Predicting Plant Diversity Based on Remote Sensing Products in the Semiarid Region of Inner Mongolia

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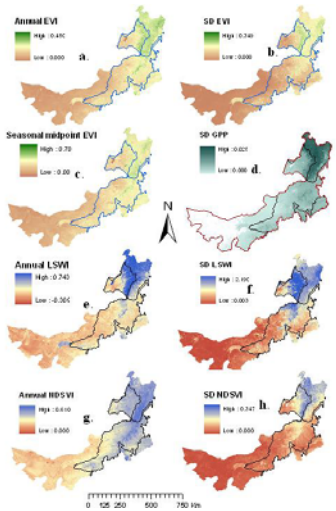
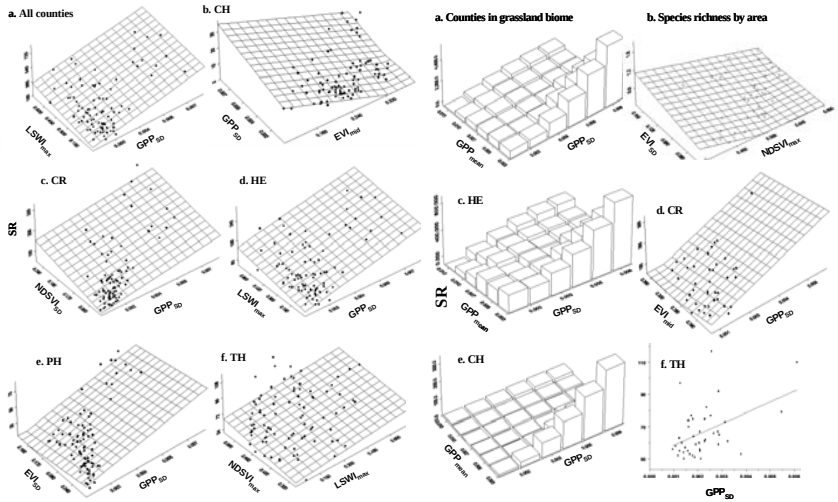
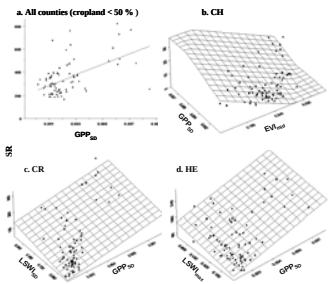
Background

Vegetation indices such as NDVI have been used to predict species richness at landscape and regional scales. However, the use of NDVI is limited in semiarid regions by sensitivity to bright soil signature, which is maximum at 50% cover. We hypothesize that improved productivity measures, e.g. MODIS GPP, EVI and water content indices (NDSVI, EVI, LSWI), are better suited to predict plant distribution and richness at broader spatial scales (e.g., county, biome, and regional levels.







Methods

Distribution of each species recorded in the ***Flora of Inner Mongolia*** was transformed to a spreadsheet database. The mean, maximum and STD of MODIS GPP, LSWI, EVI, and NDSVI were regressed with SR at the county level using stepwise linear regression. To exclude the effect of land use, counties with >50% were removed from the database to repeat the analysis. The region was divided in to the desert, grassland and forest biomes based on LULC coverage.

Major Findings

Species richness (SR) decreased from desert to forest biomes, but not for all life form groups. SR showed a positive linear relation with GPP variance and $LSWI_{max}$. In addition species richness was also linearly related to metrics of biophysical variables which differed by biome and functional groups (e.g., lifeforms). Selected predictive variables varied greatly among the 3 biomes and the functional groups.

Region (N=88) 1,153,181km^2	Independent variables				Dependent variables					
	EVI	GPP	LSWI	NDSVI	SR	CH	CR	HE	PH	TH
Mean	0.163	0.009	-0.065	0.344	337	9	106	126	24	66
Minimum	0	0	-0.309	0	165	0	0	0	0	0
Maximum	0.480	0.035	0.743	0.610	822	37	328	300	90	117
STD	0.088	0.007	0.105	0.106	148	8	64	58	18	16
Total					2562	118	834	959	320	331
Of the total (%)					100	4.61	32.55	37.43	12.49	12.92
Desert biome (N=28) Area: 461,658 km^2 (40.03%)										
Mean	0.152^b	0.003^c	-0.091^b	0.267^c	277^b	16^a	69^b	100^b	22^a	65^a
Minimum	0	0.0	-0.150	0	187	2	46	65	6	50
Maximum	0.346	0.008	0.229	0.402	390	37	123	139	44	91
STD	0.045	0.001	0.053	0.040	66	10	18	23	11	11
Total					1161	79	311	441	138	192
Of the total (%)					100	6.80	26.79	37.98	11.89	16.54
Grassland biome (N =42) Area: 4 64,369 km^2 (40.27%)										
Mean	0.201^a	0.007^b	-0.073^b	0.389^b	342^{ab}	6^b	115^a	135^a	23^a	67^a
Minimum	0	0.0	-0.125	0	165	0	52	59	4	50
Maximum	0.370	0.019	0.257	0.522	822	19	328	300	90	117
STD	0.095	0.002	0.125	0.083	153	4	61	59	18	15
Total					1813	55	639	672	208	239
Of the total (%)					100	3.03	35.25	37.07	11.47	13.18
Forest Biome (N=18) Area: 227,154 km^2 (19.70%)										
Mean	0.182^{ab}	0.014^a	0.012^a	0.441^a	408^a	7^b	144^a	154^a	33^a	71^a
Minimum	0.0	0	-0.081	0	178	1	52	63	8	51
Maximum	0.378	0.026	0.311	0.567	767	17	318	280	71	105
STD	0.142	0.005	0.184	0.144	193	5	86	70	23	16
Total					1586	41	613	560	178	194
Of the total (%)					100	2.59	38.65	35.31	11.22	12.23

Acknowledgments

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