

Title: Estimating the seasonal dynamics of the leaf area index using piecewise LAI-VI relationships based on phenophases

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Supplementary materials

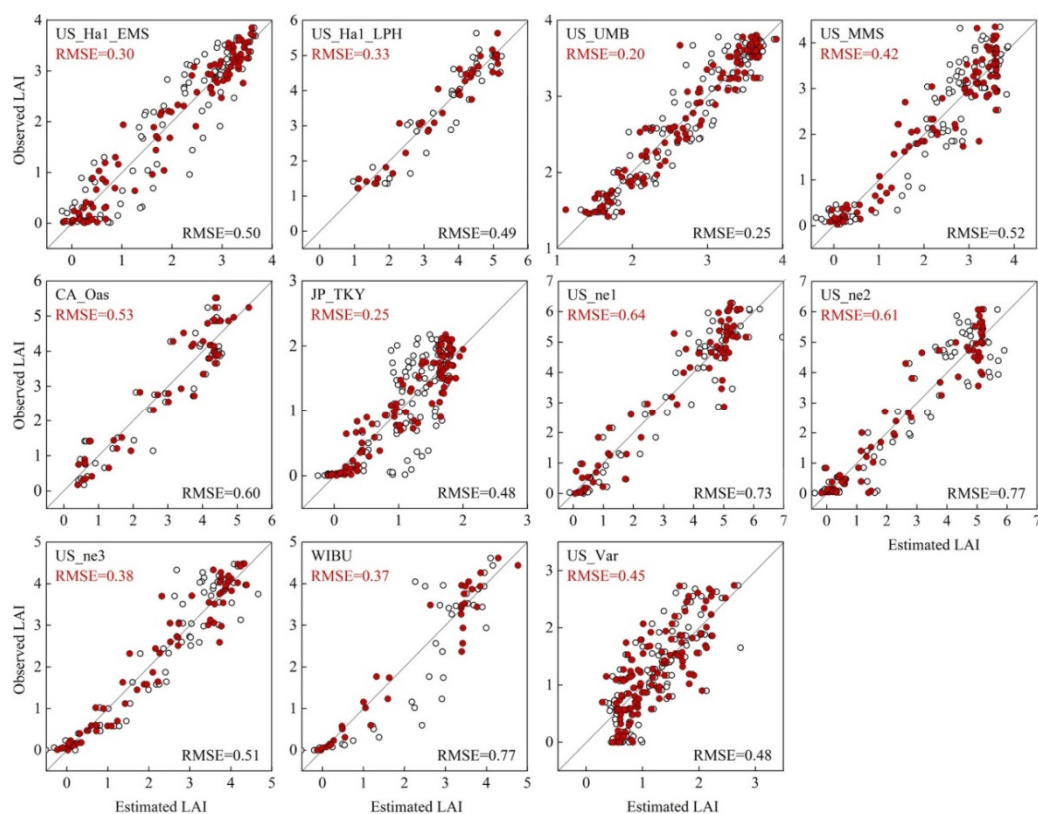


Figure S1. Scatter plots of the observed LAIs versus the LAIs estimated with the piecewise LAI-EVI relationships (red solid circle) and the single LAI-EVI relationship (black open circle).

