Introduce on China Grassland Types and Estimating Carbon Sinks in Recent Years

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Main Contents

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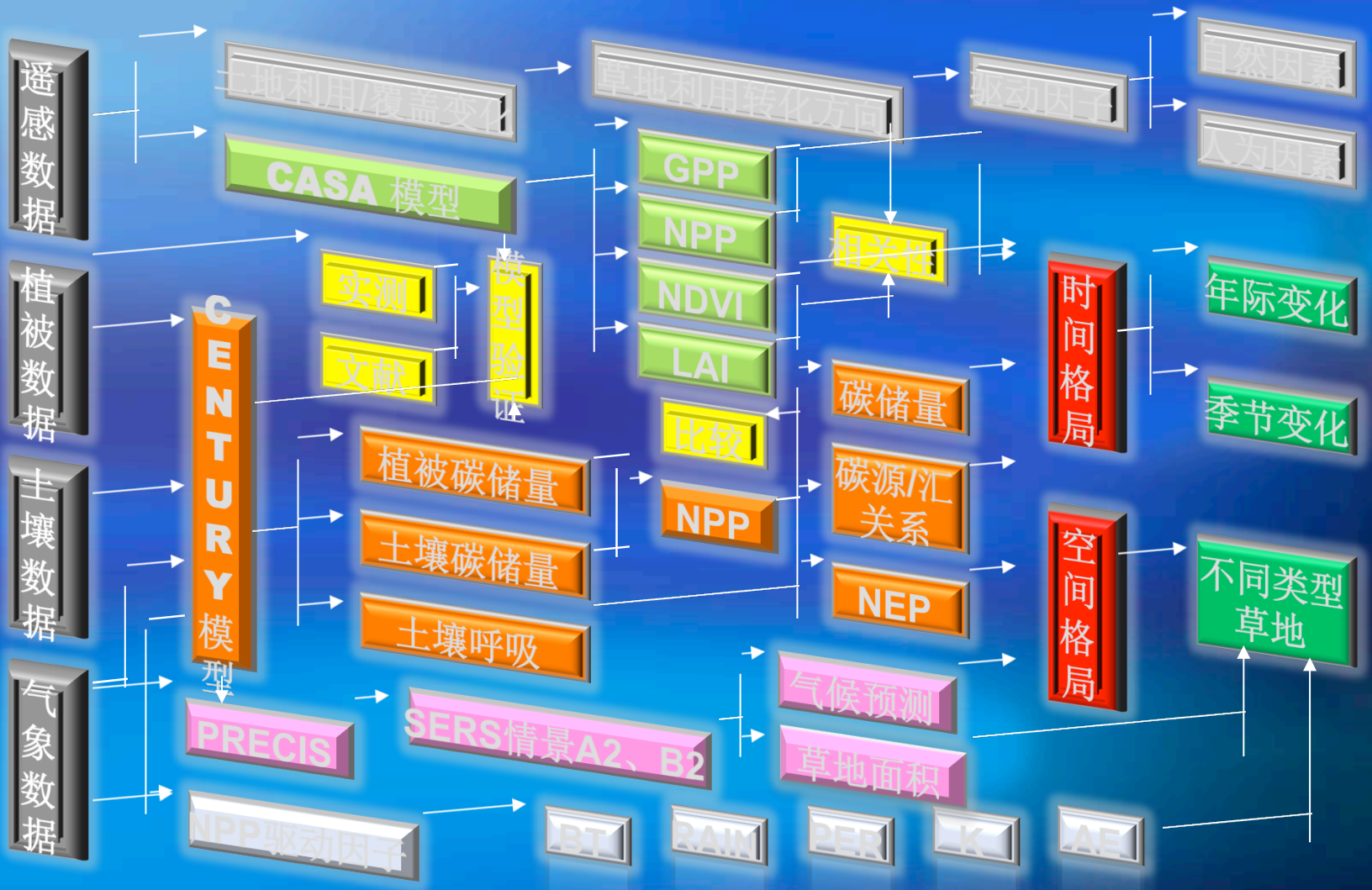
2. Temporal and spatial distribution and C sinks of grassland in south of china
3. Temporal and spatial distribution and NPP of grassland in Inner Mongolia
4. Biomass, NPP and carbon sinks of China from 2008 to 2010
5. Some Photos in the experiment stations

图1. 1. 草地碳源/汇变化特征及储量核算主要数据库与系统构成示意图

Fig1.1. Framework of the grassland carbon source/sink change characteristics and estimation method



