Habitat Heterogeneity Metrics
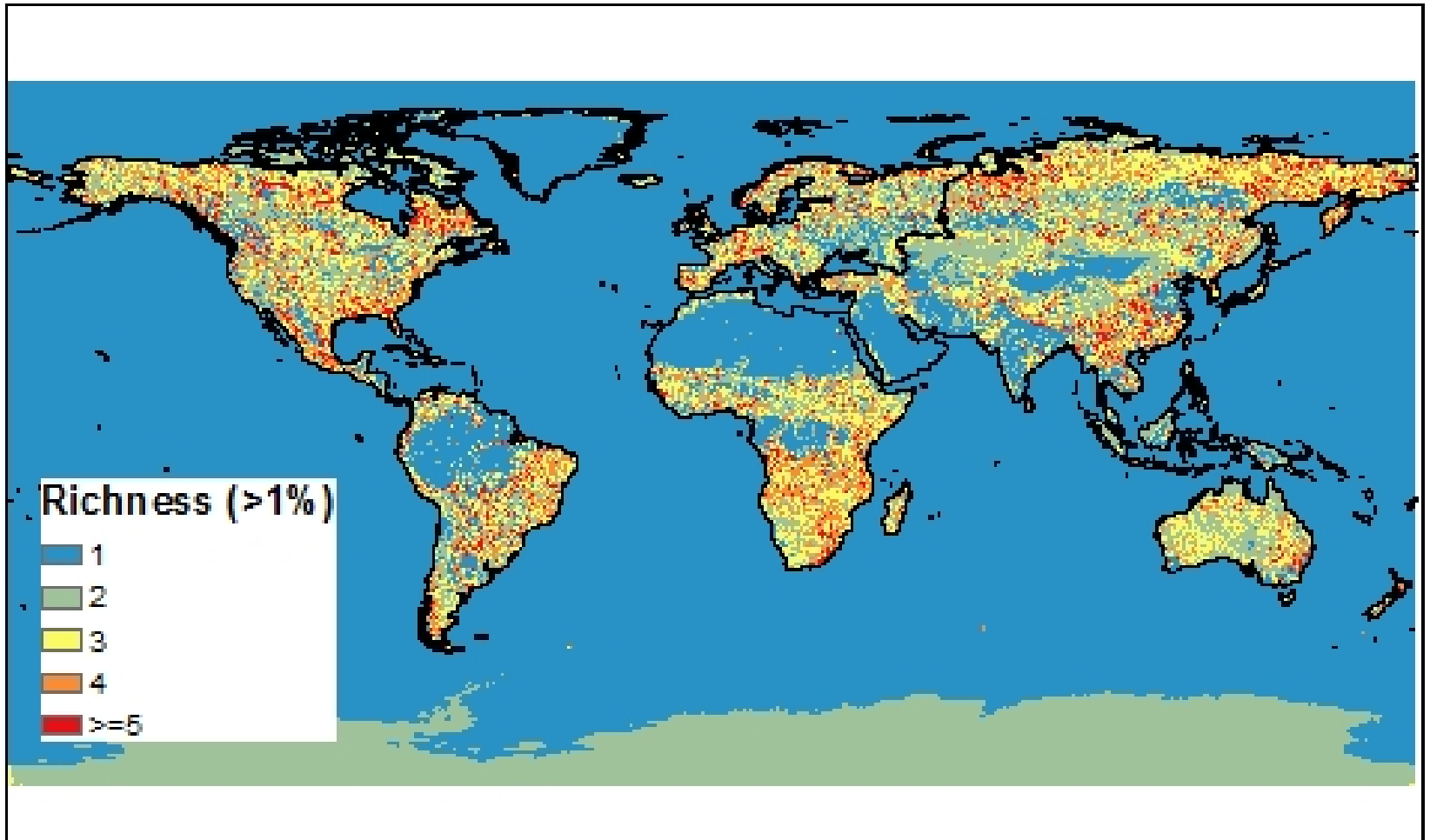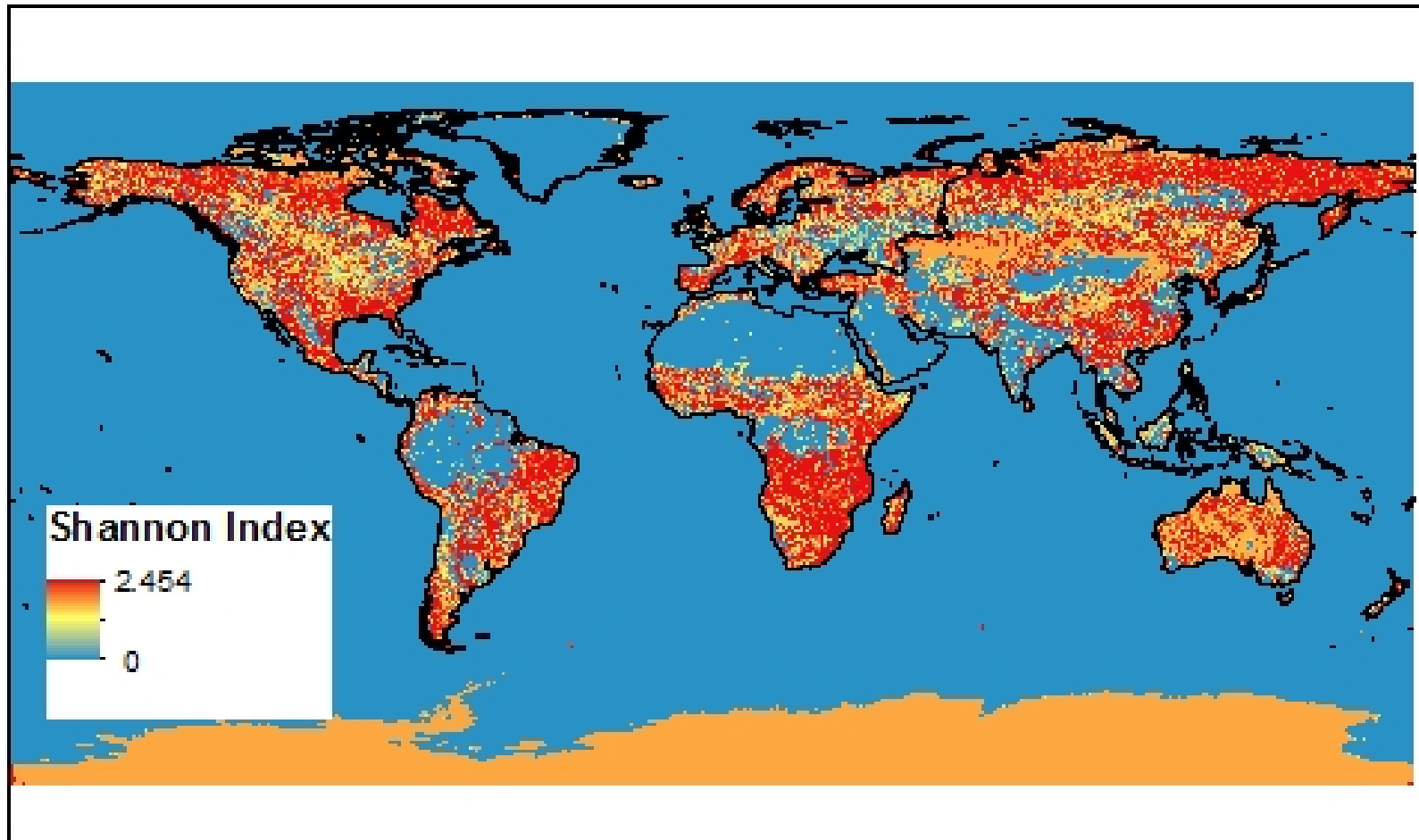
5/21/2013