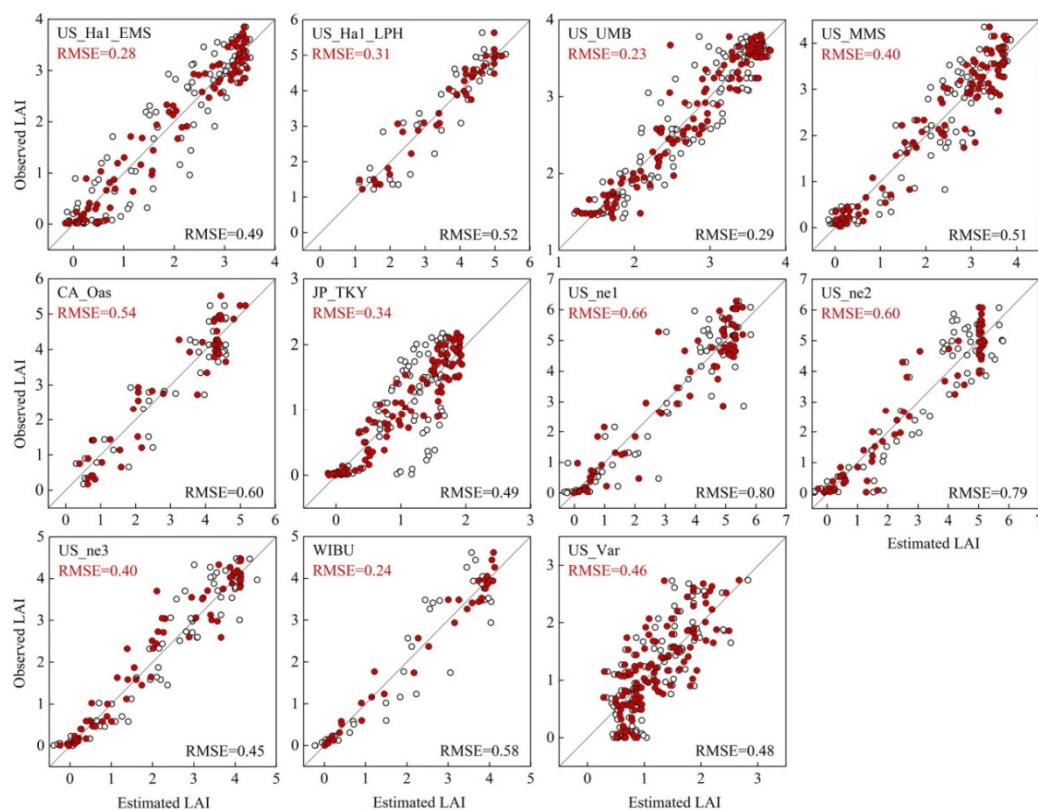


Figure S2. Scatter plots of the observed LAIs versus the LAIs estimated with the piecewise LAI-NIRv relationships (red solid circle) and the single LAI-EVI relationship (black open circle).

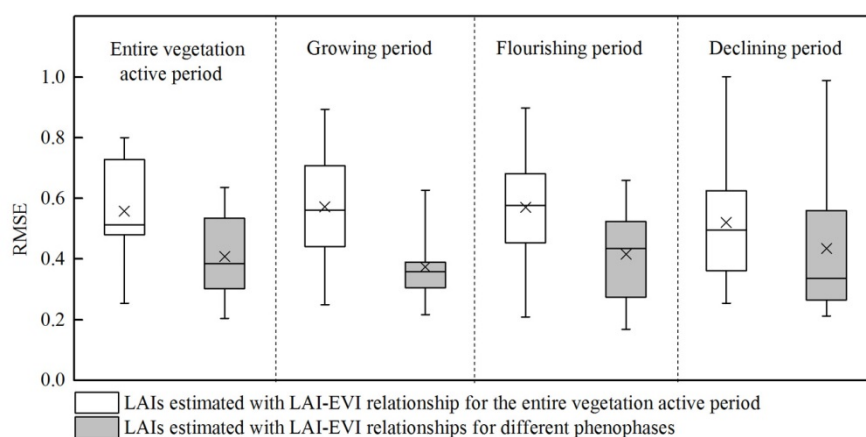


Figure S3. The RMSEs for the LAIs estimated based on the LAI-EVI relationships for the entire vegetation active period and for the different phenophases. The bottoms and tops of the boxes are the 25th and 75th percentiles; the bands near the middle are the median; the ends of the whiskers represent the minimum and maximum; and the crosses designate the mean value.

