Estimation of bamboo forest carbon reserves and analysis of temporal and spatial variation characteristics in China

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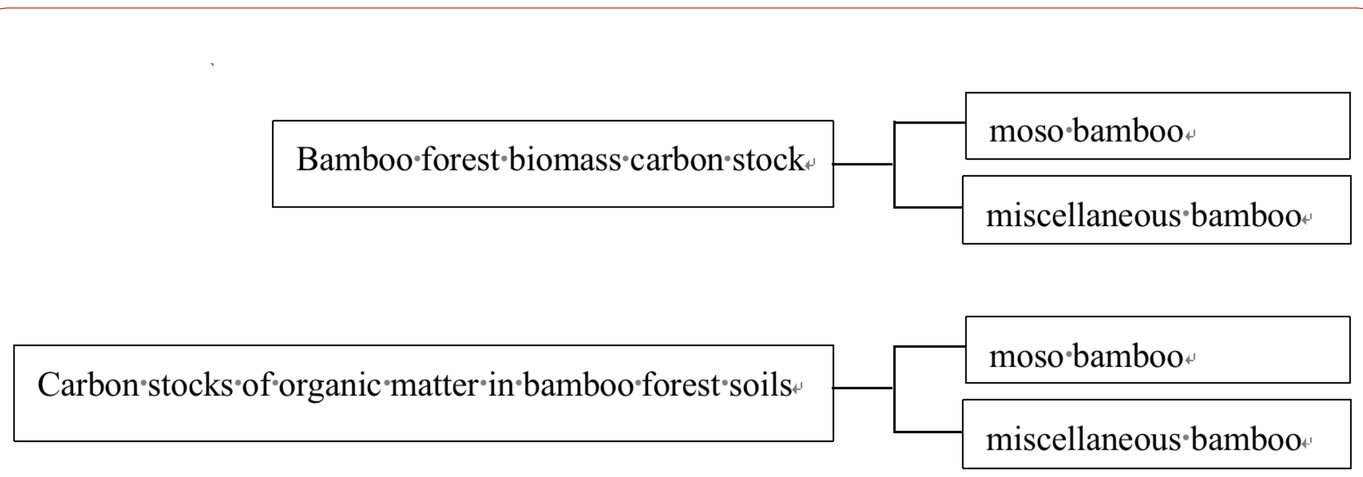
Introduction

- The bamboo forest has always been known as the "**second forest**", and China also has the title of "**bamboo kingdom**".
- The bamboo forest, which is the **main carbon sink species** in China, has a high potential to store carbon.
- Bamboo forests' ability to sequester carbon and provide **economic benefits** has progressively come to be recognized and respected by many spheres of society. The effect of bamboo forests in carbon sequestration in relation to climate change is **significant**.

Research method

In the part of Carbon Storage Estimation of bamboo forest in China, this paper divides bamboo forest into mao bamboo and miscellaneous bamboo. The carbon reserves of the two types of bamboo forests are calculated in the upper and lower parts (biomass carbon reserves of bamboo forests and soil organic carbon reserves of bamboo forests).



Spatial visualization (ESDA) is used to reveal the main characteristics of spatial data. It is often used in the literature to determine spatial data distribution patterns, aggregation hot spots and spatial heterogeneity

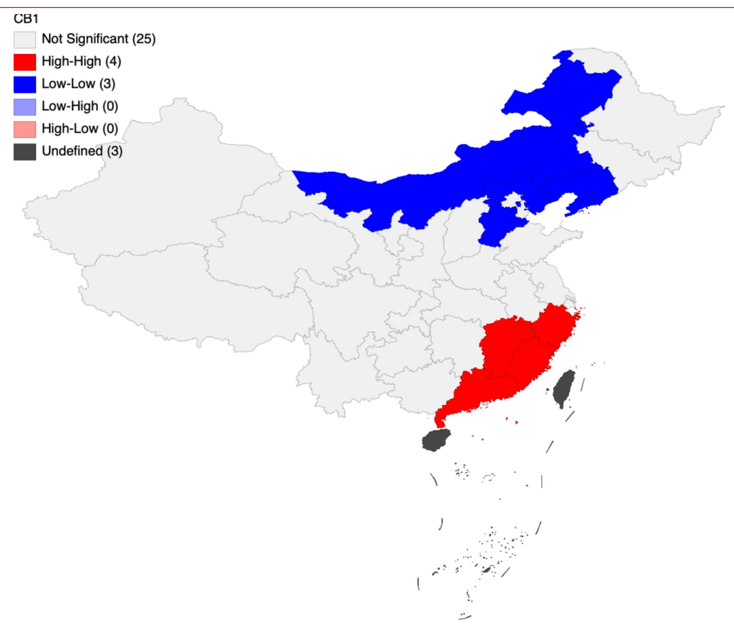
$$I_G = \frac{n\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij}(y_i-\bar{y})(y_j-\bar{y})}{(\sum_{i=1}^{n}\sum_{j=1}^{n} w_{ij})\sum_{i=1}^{n}(y_i-\bar{y})^2}$$

$$I_L = \frac{(y_i-\bar{y})\sum_{j=1}^{n} w_{ij}(y_j-\bar{y})}{\sum_{i=1}^{n}(y_i-\bar{y})^2/n}$$

Empirical analysis

- **Estimation** results of bamboo forest carbon reserves in different periods in China.
- **Vertical distribution** pattern of bamboo forest carbon reserves in different periods in China.
- **Global autocorrelation analysis** results of bamboo forest carbon reserves in China.

Province	Total carbon storage in bamboo forests (Tg C)			Total incremental volume	Average annual growth rate
	2004-2008	2009-2013	2014-2018		
Fujian	136.73	148.98	159.38	22.65	1.66
Jingxi	120.53	140.71	149.11	28.58	2.37
Zhejiang	106.23	113.84	123.45	17.22	1.62
Hunan	88.20	109.42	116.01	27.81	3.15
Sichuan	53.26	60.22	64.81	11.55	2.17
Guangdong	48.24	53.15	53.15	4.91	1.02



Province	2004-2008		2009-2013		2014-2018	
	Biomass	Soil organic matter	Biomass	Soil organic matter	Biomass	Soil organic matter
Fujian	75.28	61.45	82.92	66.06	88.86	70.52
Jiangxi	67.83	52.70	78.89	61.81	83.74	65.38
Zhejiang	57.79	48.45	62.27	51.57	67.72	55.73
Hunan	49.35	38.85	61.26	48.16	65.08	50.93
Sichuan	23.19	30.07	26.25	33.97	28.13	36.68
Guangdong	23.00	25.23	25.54	27.61	25.54	27.61

Conclusions

- Static carbon storage of bamboo forest. China's bamboo forest carbon reserves show an **increasing trend** year by year. Fujian, Jiangxi, Zhejiang, Hunan, Sichuan and Guangdong are still the major bamboo forest provinces in China.
- Vertical distribution pattern of bamboo forest carbon reserves.In three periods , the carbon reserves of bamboo forest biomass accounted for 52.64%-52.91% of the total carbon reserves in China, and the carbon reserves of bamboo forest soil organic matter accounted for 47.01% - 47.36%. The vertical distribution pattern of bamboo forests in the three periods was the same.
- Spatial effect of bamboo forest carbon storage.The distribution of bamboo forest spatial carbon reserves in China has a strong spatial positive correlation effect. Provinces with high bamboo forest carbon reserves and provinces with low carbon reserves are close to their adjacent provinces to form a spatial agglomeration effect.