Heterogeneity Metrics

- Metrics derived from 30m Landsat imagery
  - 1st and 2nd order texture metrics
  - Insufficient valid data in tropical areas
- Metrics derived from the 1km consensus land cover data
  - Proportional land cover data
  - Richness, diversity, evenness
- Metrics derived from 250m MODIS data

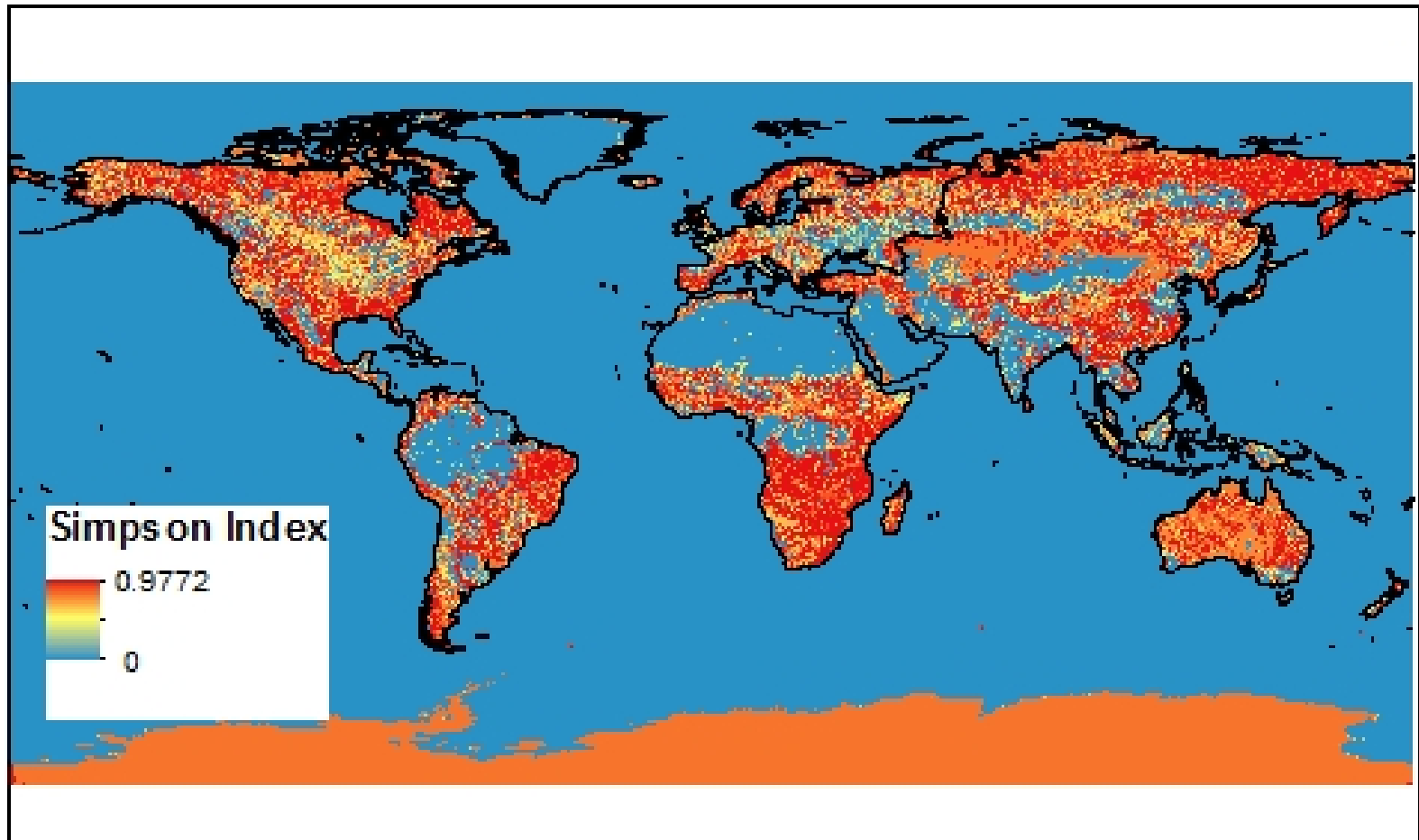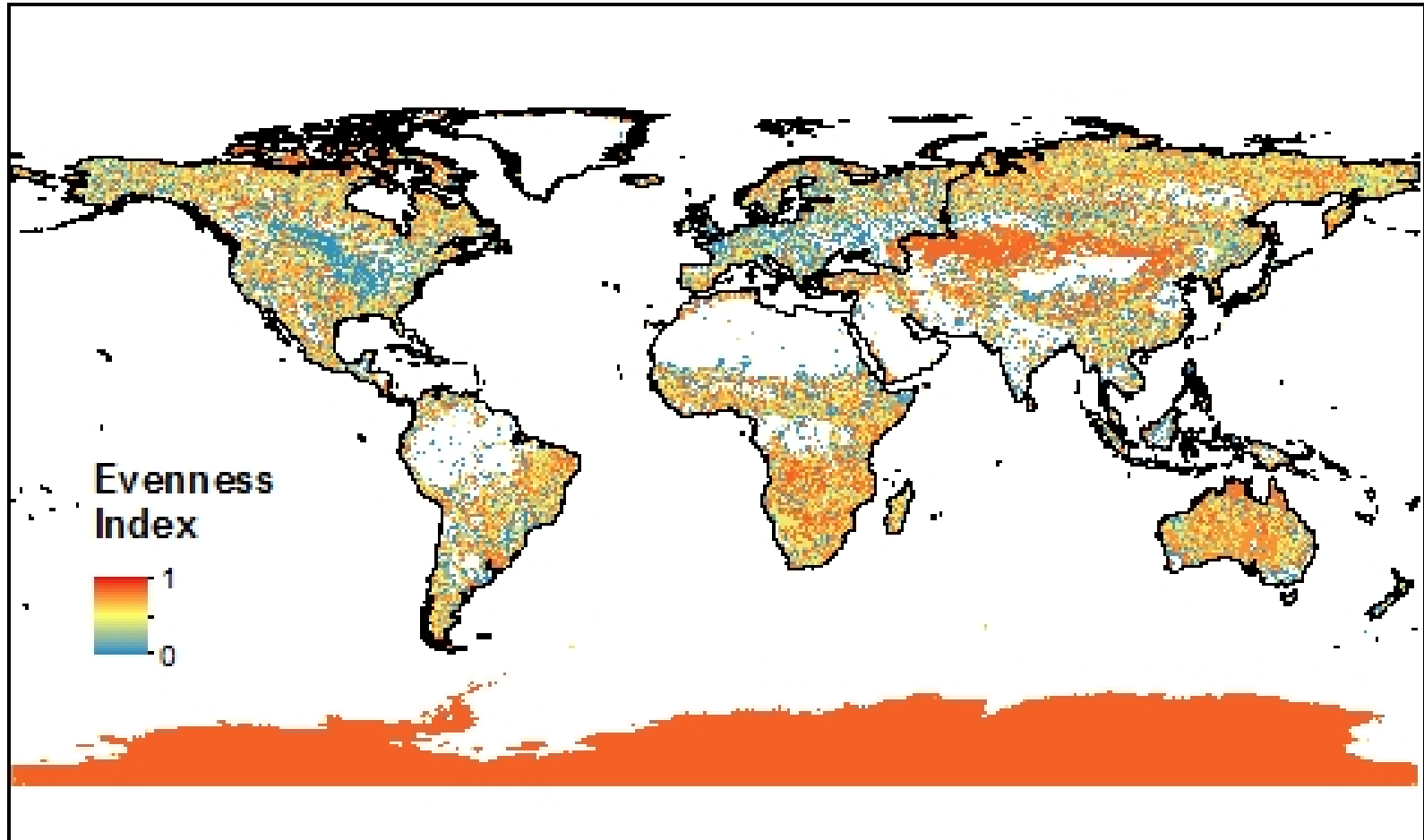# Metrics from Consensus Land Cover Data