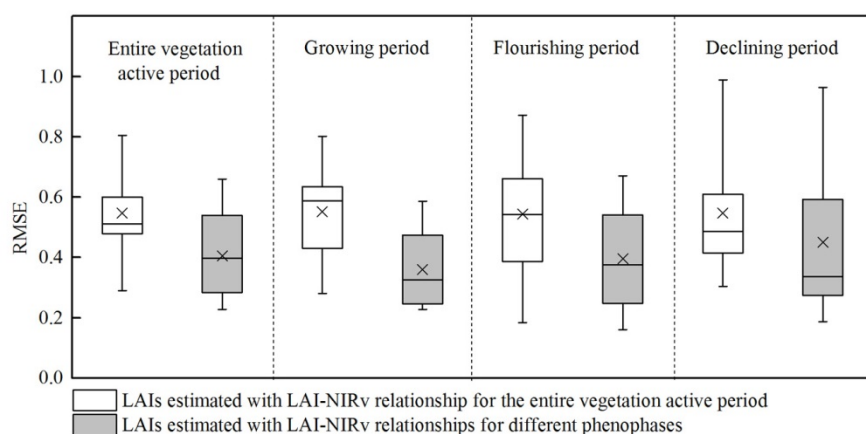


Figure S4. The RMSEs for the LAIs estimated based on the LAI-NIRv relationships for the entire vegetation active period and for the different phenophases. See Figure S3 for descriptions of the boxplot.

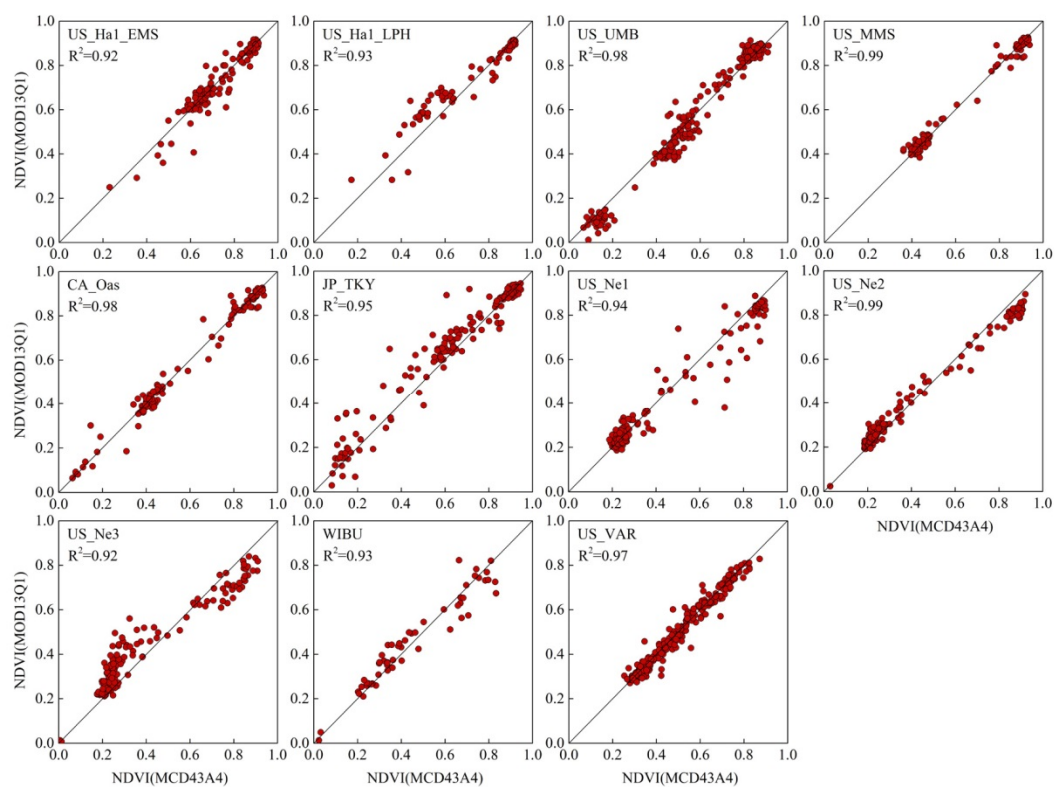


Figure S5. Scatter plots of the NDVI product (MOD13Q1) versus the NDVI estimated with the MCD43A4 product.

Table S1. Results of the regression analysis, F-test and RMSE of the LAI-VI relationships during the entire vegetation active period and different phenophases.

