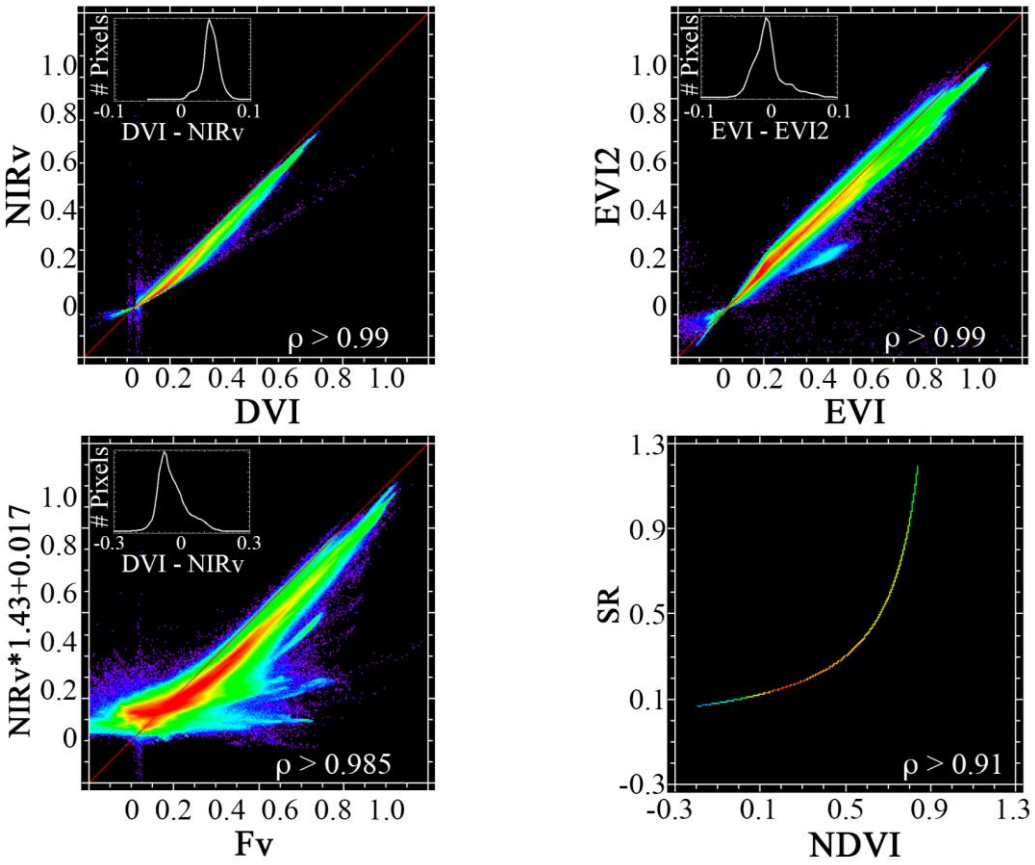

Figure S1. Additional VI relationships. Upper left: DVI and NIRv are highly correlated (ρ >0.99), but DVI gives slightly higher values (mean difference 4.0%, standard deviation 1.2%). Upper right: EVI and EVI2 are also highly correlated (ρ > 0.99), with a much smaller average difference (mean = 0.1%) but greater dispersion (standard deviation = 2.2%). Lower left: Regressing NIRv against Fv greatly reduces underestimation but increases the sensitivity to substrate background reflectance (note negative values excluded in regression). Lower right: The bivariate distribution of NDVI and SR gives a strikingly tight curvilinear relationship. An algebraic explanation for this is explored in Analytical Exercise S1.