Land Cover Class Richness

Shannon Diversity Index

Simpson Diversity Index

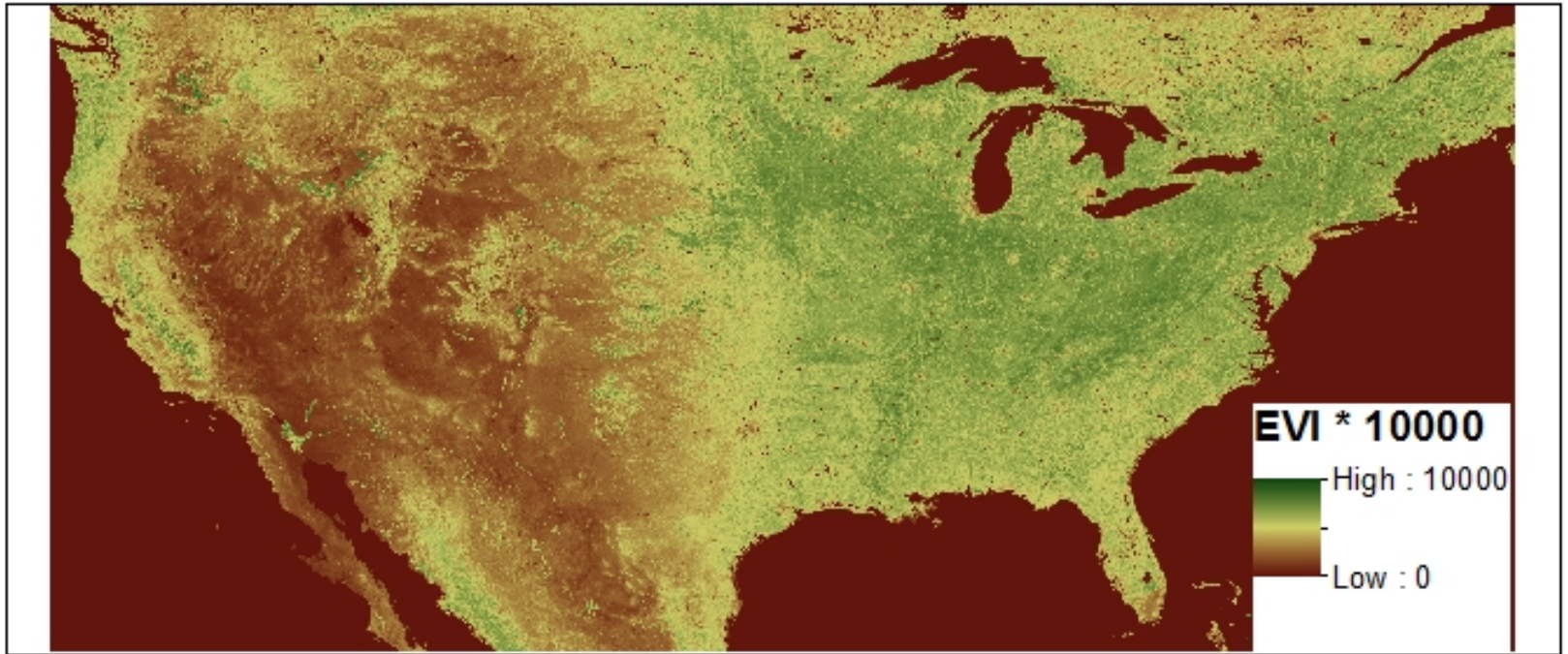# Pielou Evenness Index

Metrics from MODIS

Heterogeneity metrics from MODIS

- 250-m 16-day EVI from the Vegetation Index Product (MOD13Q1)
- 2001-2010
- Three Types of Metrics
  - No time dimension
  - Spatial heterogeneity of seasonality
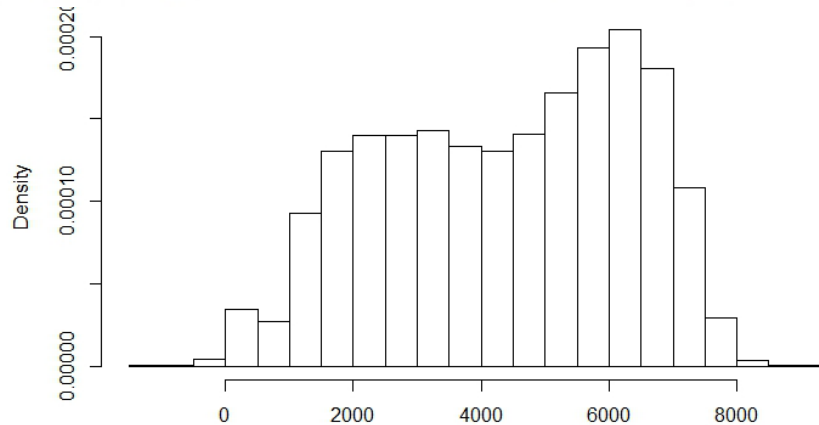 - Seasonality of spatial heterogeneity