Site ID	VI	Parameters for regression equation: $LAI=aVI^2+bVI+c$ (R^2 /RMSE)			
		Growing period	Flourishing period	Declining period	Entire vegetation active period
US_Ha1_EMS	NDVI	$Y = 23.71X^2 - 23.62X + 5.59$ (0.94 ^{***} /0.28)	$Y = -48.41X^2 + 88.62X - 37.23$ (0.03/0.28)	$Y = -4.54X^2 + 19.98X - 10.55$ (0.84 ^{***} /0.44)	$Y = 1.20X^2 + 10.04X - 6.59$ (0.90 ^{***} /0.40)
	EVI	$Y = 12.39X^2 - 2.09X - 0.42$ (0.91 ^{***} /0.35)	$Y = 8.23X^2 - 6.10X + 3.94$ (0.40 ^{***} /0.23)	$Y = 1.54X^2 + 10.45X - 2.66$ (0.91 ^{***} /0.32)	$Y = -7.33X^2 + 15.71X - 3.66$ (0.86 ^{***} /0.50)
	NIRv	$Y = 17.65X^2 + 6.67X - 1.23$ (0.95 ^{***} /0.26)	$Y = -2.68X^2 + 4.91X + 1.93$ (0.16/0.27)	$Y = -48.96X^2 + 37.69X - 3.55$ (0.92 ^{***} /0.32)	$Y = -32.14X^2 + 29.11X - 2.98$ (0.86 ^{***} /0.49)
US_Ha1_LPH	NDVI	$Y = 13.66X^2 - 9.76X + 2.70$ (0.98 ^{***} /0.19)	$Y = -3620.50X^2 + 6552.20X - 2959.20$ (0.37/0.26)	$Y = -20.38X^2 + 38.26X - 13.51$ (0.91 ^{***} /0.29)	$Y = 3.90X^2 + 3.97X - 1.80$ (0.94 ^{***} /0.33)
	EVI	$Y = 4.05X^2 + 4.50X - 0.21$ (0.93 ^{***} /0.36)	$Y = 11.49X^2 - 14.40X + 9.49$ (0.002/0.36)	$Y = -8.88X^2 + 15.95X - 1.85$ (0.92 ^{***} /0.26)	$Y = -5.79X^2 + 14.33X - 2.03$ (0.86 ^{***} /0.49)
	NIRv	$Y = 5.24X^2 + 13.90X - 0.43$ (0.95 ^{***} /0.32)	$Y = 110.98X^2 - 6.98X + 6.09$ (0.002/0.33)	$Y = -65.04X^2 + 39.31X - 1.54$ (0.91 ^{***} /0.28)	$Y = -28.70X^2 + 28.32X - 1.29$ (0.84 ^{***} /0.52)
US_UMB	NDVI	$Y = 4.17X^2 - 0.01X + 0.64$ (0.95 ^{***} /0.16)	$Y = -33.80X^2 + 60.47X - 23.35$ (0.29 [*] /0.16)	$Y = -12.04X^2 + 22.92X - 7.03$ (0.86 ^{***} /0.29)	$Y = -1.35X^2 + 7.37X - 1.68$ (0.90 ^{***} /0.25)
	EVI	$Y = -0.95X^2 + 6.69X - 0.07$ (0.91 ^{***} /0.22)	$Y = -61.66X^2 + 71.65X - 17.14$ (0.19/0.17)	$Y = -16.35X^2 + 20.03X - 2.42$ (0.92 ^{***} /0.21)	$Y = -4.74X^2 + 9.93X - 0.59$ (0.90 ^{***} /0.25)
	NIRv	$Y = -9.30X^2 + 12.77X + 0.35$ (0.90 ^{***} /0.23)	$Y = -49.41X^2 + 33.47X - 1.99$ (0.26 [*] /0.16)	$Y = -34.60X^2 + 24.12X - 0.31$ (0.87 ^{***} /0.27)	$Y = -18.18X^2 + 16.54X + 0.16$ (0.87 ^{***} /0.29)
US_MMS	NDVI	$Y = 10.12X^2 - 6.62X + 1.12$ (0.92 ^{***} /0.27)	$Y = 82.70X^2 - 135.94X + 58.70$ (0.26 ^{**} /0.34)	$Y = 7.30X^2 - 2.93X + 0.19$ (0.80 ^{***} /0.47)	$Y = 8.34X^2 - 4.30X + 0.51$ (0.91 ^{***} /0.42)