1.Introduce on China grassland type classifications using CSCS approach

Fig.1.2. Index chart for determining grassland class in the CSCS

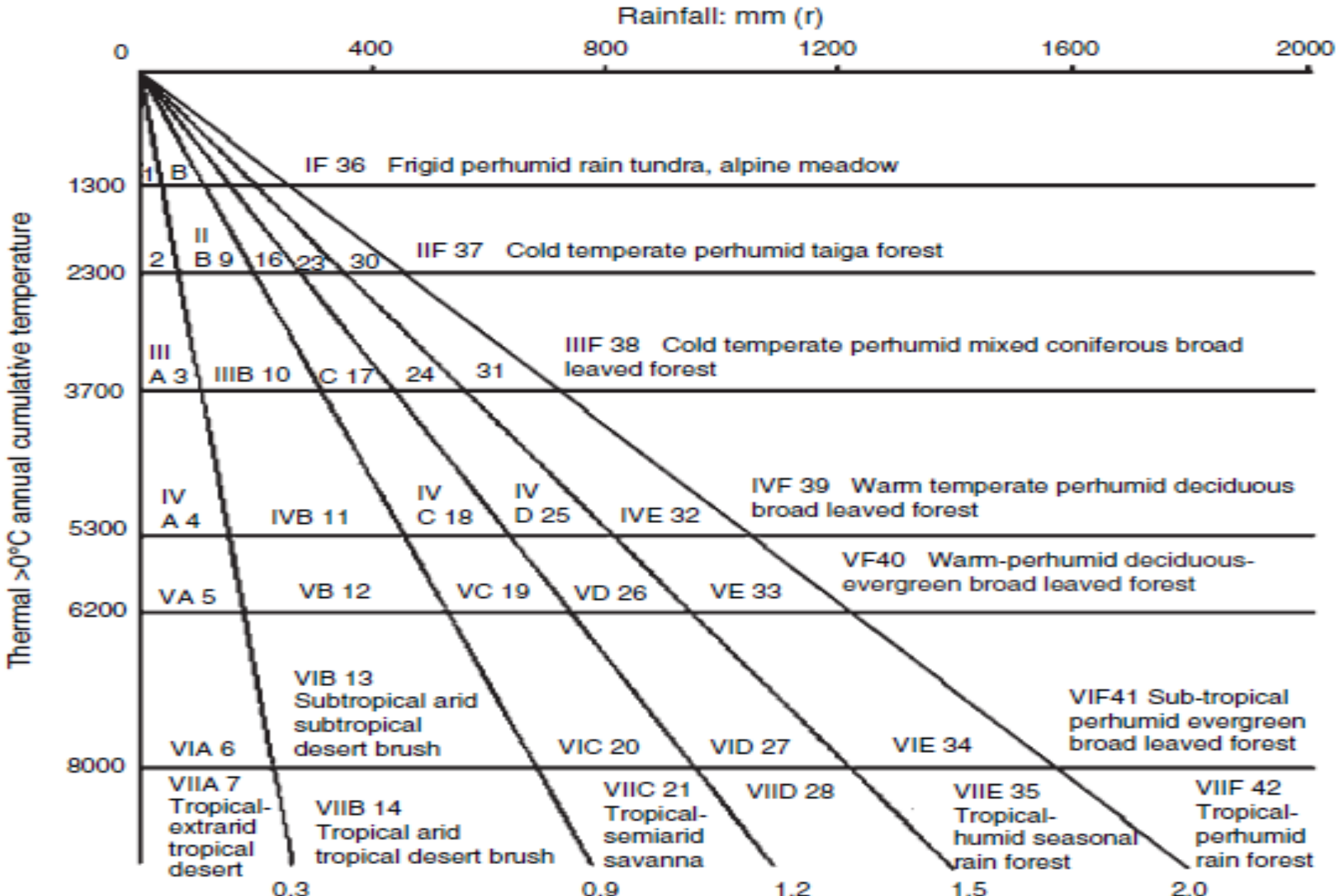
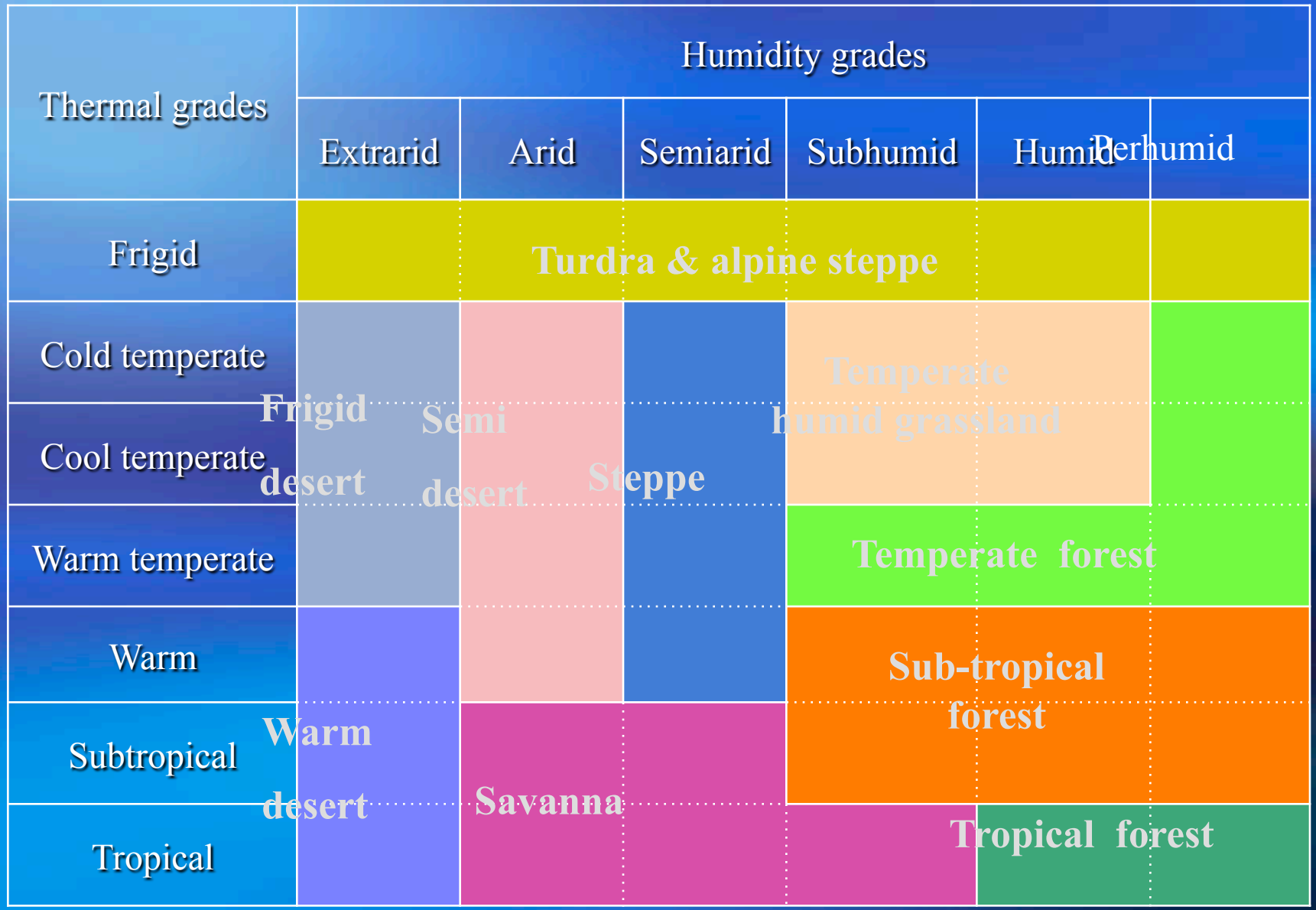


Table 1.1. The 10 broad categories (super-class) merged by classes within the CSCS based on ecological similarity



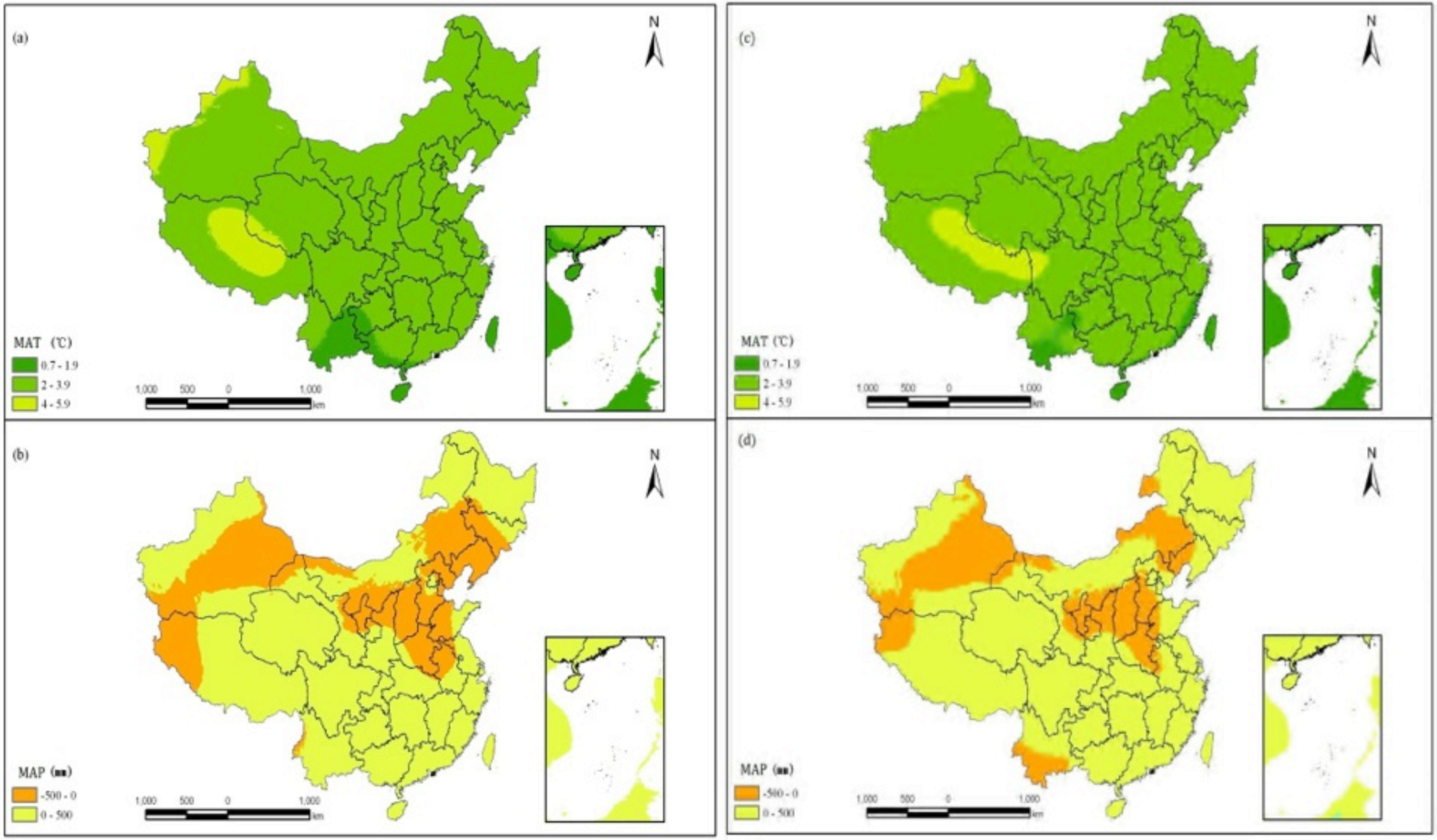


Fig.1.3. Change in the average for MAT(mean annual temperature) and MAP(mean annual precipitation)between future (2001-2050) and recent (1950-2000) scenario in China (a) change MAT in A2a scenario;(b)Change MAP in A2a scenario; (c) as (a), but for B2a; (d) as (b), but for B2a. Negative values denote decrease.

