Supplementary figure and tables

Temporal Variability of Precipitation and Biomass of Alpine Grasslands on the Northern Tibetan Plateau

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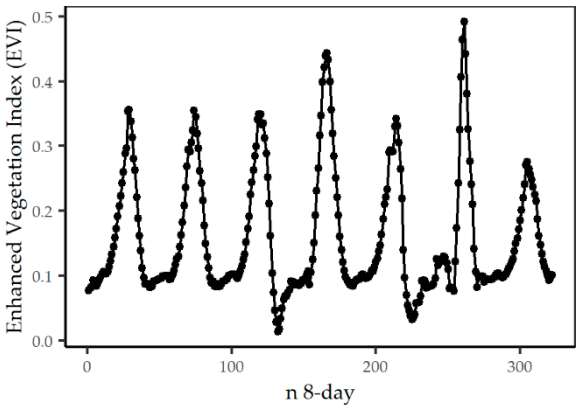

Figure S1: The dynamic of smoothed enhanced vegetation index (EVI) at the alpine meadow site (Nagqu) from 2009 to 2015.

Table S1. Parameters and fitness comparisons of the potential models (linear, quadratic, exponential and logarithmic) using the enhanced vegetation index (EVI) for estimating the peak aboveground biomass (AGB_{peak}, g m^{-2}) of alpine grasslands on the northern Tibetan Plateau.

Model	Coefficients	Estimate	Std. Error	t-value	*p*-value	R^2	RMSE	AIC
linear								
$AGB_{peak} = a + b * GEVI$	a	-21.27	8.65	-2.46	0.02	**0.78**	**19.73**	**287.67**
	b	545.22	52.45	10.40	< 0.001			
$AGB_{peak} = a + b * EVI_{beforepeak}$	a	-18.09	10.18	-1.78	0.09	0.70	22.99	297.47
	b	526.75	62.23	8.46	< 0.001			
$AGB_{peak} = a + b * EVI_{peak}$	a	-1.19	9.88	-2.12	0.91	0.63	25.85	304.96
	b	275.17	38.75	7.10	< 0.001			
Quadratic								
$AGB_{peak} = a + b*GEVI + c*GEVI^2$	a	-23.56	19.59	-1.20	0.24	0.78	19.73	289.65
	b	580.11	273.86	2.12	0.04			
	c	-108.20	832.94	-0.13	0.90			
$AGB_{peak} = a + b*EVI_{beforepeak} + c*EVI_{beforepeak}^2$	a	60.42	4.22	14.30	< 0.001	0.71	22.75	289.80
	b	201.01	23.90	8.41	< 0.001			
	c	18.72	23.90	0.78	0.44			
$AGB_{peak} = a + b*EVI_{peak} + c*EVI_{peak}^2$	a	60.42	4.78	12.65	< 0.001	0.63	25.72	306.64
	b	189.59	27.02	7.02	< 0.001			
	c	-14.38	27.02	-0.53	0.60			
Exponential								
$AGB_{peak} = a + b * exp(GEVI)$	a	-478.29	52.18	-9.17	< 0.001	0.78	19.80	287.89
	b	462.65	44.71	10.35	< 0.001			
$AGB_{peak} = a + b * exp(EVI_{beforepeak})$	a	-463.94	61.57	-7.54	< 0.001	0.71	22.86	297.08
	b	450.72	52.80	8.54	< 0.001			
$AGB_{peak} = a + b * exp(EVI_{peak})$	a	-208.54	38.77	-5.38	< 0.001	0.62	26.11	305.59
	b	213.40	30.53	6.99	< 0.001			
Logarithmic								
$AGB_{peak} = a + b * log(GEVI)$	a	207.74	16.16	12.86	< 0.001	0.75	21.32	292.62
	b	733.11	7.78	9.40	< 0.001			
$AGB_{peak} = a + b * log(EVI_{beforepeak})$	a	200.76	18.56	10.82	< 0.001	0.67	24.35	301.13
	b	69.50	8.92	7.79	< 0.001			
$AGB_{peak} = a + b * log(EVI_{peak})$	a	151.46	13.74	11.02	< 0.001	0.62	25.95	305.20
	b	54.53	7.73	7.06	< 0.001			