Type 1 – No time dimension

- Obtain a 10-year time series of 16-day EVI
- Remove low quality data
- Calculate the 95th percentile over the 10-year time series for each pixel
- Generate metrics within 1km pixels (~ 4 x 4 MODIS pixels)
  - Mean, max, min, range, std, cv, median, 95th percentile, 5th percentile, skewness
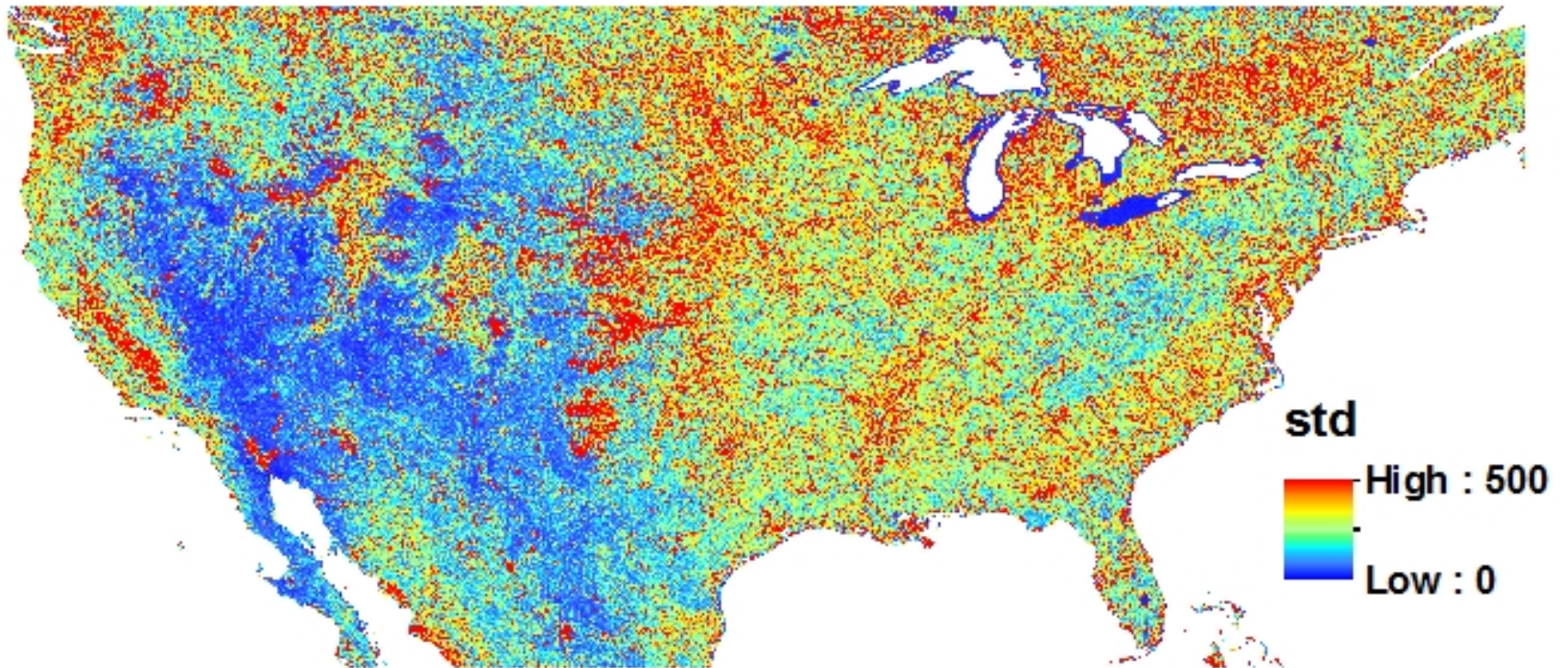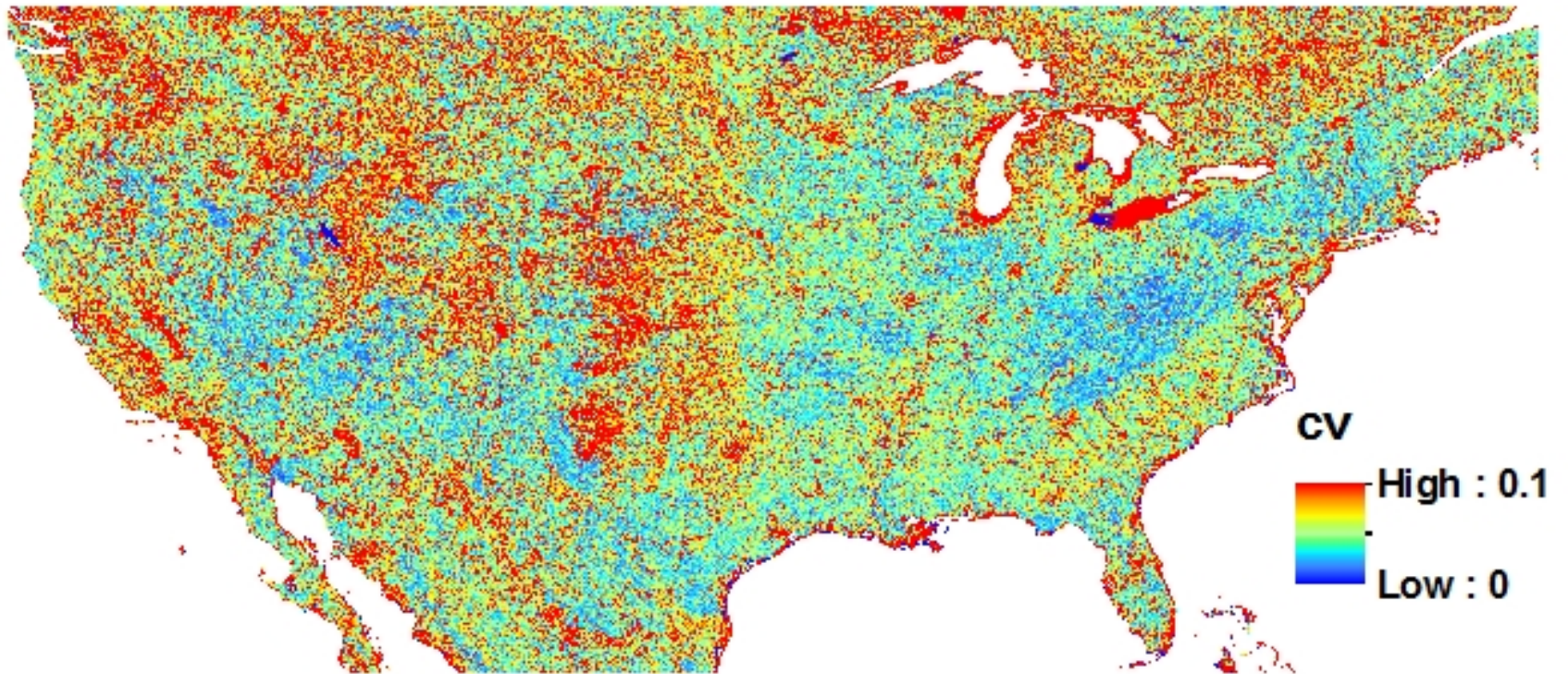 - 2nd order texture metrics
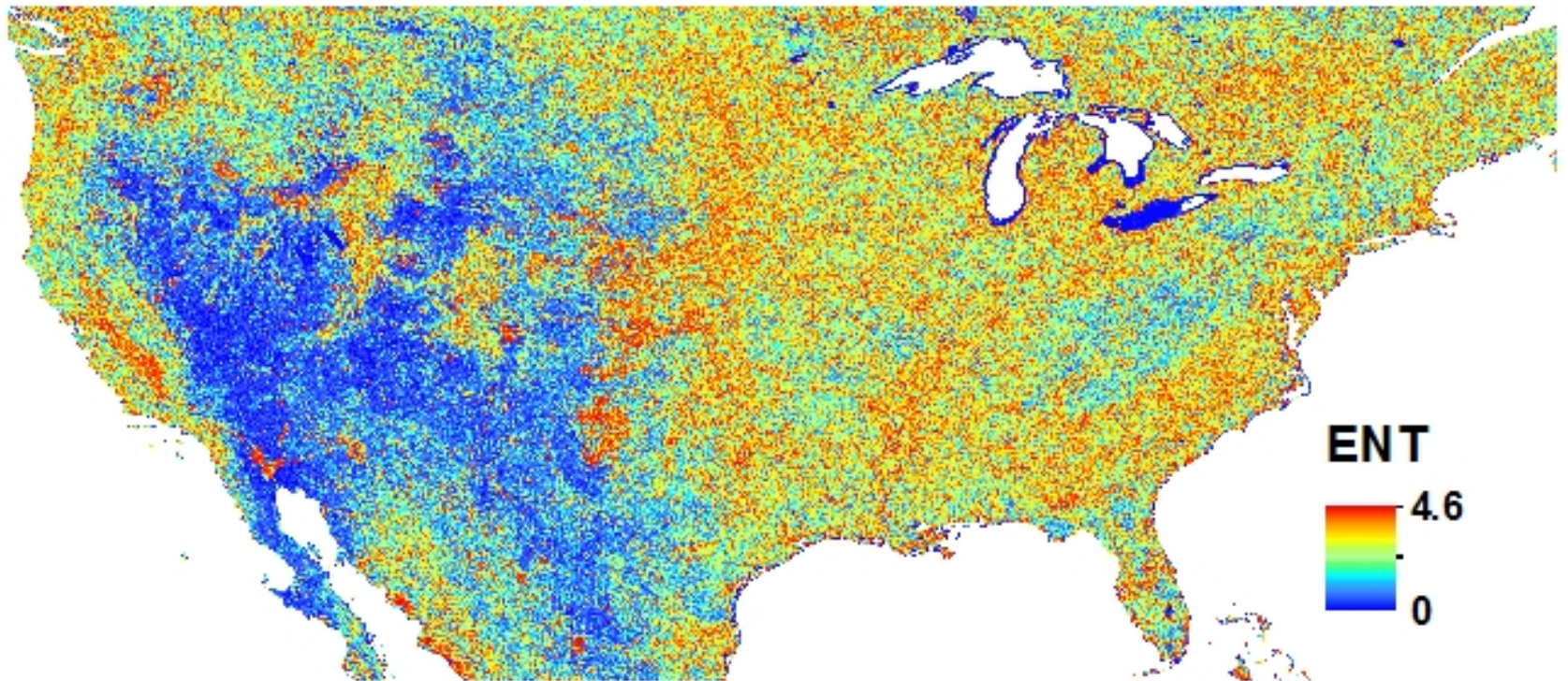
95ᵗʰ Percentile of EVI