图1.4. 中国草地综合顺序分类图

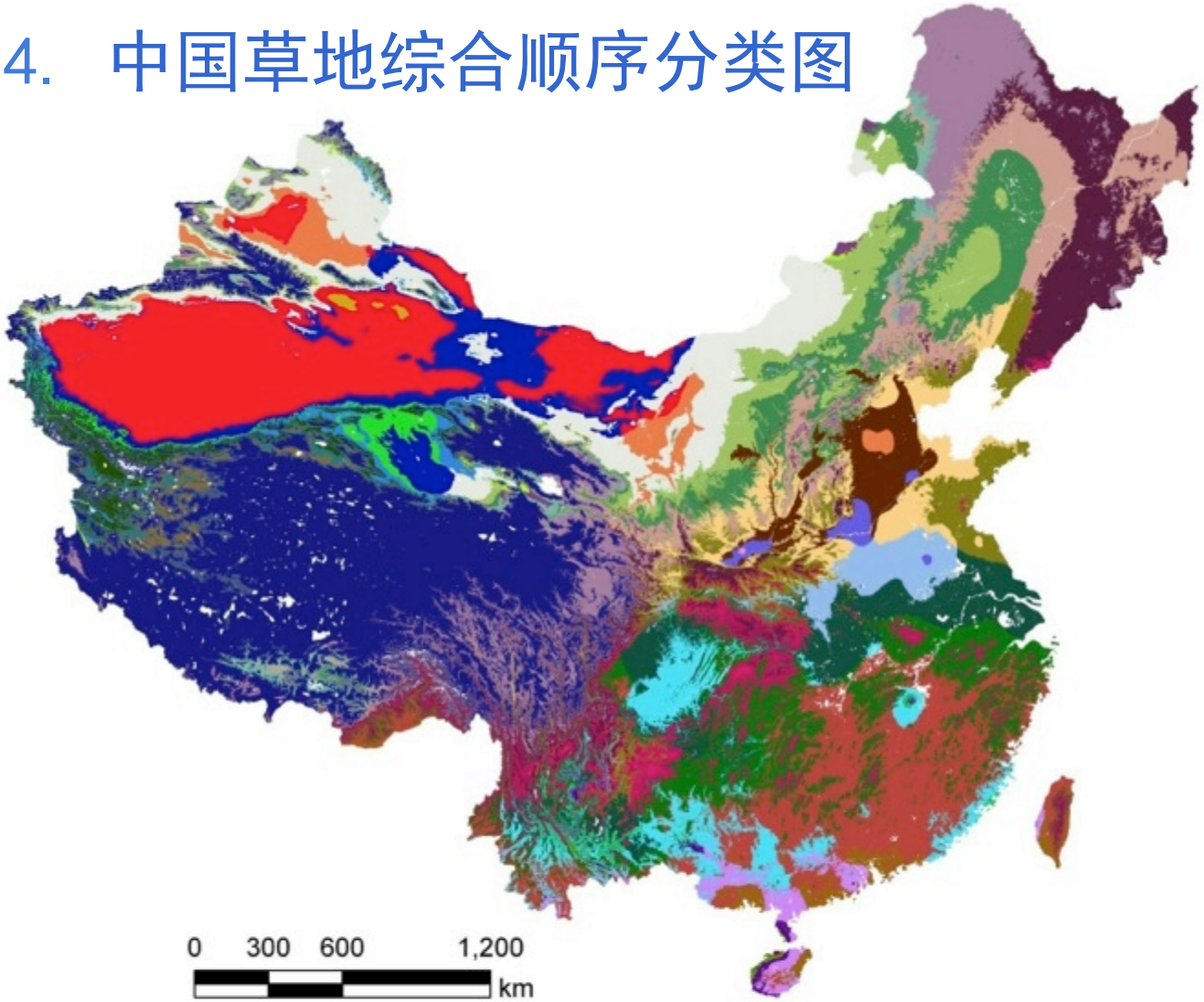


图 例

ⅠA1	ⅤA5	ⅣB11	ⅠC15	ⅤC19	ⅡD23	ⅦD27	ⅢE31	ⅧE35	ⅣF39		
ⅡA2	ⅠB8	ⅤB12	ⅡC16	ⅥC20	ⅢD24	ⅧD28	ⅣE32	ⅠF36	ⅤF40		
ⅢA3	ⅡB9	ⅥB13	ⅢC17	ⅦC21	ⅣD25	ⅠE29	ⅤE33	ⅡF37	ⅥF41		
ⅣA4	ⅢB10	ⅦB14	ⅣC18	ⅠD22	ⅤD26	ⅡE30	ⅥE34	ⅢF38	ⅦF42		