Note: GEVI, the average EVI during the plant growing season from May to September; $EVI_{beforepeak}$, the average EVI before reaching the peak value in the plant growing season; EVI_{peak}, the peak EVI value in the plant growing season. R^2, the coefficient of determination, which indicates the proportion of the variability of the response variable explained by the model; RMSE, the root mean square error, which gives the standard deviation of the model prediction error; AIC, the Akaike information criterion, which is an estimator of the relative quality of statistical models for a given set of data. A model with larger values of R^2 and smaller values of RMES and AIC performs better. Bolded R^2, RMSE, and AIV represent the best-fitted model.

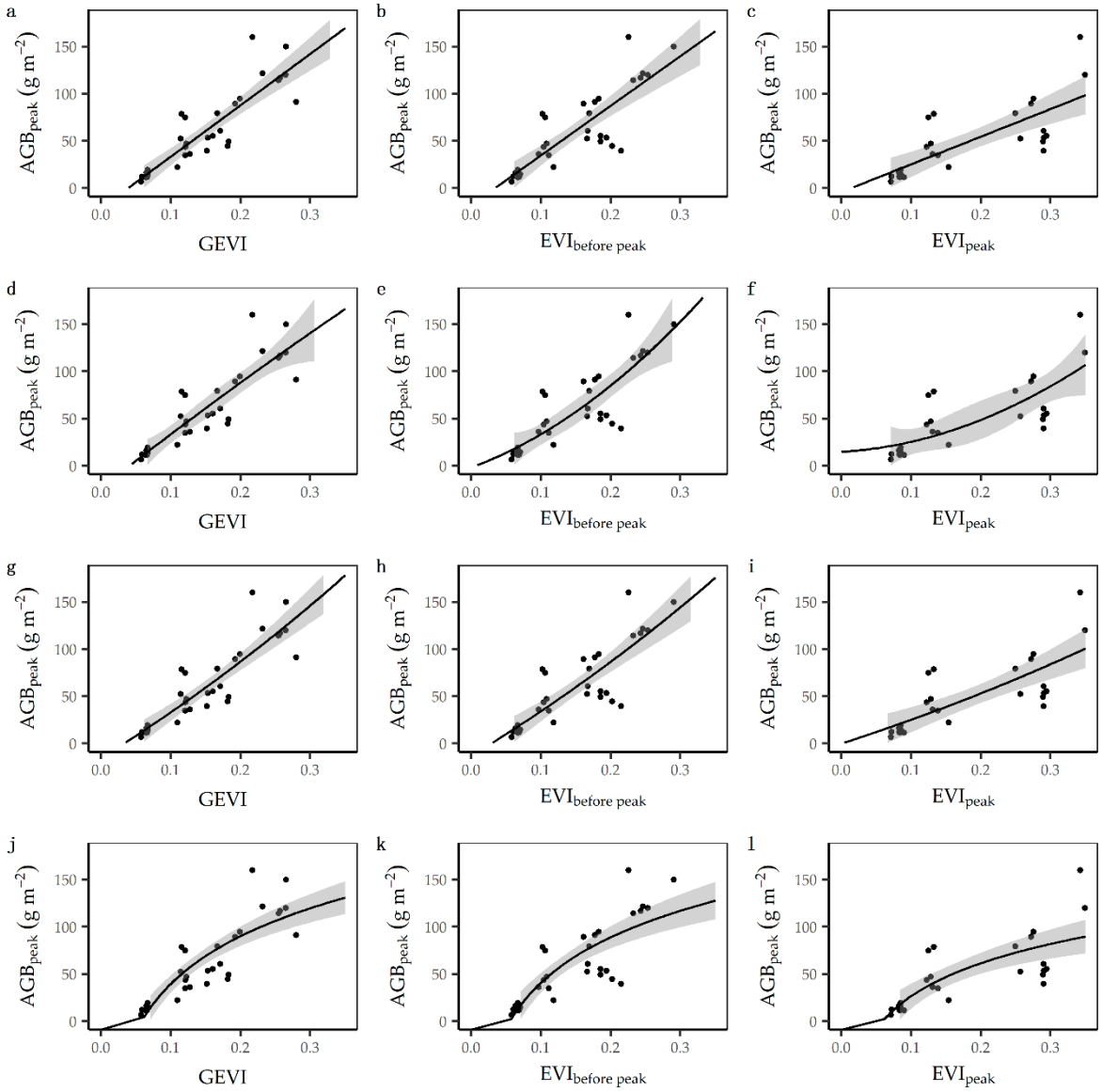

Figure S2. Relationships of peak aboveground biomass (AGB_{peak}) with the average enhanced vegetation index (EVI) during the plant growing season (GEVI), the average EVI before it reaches the peak value ($EVI_{beforepeak}$), and the peak EVI value (EVI_{peak}) in the plant growing season. Linear (a, b, c), quadratic (e, f, g), exponential (g, h, i) and logarithmic (j, k, l) models were examined. See Table S1 for the summary of parameters and fitness indicators of the candidate models.

Table S2. Summary of correlations of the peak aboveground biomass (AGB_{peak}) with the growing season precipitation (GSP), the number of precipitation events (Events), the intensity of precipitation events (Intensity), and the time interval between precipitation events (Interval) within each alpine grassland type on the northern Tibetan Plateau. Percentages at the pixel scale were given for positive and negative correlations at α= 0.1 significance level and non-significant correlation within each alpine grassland type.