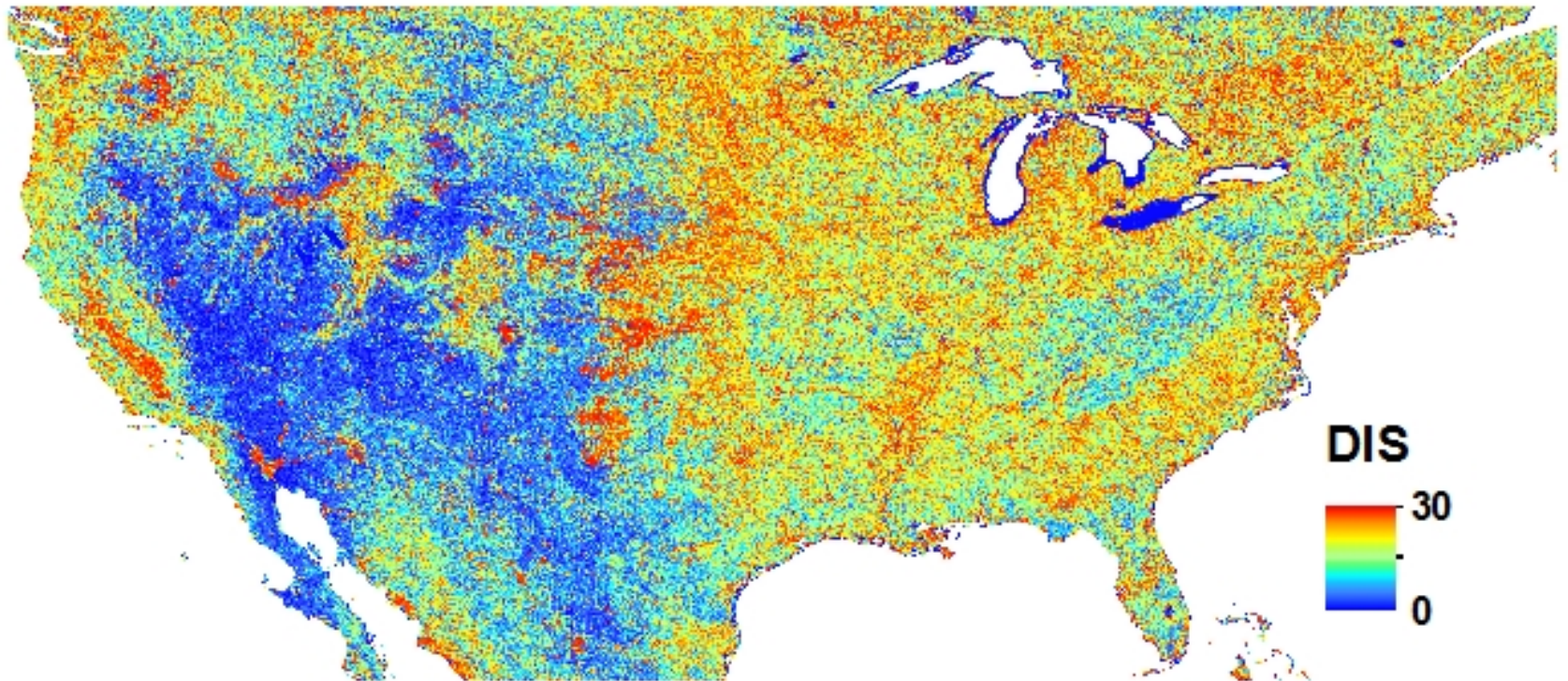Histogram of pixel values

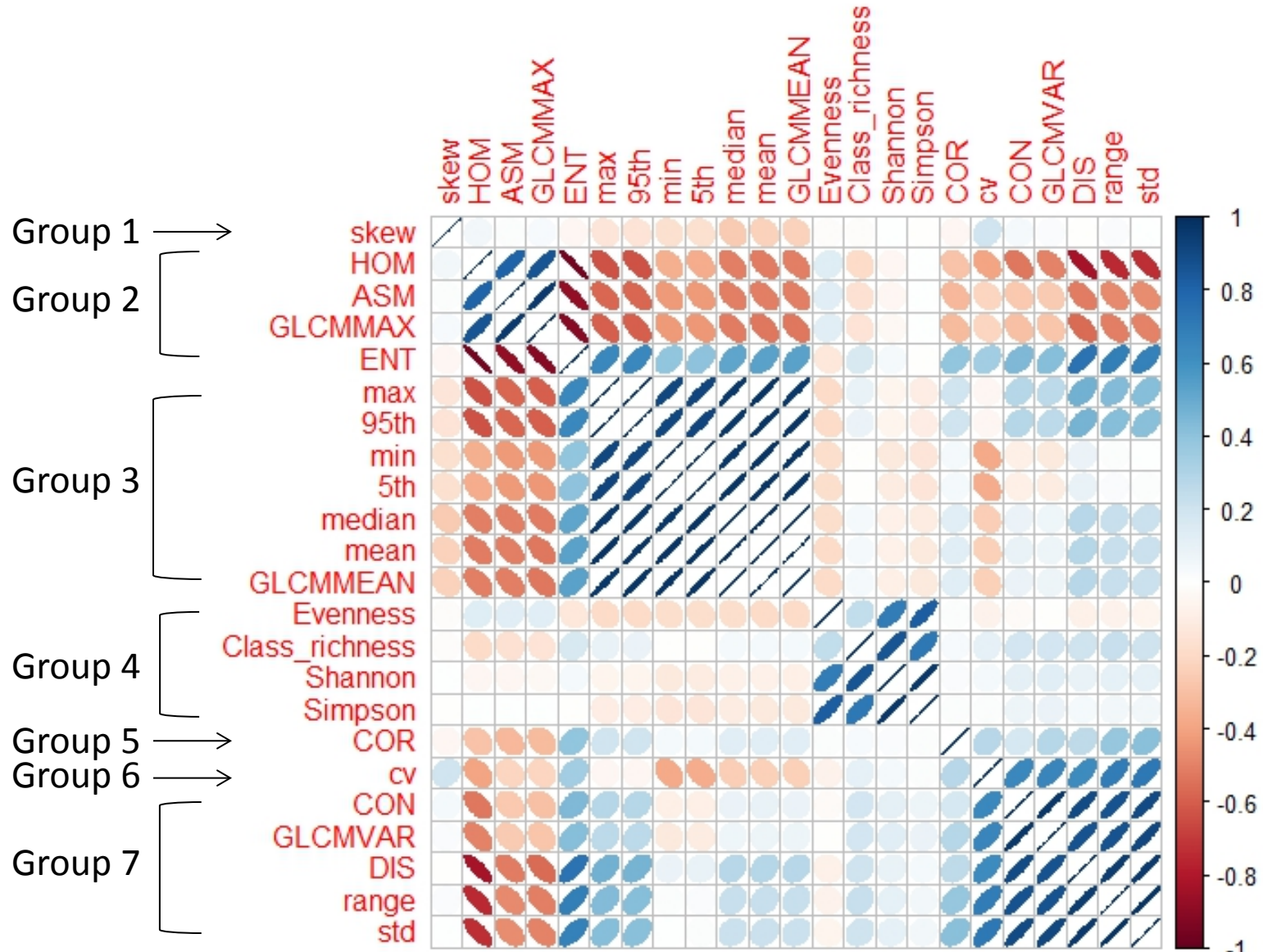# Standard Deviation

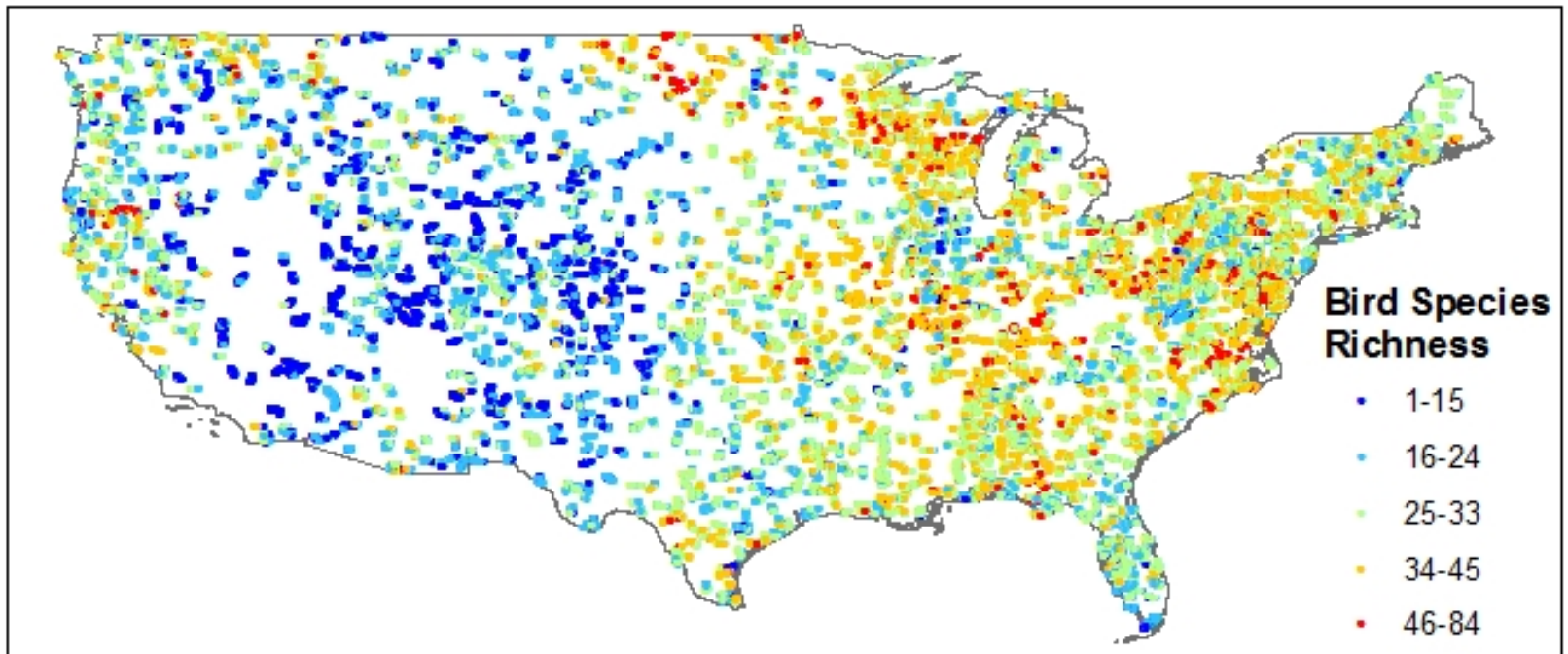# Coefficient of Variation

Entropy

Dissimilarity

Correlations between Metrics

Correlations with Bird Species Richness

- BBS stop-level data from 1997 to 2011
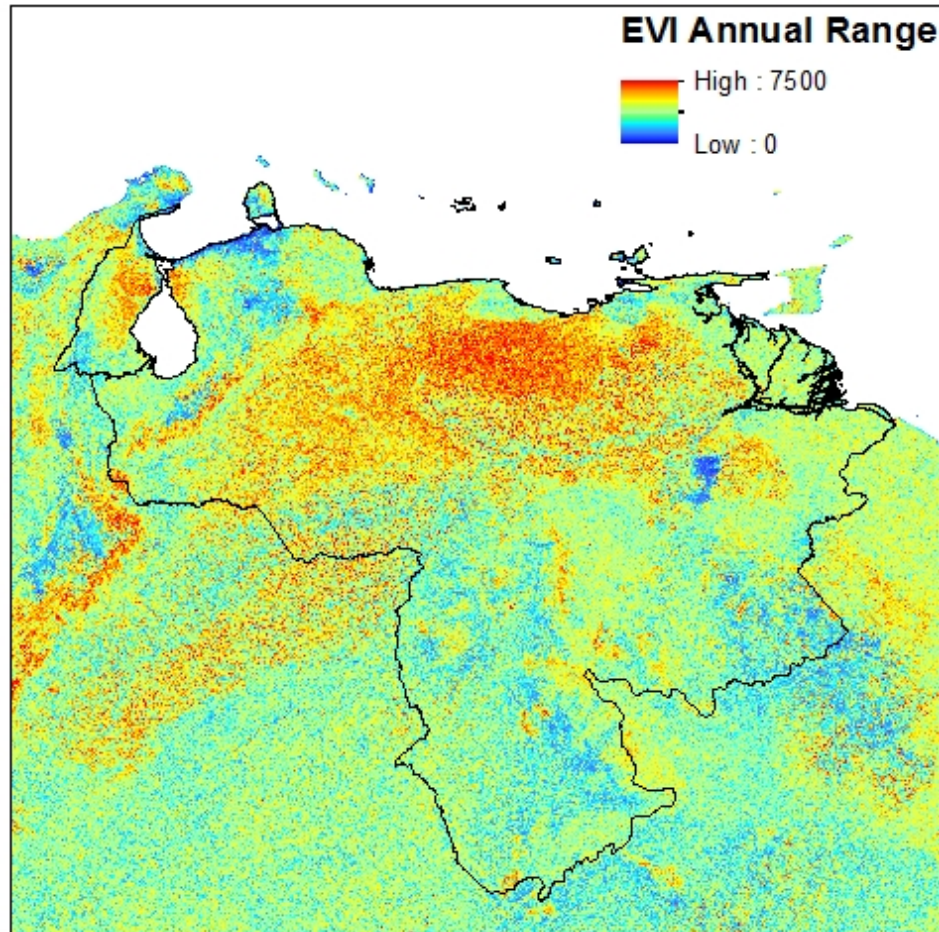- 115,300 stops (2,306 routes) were surveyed at least 10 times during the period

Bird Species Richness
- 1-15
- 16-24
- 25-33
- 34-45
- 46-84