图1.5. 中国草地综合顺序类组图

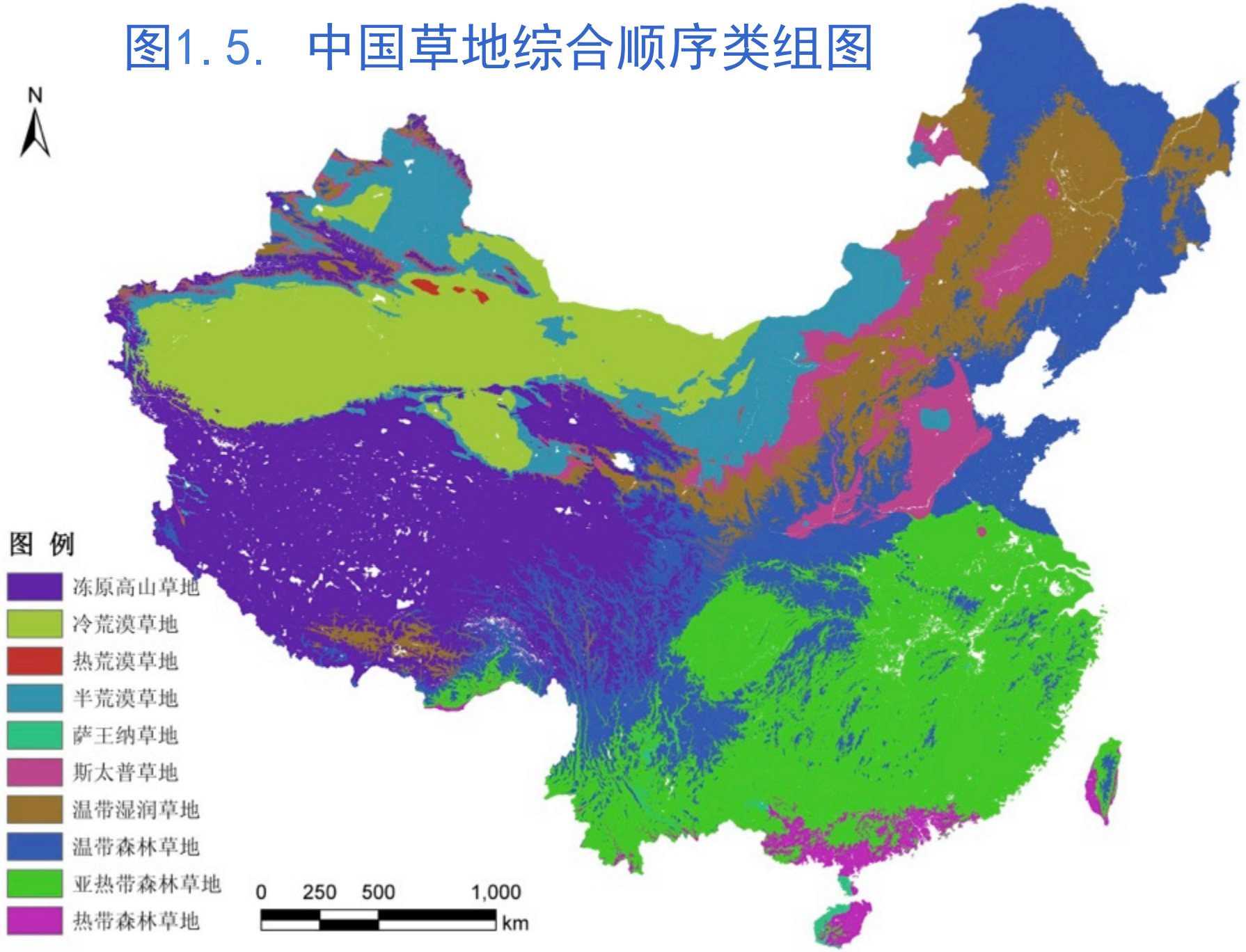
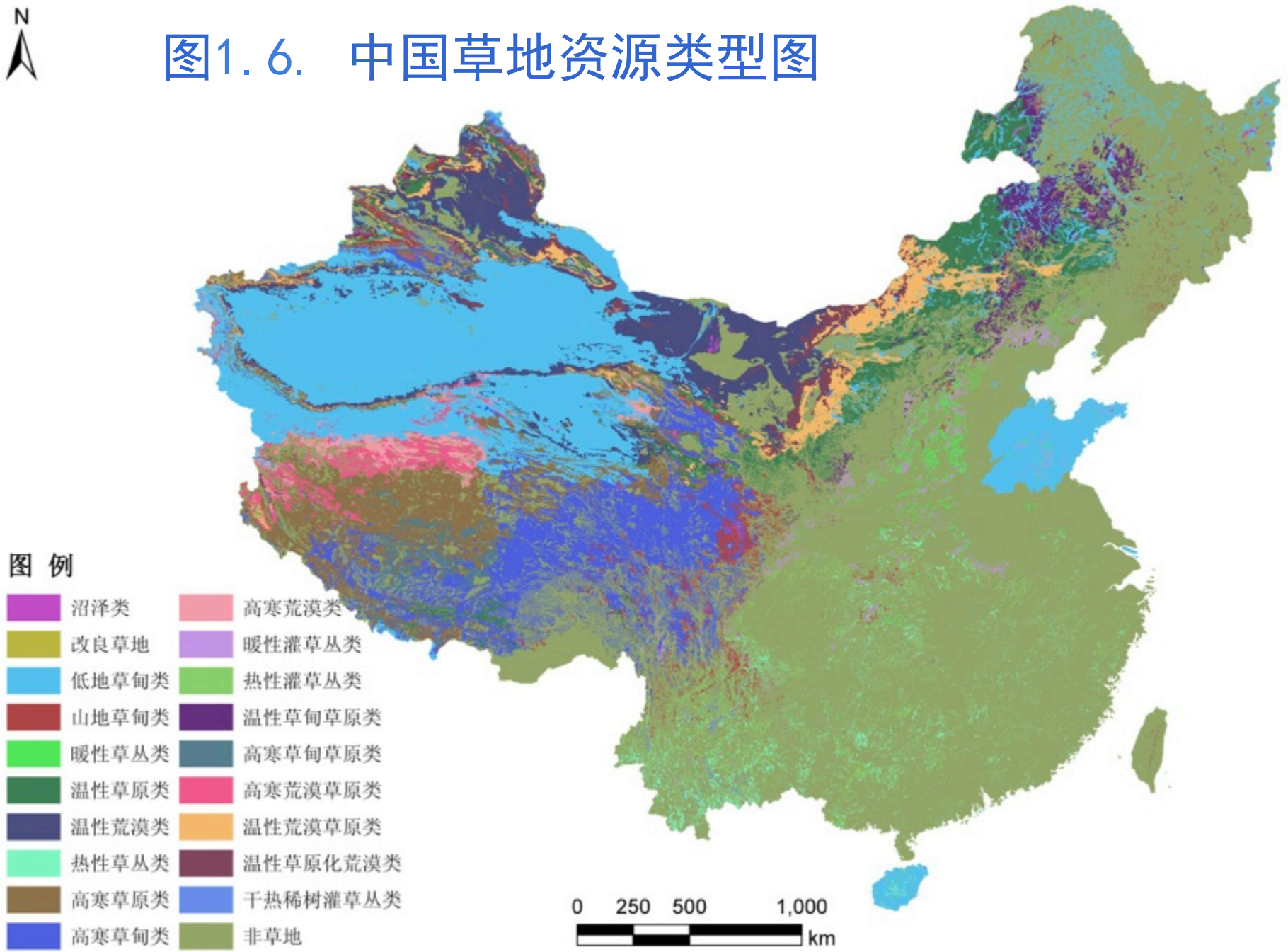


图1. 6. 中国草地资源类型图



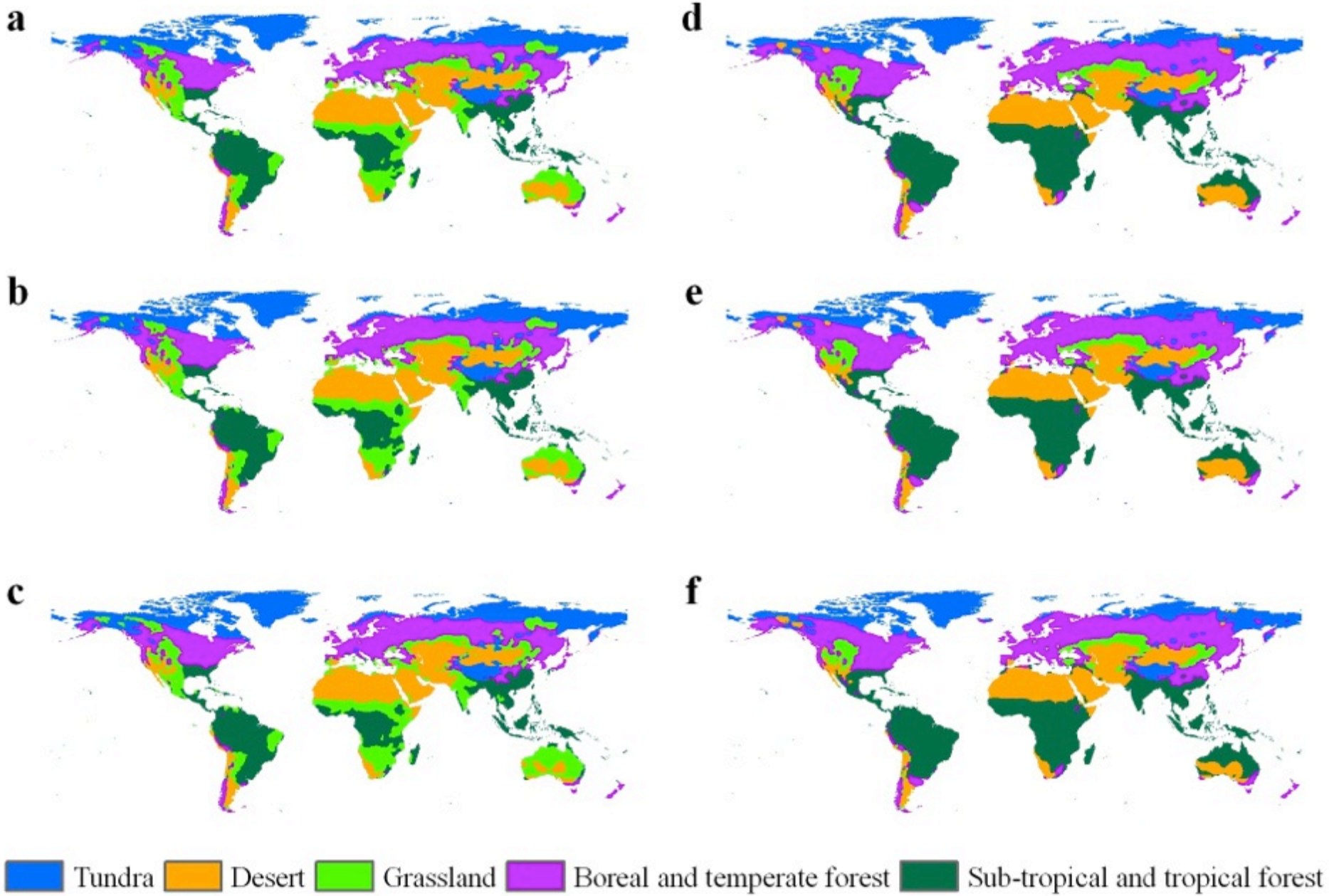


Fig. 1.7. The CSCS vs. HLZ PNV maps in the three periods from 1911 to 1940 (T1) (a vs. d) , 1941 to 1970 (T2) (b vs. e) and 1971 to 2000 (T3) (c vs. f)

Fig.1.8 .The CSCS (a), HLZ (b) and BIOME4 (c) PNV maps simulated by the 30-year (1961-1990) global climatology grid data at 0.5° spatial resolution.