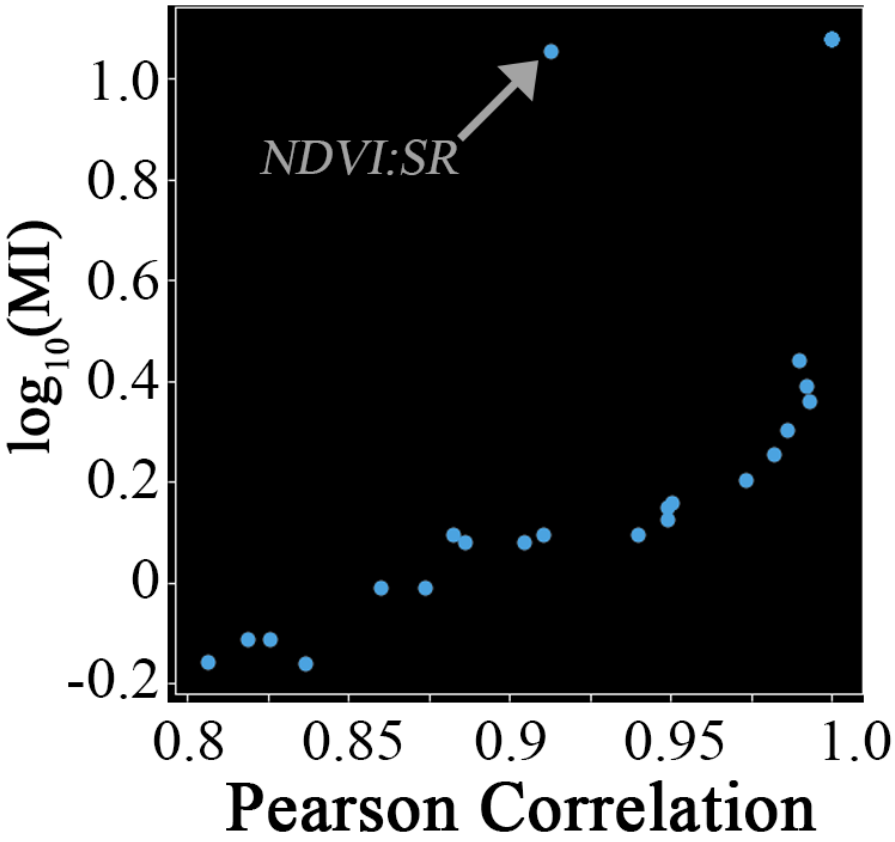

Figure S2. Parametric versus nonparametric statistics. Pearson correlation coefficient (ρ) is roughly loglinear with Mutual Information (MI) for these distributions. The strong nonlinear analytic NDVI:SR relationship (lower right on Figure S1) occurs as an outlier deviating well above the log-linear relation ($\rho = 0.91$, $\log_{10}(MI) > 1$). This demonstrates the efficacy of MI in quantifying nonlinear relationships. The lack of similarly elevated MI values for NDVI:F_v and SR:F_v provides further evidence that the greater dispersion and heteroskedasticity of these indexes would be challenging to incorporate effectively into even a nonlinear regression. The 7 identical outliers ($\rho = 1.0$, MI = 12.01) upper right correspond to self-information of each distribution with itself.

Analytical Exercise S1. An exploration of the relationship between SR and NDVI.

Begin with the formula for SR:

$$SR = \frac{NIR}{Red}$$

Rearrange terms:

$$Red = \frac{NIR}{SR}$$

Now examine the formula for NDVI:

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

Substitute for Red:

$$NDVI = \frac{NIR - \frac{NIR}{SR}}{NIR + \frac{NIR}{SR}}$$

Multiply by 1:

$$NDVI = \frac{NIR - \frac{NIR}{SR}}{NIR + \frac{NIR}{SR}} \times \frac{SR}{SR}$$

$$NDVI = \frac{(SR \times NIR) - NIR}{(SR \times NIR) + NIR}$$

Factor:

$$NDVI = \frac{NIR \times (SR - 1)}{NIR \times (SR + 1)}$$

Simplify:

$$NDVI = \frac{SR - 1}{SR + 1}$$

The relationship between SR and NDVI can thus be described by a simple rational function of the form:

$$y = \frac{x - 1}{x + 1}$$

This explains the curvilinear shape of the lower right plot in Figure S1, as well as the notably elevated MI score for this pair of vegetation indices.