	EVI	$Y = 3.42X^2 + 3.76X - 0.78$ (0.90***/0.31)	$Y = -15.92X^2 + 22.15X - 4.09$ (0.15*/0.51)	$Y = 6.32X^2 + 4.33X - 0.73$ (0.90***/0.35)	$Y = -6.63X^2 + 12.69X - 2.07$ (0.86***/0.52)
	NIRv	$Y = 11.76X^2 + 5.29X - 0.38$ (0.91***/0.29)	$Y = -11.55X^2 + 12.75X + 0.39$ (0.26**/0.46)	$Y = 0.89X^2 + 14.77X - 0.87$ (0.89***/0.36)	$Y = -16.97X^2 + 18.93X - 1.22$ (0.86***/0.51)
CA_Oas	NDVI	$Y = -6.83X^2 + 17.01X - 4.91$ (0.87***/0.53)	$Y = -275.52X^2 + 468.25X - 194.10$ (0.20/0.53)	$Y = 10.44X^2 - 5.00X + 1.09$ (0.89***/0.54)	$Y = -4.36X^2 + 13.04X - 3.61$ (0.86***/0.62)
	EVI	$Y = -15.96X^2 + 20.77X - 2.35$ (0.86***/0.54)	$Y = 146.35X^2 - 177.01X + 57.85$ (0.23/0.52)	$Y = 2.75X^2 + 8.79X - 1.17$ (0.89***/0.53)	$Y = -14.84X^2 + 20.40X - 2.45$ (0.86***/0.60)
	NIRv	$Y = -12.95X^2 + 22.13X - 0.71$ (0.84***/0.59)	$Y = 171.77X^2 - 110.50X + 22.06$ (0.17/0.54)	$Y = -64.15X^2 + 39.34X - 1.56$ (0.92***/0.46)	$Y = -50.75X^2 + 35.04X - 1.46$ (0.86***/0.60)
JP_TKY	NDVI	$Y = 56.66X^2 - 84.66X + 31.66$ (0.89***/0.18)	$Y = 114.98X^2 - 203.43X + 91.62$ (0.11/0.27)	$Y = 12.45X^2 - 12.80X + 3.14$ (0.83***/0.23)	$Y = 18.15X^2 - 21.97X + 6.66$ (0.79***/0.34)
	EVI	$Y = 9.20X^2 - 6.63X + 1.32$ (0.77***/0.25)	$Y = 2.48X^2 - 2.09X + 2.08$ (0.10/0.25)	$Y = 6.56X^2 - 0.04X - 0.23$ (0.84***/0.19)	$Y = -2.58X^2 + 5.60X - 1.0$ (0.55***/0.49)
	NIRv	$Y = 29.04X^2 - 9.35X + 0.72$ (0.79***/0.54)	$Y = -3.90X^2 + 4.84X + 0.62$ (0.27**/0.52)	$Y = 25.93X^2 + 4.17X - 0.50$ (0.89***/0.53)	$Y = -10.44X^2 + 10.07X - 0.65$ (0.54***/0.54)
US_ne1	NDVI	$Y = 19.55X^2 - 13.16X + 2.46$ (0.90***/0.49)	$Y = 188.15X^2 - 311.93X + 134.07$ (0.14/0.66)	$Y = 6.12X^2 + 2.18X - 1.90$ (0.82***/0.78)	$Y = 14.61X^2 - 8.12X + 1.27$ (0.91***/0.66)
	EVI	$Y = 11.01X^2 - 1.17X + 0.12$ (0.84***/0.63)	$Y = -10.93X^2 + 21.38X - 4.42$ (0.16/0.66)	$Y = 7.22X^2 + 4.77X - 1.25$ (0.89***/0.59)	$Y = 6.37X^2 + 3.75X - 0.73$ (0.89***/0.73)
	NIRv	$Y = 50.51X^2 - 1.89X - 0.07$ (0.87***/0.57)	$Y = 17.01X^2 - 5.71X + 4.99$ (0.13/0.67)	$Y = 13.32X^2 + 8.92X - 0.81$ (0.80***/0.81)	$Y = -4.88X^2 + 19.99X - 1.81$ (0.86***/0.80)
US_ne2	NDVI	$Y = 7.81X^2 - 2.28X + 0.07$ (0.94***/0.31)	$Y = -53.18X^2 + 93.65X - 36.11$ (0.01/0.56)	$Y = 31.92X^2 - 29.59X + 6.94$ (0.90***/0.59)	$Y = 15.89X^2 - 10.39X + 1.85$ (0.92***/0.62)
	EVI	$Y = 4.14X^2 + 3.25X - 0.70$	$Y = -36.42X^2 + 53.93X - 14.77$	$Y = 10.14X^2 + 0.30X - 0.45$	$Y = 4.71X^2 + 4.72X - 1.14$