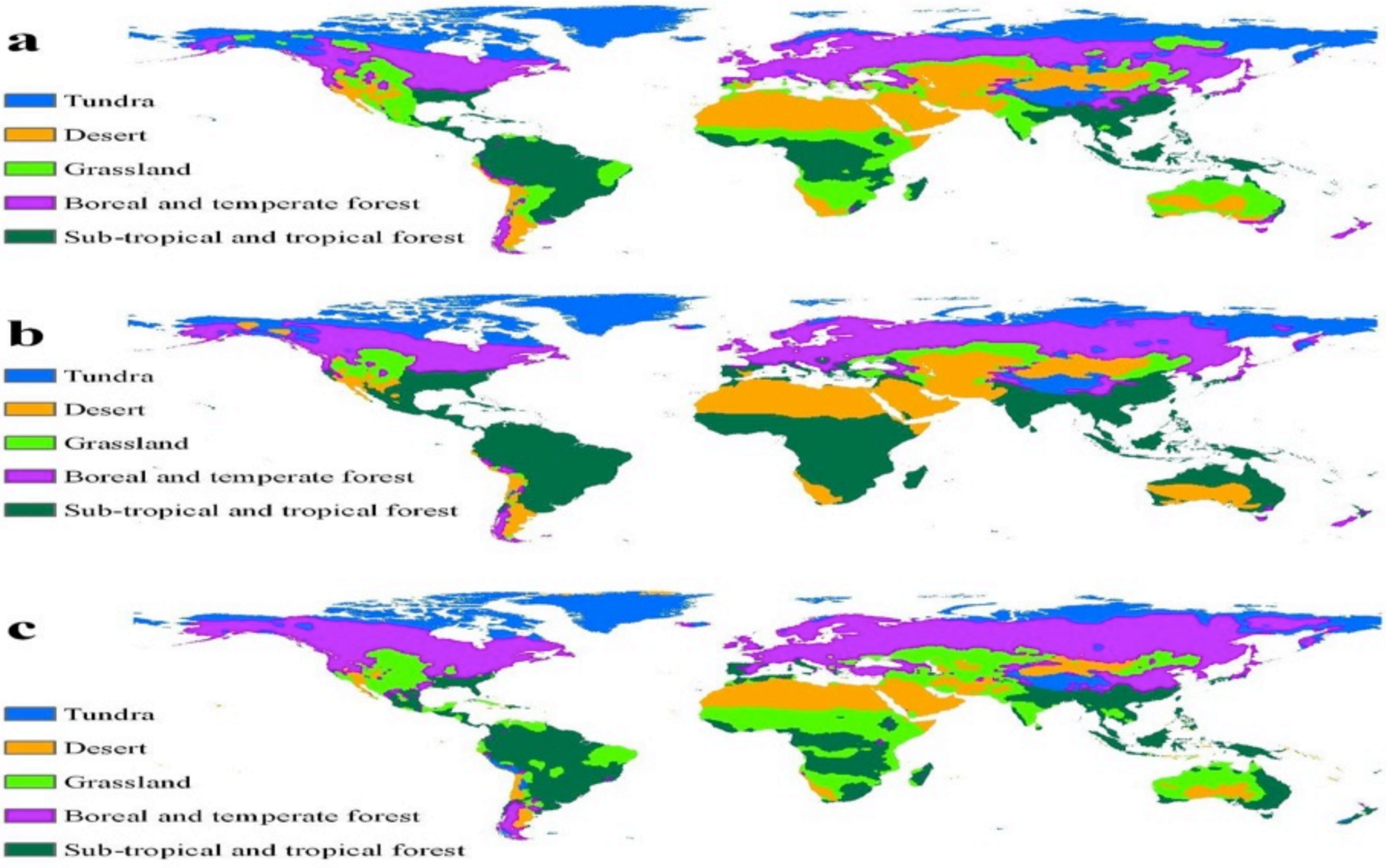
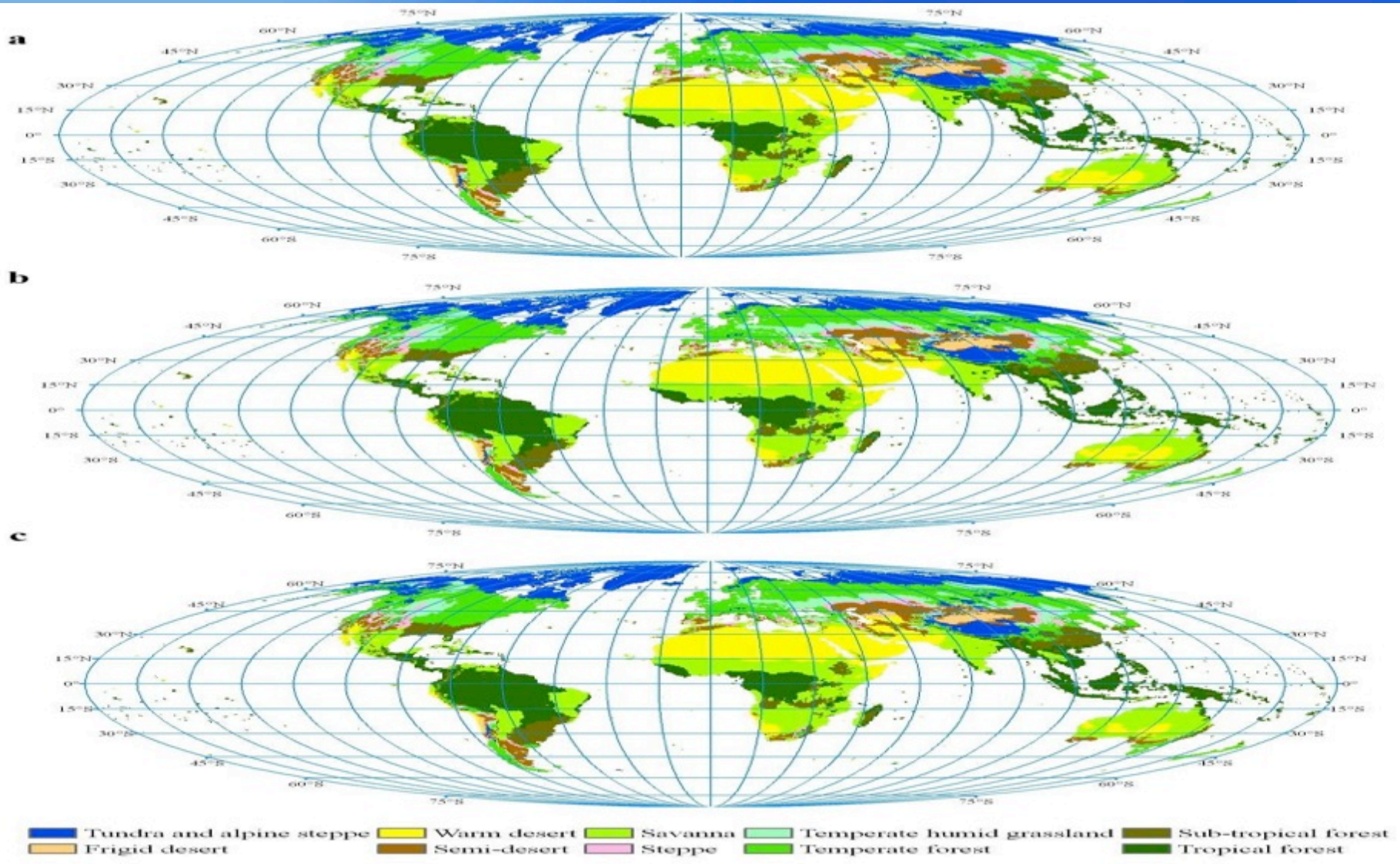


Fig. 1.9. The distribution extent of broad vegetation categories in the CSCS PNV maps simulated by the CRU TS 2.1 climatic data in the periods T1 (1911-1940) (a), T2 (1941-1970) (b) and T3 (1971-2000) (c).