Correlations with Bird Species Richness

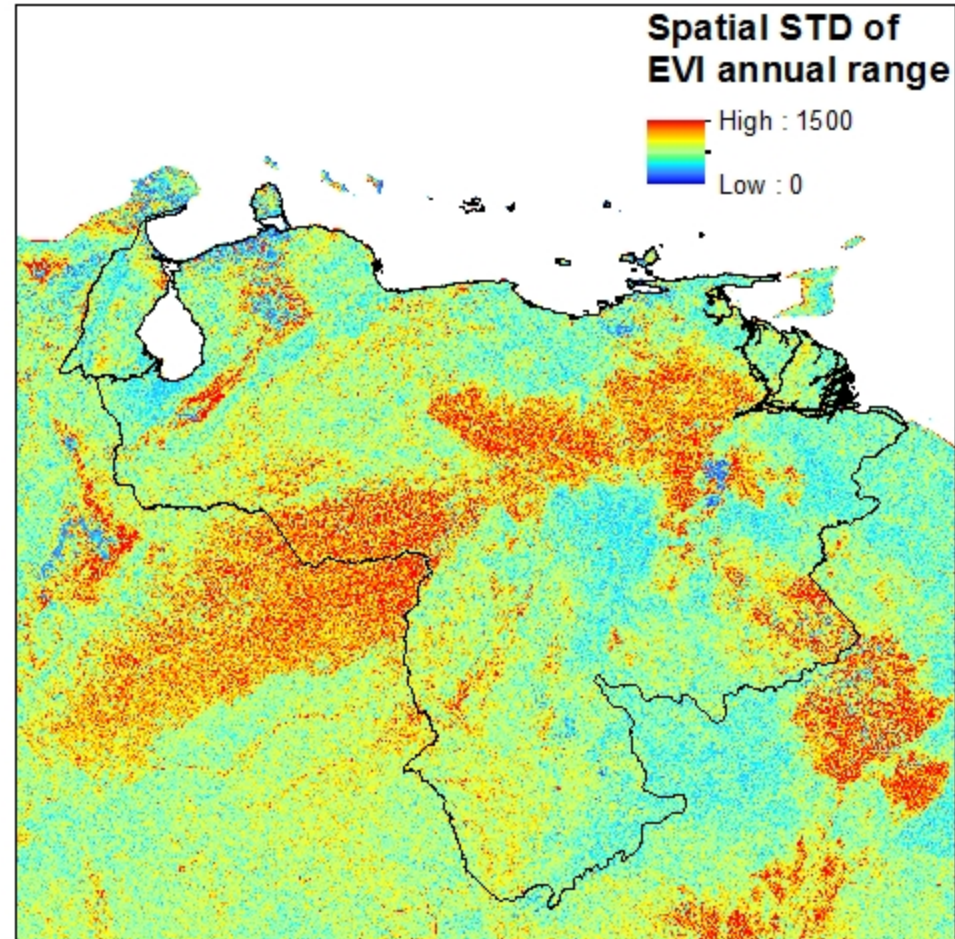| Metrics	r	Metrics	r	Metrics	r
Group 1		*Group 3*		*Group 4*	
skew	**-0.081**	max	**0.494**	Richness	**0.146**
Group 2		mean	**0.496**	Evenness	**0.055**
HOM	**-0.301**	min	**0.470**	Shannon	**0.072**
ASM	**-0.330**	5th	**0.472**	Simpson	**0.050**
GLCMMAX	**-0.315**	median	**0.495**	*Group 7*	
ENT	**0.315**	95th	**0.495**	CON	**0.016**
Group 5		GLCMMEAN	**0.495**	GLCMVAR	**0.008**
COR	**0.036**			DIS	**0.133**
Group 6				range	**0.119**
cv	**-0.075**			std	**0.105**