		(0.92*** / 0.39)	(0.06 / 0.55)	(0.73*** / 0.99)	(0.87*** / 0.77)
	NIRv	$Y = 9.72X^2 + 8.69X - 0.83$ (0.91*** / 0.39)	$Y = 54.34X^2 - 42.03X + 13.15$ (0.009 / 0.57)	$Y = 14.31X^2 + 12.69X - 1.75$ (0.75*** / 0.96)	$Y = 3.21X^2 + 15.69X - 1.68$ (0.86*** / 0.79)
US_ne3	NDVI	$Y = 6.37X^2 - 0.82X - 0.27$ (0.94*** / 0.31)	$Y = 2.13X^2 + 1.79X + 0.92$ (0.26 / 0.42)	$Y = 3.55X^2 + 2.52X - 1.44$ (0.93*** / 0.33)	$Y = 6.84X^2 - 0.96X - 0.33$ (0.92*** / 0.43)
	EVI	$Y = 2.84X^2 + 4.58X - 0.86$ (0.90*** / 0.38)	$Y = 9.85X^2 - 9.08X + 5.63$ (0.23 / 0.43)	$Y = -4.78X^2 + 11.21X - 2.17$ (0.94*** / 0.30)	$Y = -0.73X^2 + 8.40X - 1.57$ (0.89*** / 0.51)
	NIRv	$Y = -2.85X^2 + 15.75X - 1.42$ (0.90*** / 0.47)	$Y = -70.82X^2 + 51.48X - 5.21$ (0.41** / 0.37)	$Y = -12.12X^2 + 20.72X - 1.98$ (0.96*** / 0.26)	$Y = -9.19X^2 + 20.20X - 1.87$ (0.92** / 0.45)
WIBU	NDVI	$Y = 18.85X^2 - 14.59X + 2.90$ (0.94*** / 0.25)	$Y = -13.16X^2 + 28.05X - 9.92$ (0.50** / 0.41)	/	$Y = 1.34X^2 + 7.85X - 3.18$ (0.75*** / 0.66)
	EVI	$Y = 7.08X^2 + 1.06X - 0.65$ (0.90*** / 0.31)	$Y = 19.69X^2 - 20.43X + 8.70$ (0.42* / 0.43)	/	$Y = -13.46X^2 + 21.49X - 4.41$ (0.69*** / 0.80)
	NIRv	$Y = 33.78X^2 - 1.53X - 0.16$ (0.95*** / 0.23)	$Y = -352.14X^2 + 214.07X - 28.40$ (0.81*** / 0.25)	/	$Y = 9.03X^2 + 13.89X - 1.67$ (0.87*** / 0.58)
US_Var	NDVI	$Y = 6.38X^2 - 3.46X + 0.82$ (0.61*** / 0.38)	$Y = -9.62X^2 + 17.64X - 5.74$ (0.16 / 0.49)	$Y = 6.99X^2 - 2.99X + 0.36$ (0.58*** / 0.51)	$Y = 5.85X^2 - 2.17X + 0.30$ (0.61*** / 0.46)
	EVI	$Y = 8.80X^2 - 1.85X + 0.59$ (0.60*** / 0.38)	$Y = -29.06X^2 + 31.59X - 6.34$ (0.29 / 0.45)	$Y = 11.17X^2 - 2.68X + 0.44$ (0.49*** / 0.56)	$Y = 7.12X^2 - 0.07X + 0.19$ (0.56*** / 0.48)
	NIRv	$Y = 10.69X^2 + 4.10X + 0.13$ (0.65*** / 0.36)	$Y = -45.10X^2 + 27.21X - 1.88$ (0.22 / 0.47)	$Y = 24.43^2 + 0.62X + 0.16$ (0.43*** / 0.59)	$Y = 11.35X^2 + 4.73X + 0.005$ (0.56*** / 0.48)

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$