Broad CSCS PNV category distribution （a）in the period T1 (1911-1940)（b）in the period T2 (1941-1970)（c）in the period T3 (1971-2000)



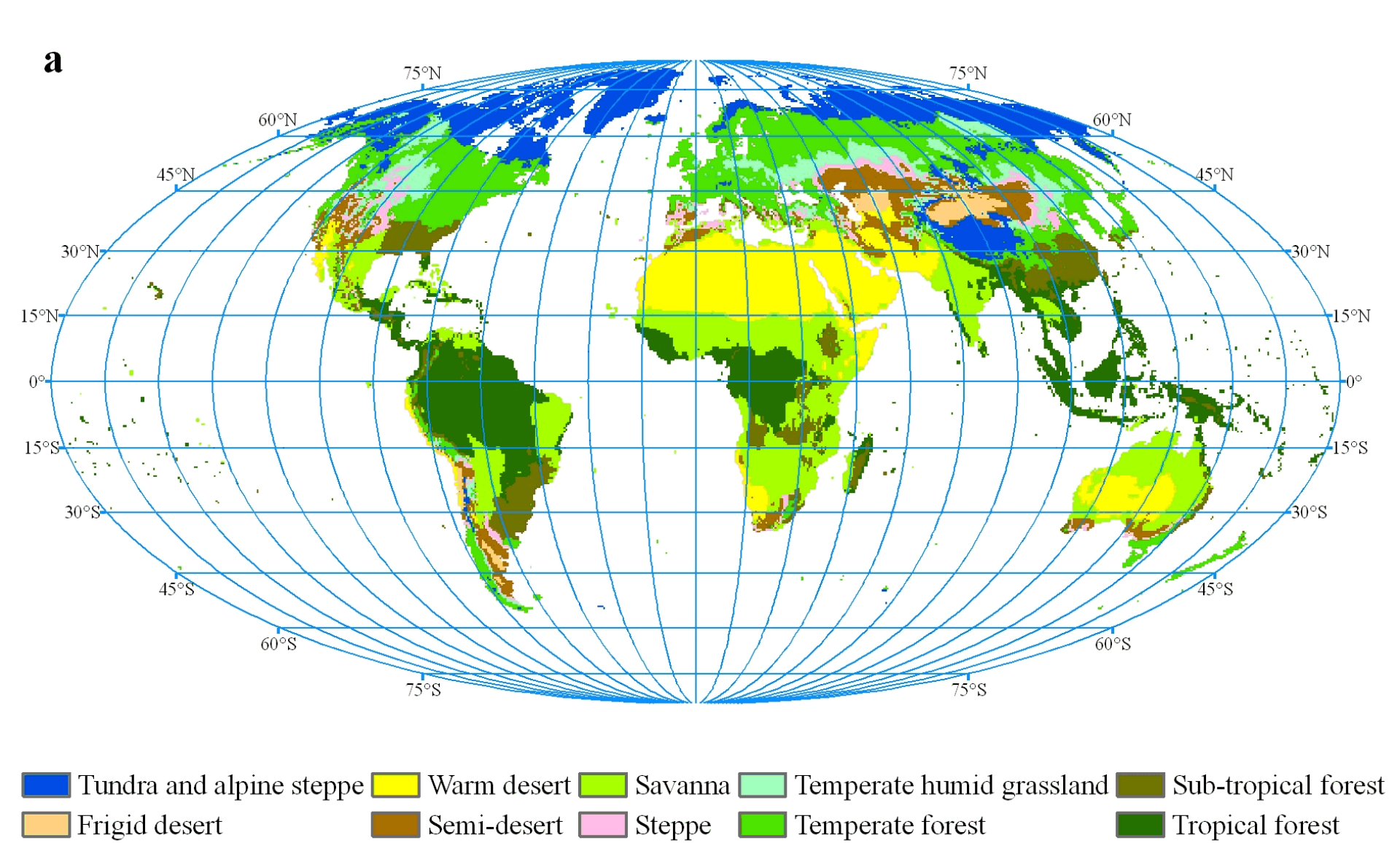


Fig.1.10 .The distribution extent of broad vegetation categories in the CSCS PNV maps simulated by the CRU TS 2.1 climatic data in the periods T1 (1911-1940) (a), T2 (1941-1970) (b) and T3 (1971-2000) (c).

Broad CSCS PNV category distribution
(a) in the period T1 (1911-1940)
(b) in the period T2 (1941-1970)
(c) in the period T3 (1971-2000)

Spatial distribution patterns and carbon sequestration capacity of potential grassland over 1950—2000

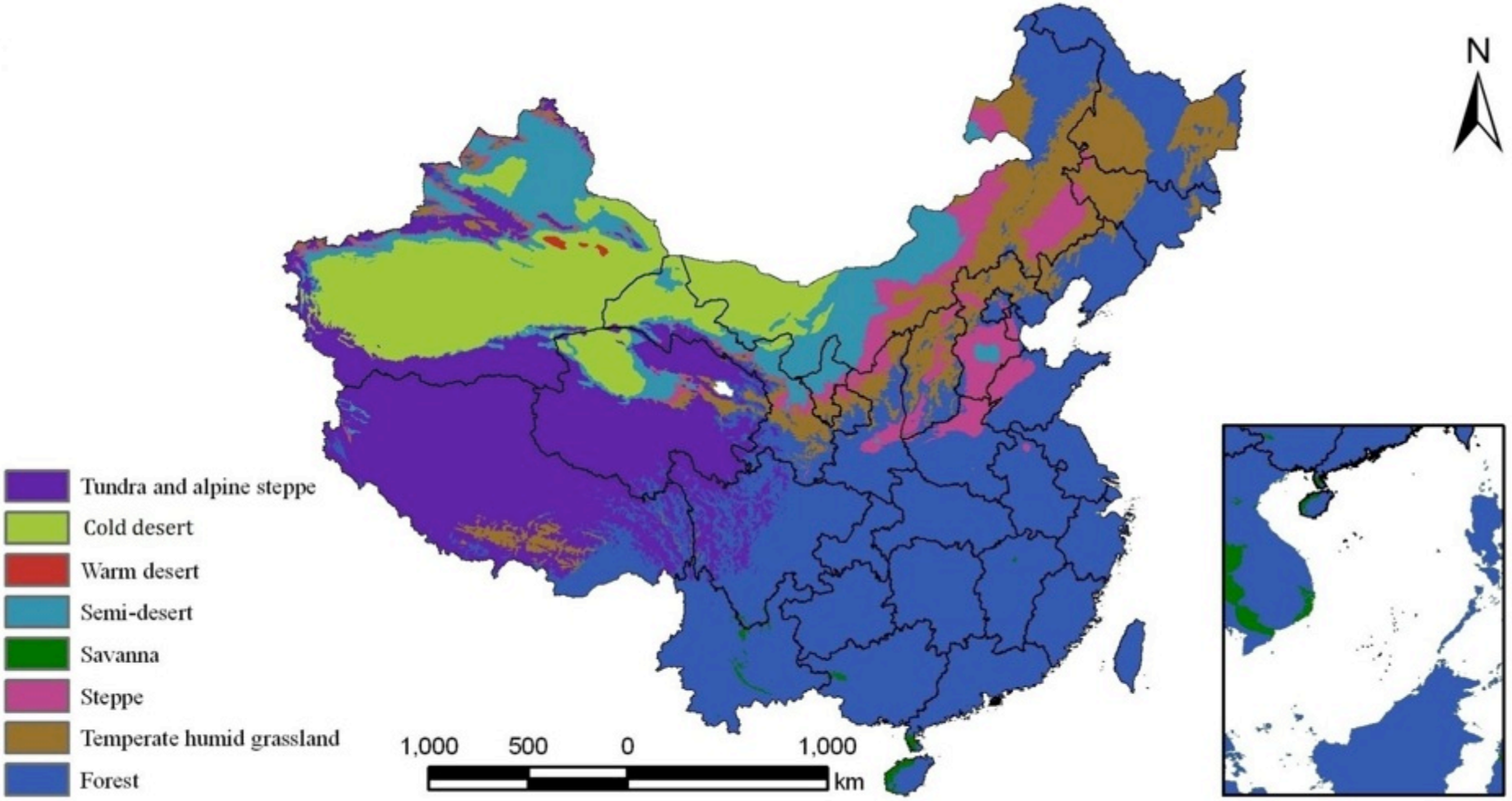


Fig.1.11. The spatial distribution patterns of potential grassland during the recent 50 years determined by CSCS approach in China