Grassland type	Correlation class	Fractions of pixels with a significant correlation of ANPP (%)			
		GSP	Events	Intensity	Interval
alpine meadow	significantly positive	7.98	13.36	5.36	2.44
	significantly negative	17.91	2.86	19.43	8.77
	insignificant	74.11	83.78	75.20	88.79
alpine meadow steppe	significantly positive	18.86	17.15	11.99	1.42
	significantly negative	5.26	2.03	5.47	8.89
	insignificant	75.88	80.81	82.54	89.69
alpine steppe	significantly positive	8.22	17.39	2.74	2.76
	significantly negative	7.27	4.30	9.11	9.14
	insignificant	84.52	78.31	88.15	88.10
desert steppe	significantly positive	2.14	5.02	0.84	2.72
	significantly negative	11.67	6.21	12.25	4.56
	insignificant	86.18	88.78	86.90	92.72
overall	significantly positive	7.93	13.52	3.90	2.97
	significantly negative	11.14	4.77	12.02	7.95
	insignificant	80.93	81.71	84.08	89.08

Table S3. Mean weights of three indices of the temporal variability of precipitation (contributors) at different levels of the standardized vegetation sensitivity index (VSI) in each alpine grassland type on the northern Tibetan Plateau.

Grassland type	Contributor	Standardized VSI level				
		0-20	20-40	40-60	60-80	80-100
alpine meadow	events	0.44	0.46	0.48	0.49	0.47
	intensity	0.13	0.13	0.12	0.08	0.06
	interval	0.43	0.41	0.40	0.44	0.47
meadow-steppe	events	0.45	0.46	0.44	0.43	0.37
	intensity	0.21	0.20	0.19	0.21	0.29
	interval	0.34	0.34	0.37	0.36	0.34
alpine steppe	events	0.45	0.45	0.46	0.45	0.40
	intensity	0.23	0.24	0.21	0.20	0.21
	interval	0.32	0.31	0.32	0.35	0.39
desert-steppe	events	0.46	0.45	0.42	0.43	0.39
	intensity	0.12	0.20	0.22	0.23	0.25
	interval	0.41	0.35	0.37	0.34	0.35
overall	events	0.45	0.45	0.46	0.46	0.43
	intensity	0.21	0.22	0.20	0.16	0.15
	interval	0.34	0.32	0.35	0.38	0.42