Type 2 – Spatial heterogeneity of seasonality

- Obtain the 95th percentile of EVI over 10 years for each 16-day period of the year for each MODIS pixel
  - Time series of 95th percentile of EVI (totally 23 images)
- Quantify intra-annual variability for each MODIS pixel
  - E.g. mean annual range of EVI
- Calculate spatial heterogeneity metrics based on the temporal variability
  - E.g. STD of annual EVI range within 1km pixels

Annual range (max - min) of EVI

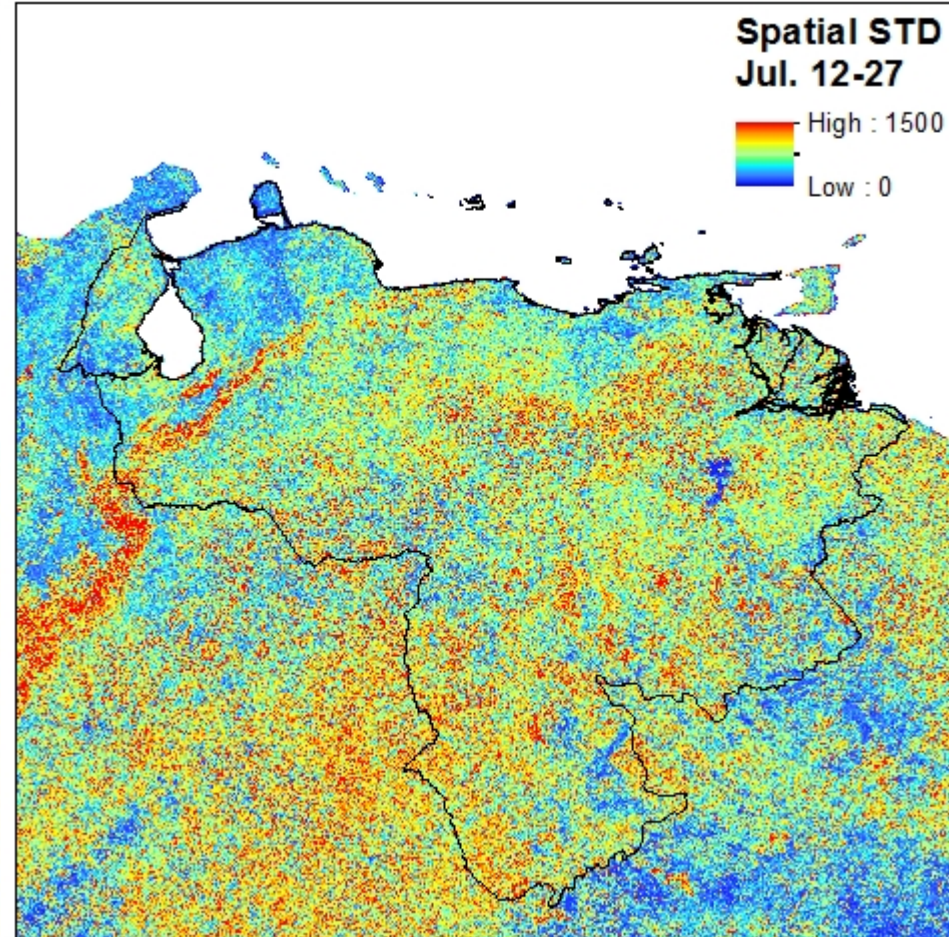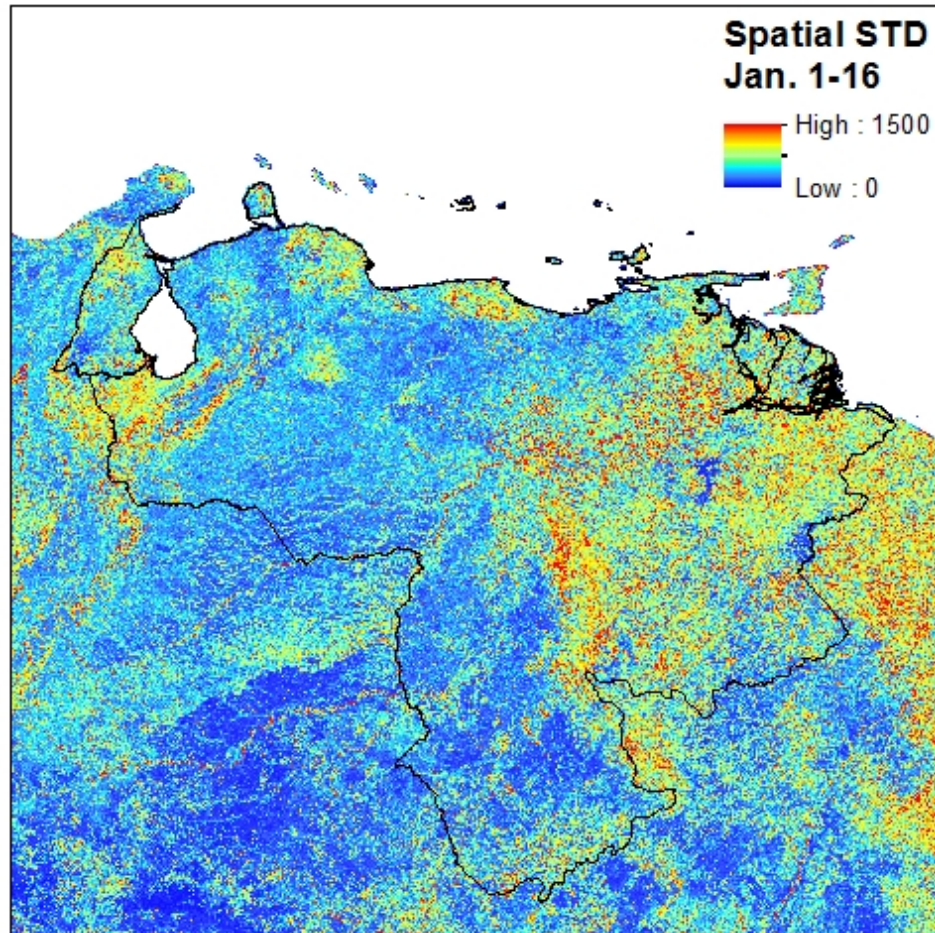**STD of annual EVI range within 1km pixels**

Type 3 – Seasonality of spatial heterogeneity

- Obtain the 95th percentile of EVI over 10 years for each 16-day period of the year for each MODIS pixel

- Quantify spatial heterogeneity within 1km pixels for each 16-day period of the year
  - Time series of spatial heterogeneity metrics

- Quantify intra-annual variability of the spatial heterogeneity
  - E.g. intra-annual STD of within-1km STD of EVI

Spatial Heterogeneity in Different Time Periods

Within-1km STD for Jan. 1-16

Within-1km STD for Jul. 12-27

Intra-annual STD of within-1km STD