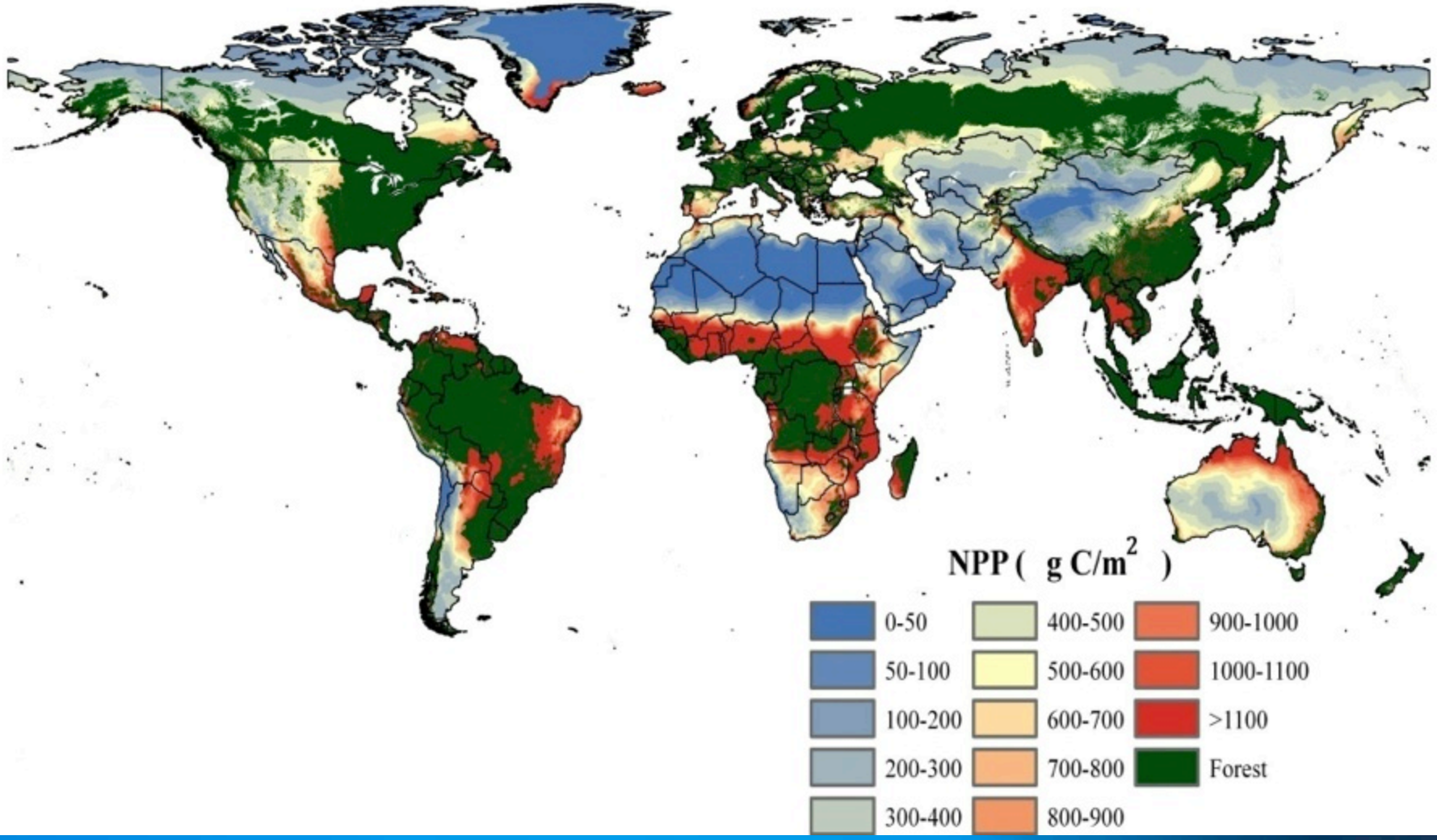


Fig.1.12. The spatial distribution patterns of carbon sequestration capacity of global potential grassland during the recent 50 years

2.Temporal and spatial distribution and C sinks of grasslands in south of china

图2. 1. 研究区地理概况
Fig 2.1. The geographic profile in research area

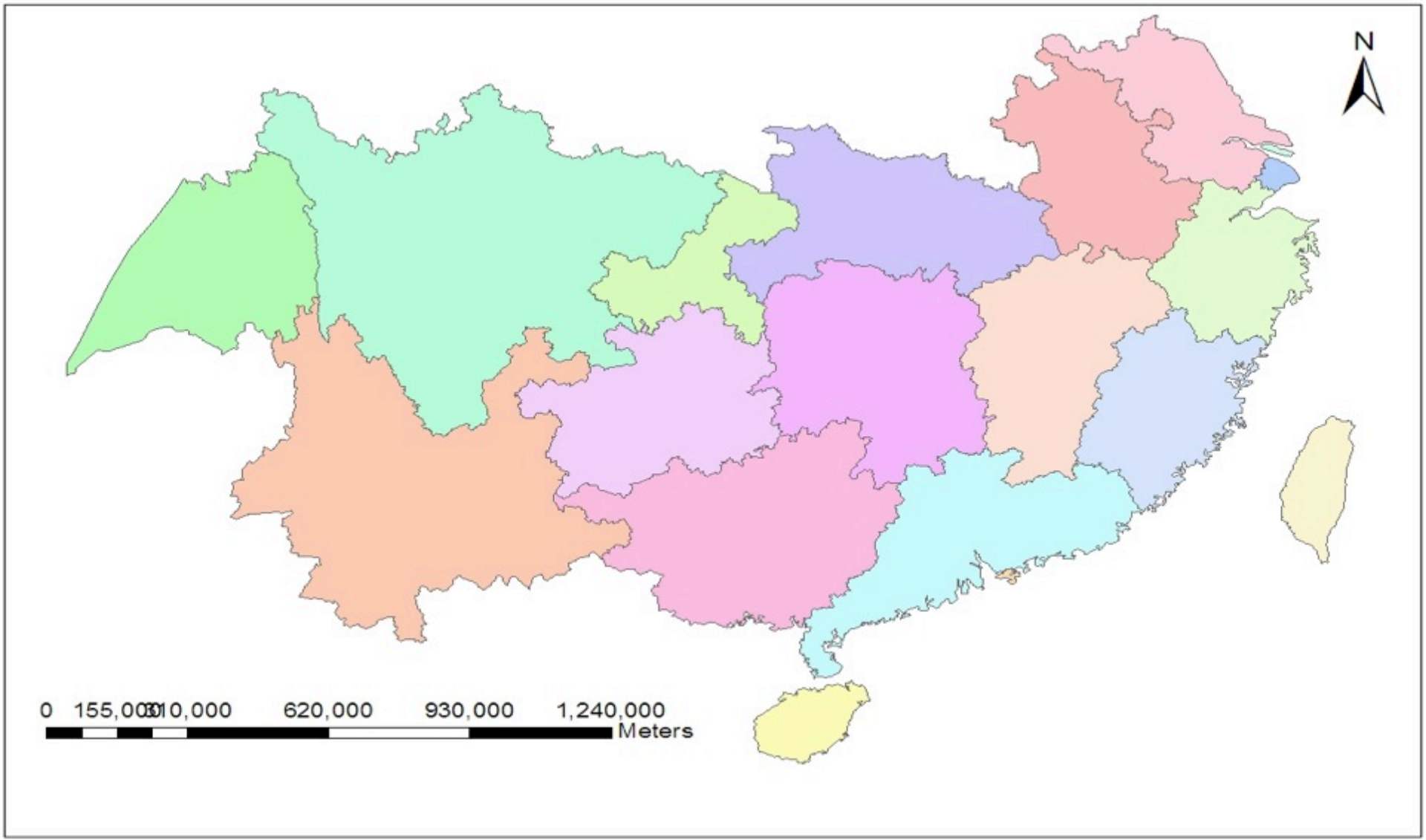


图2.2. 2001年利用IGBP建立的南方各类型草地分布图
Fig 2.2. the distribution map of different types of natural grassland in the south of China using IGBP in 2001

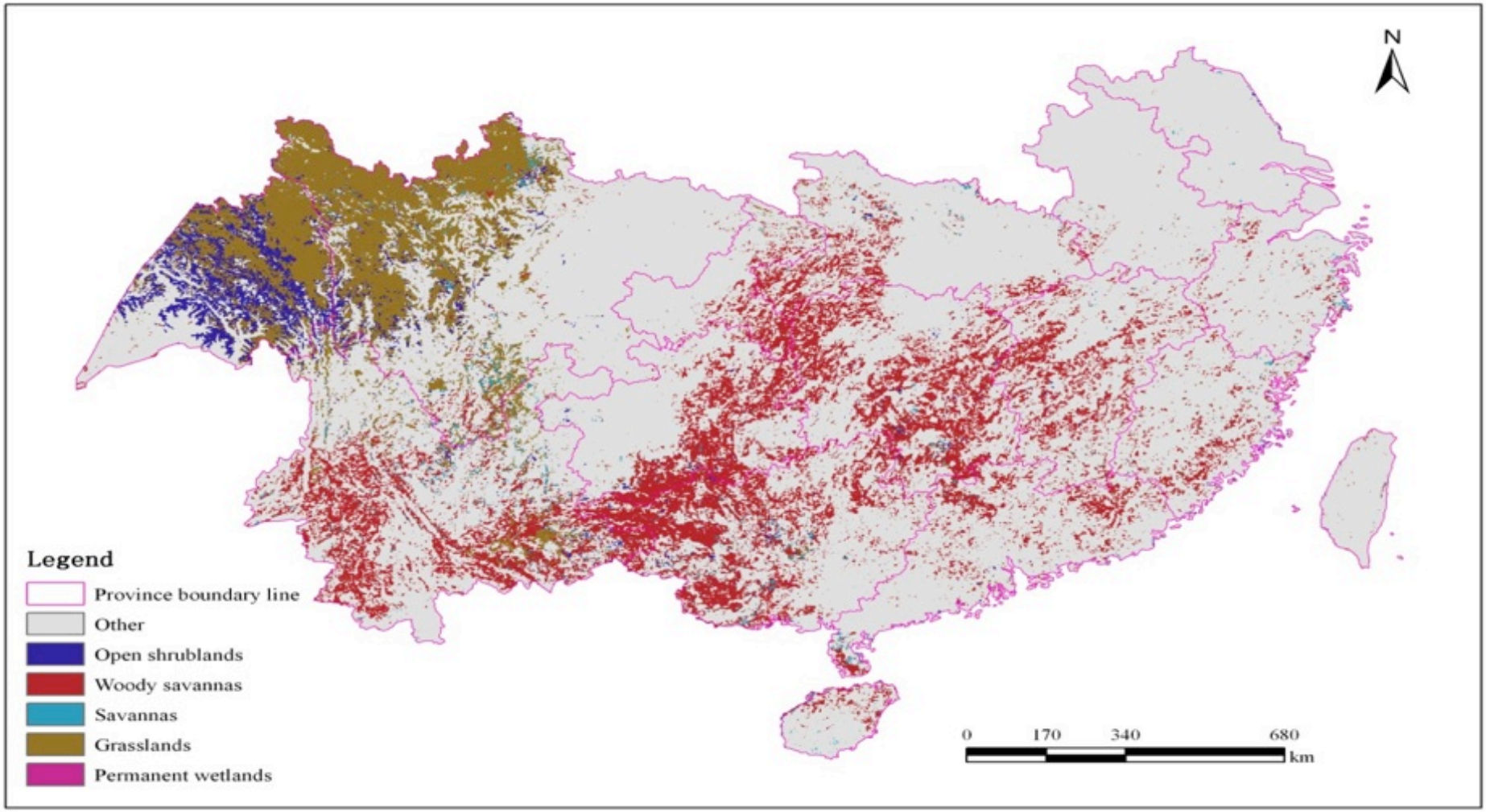


图2.3. 2004年利用IGBP建立的南方各类型草地分布图

Fig 2.3. the distribution map of different types of natural grassland in the south of China using IGBP in 2004

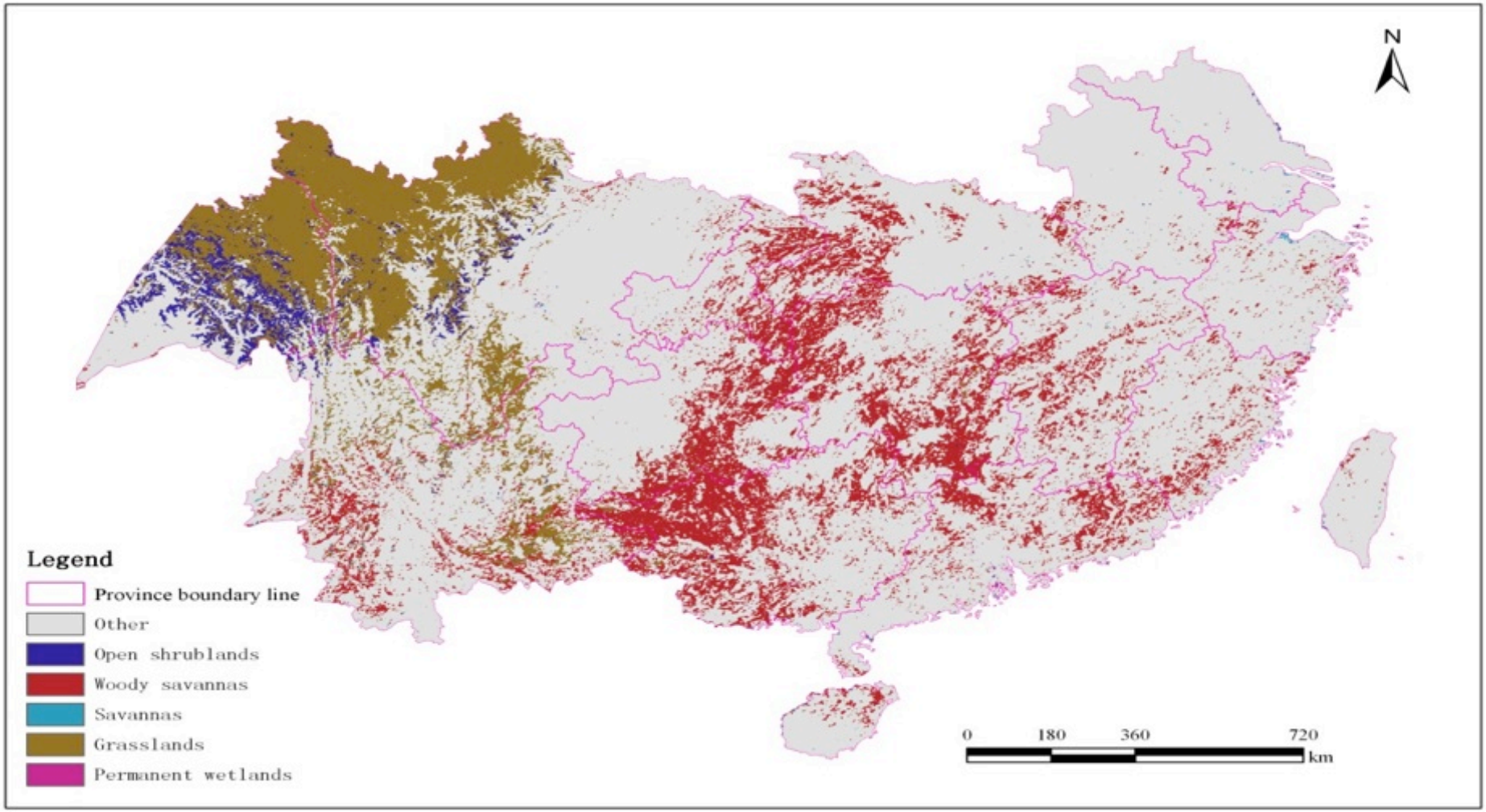


表2.1. 我国南方各类型草地植被碳储量
Table 2.1. the carbon storage of different vegetation in the south of China

草地类型 Grassland Types	生物量密度（g/m²） Mean Biomass	碳密（gC/m²） Mean NPP	生物量(Tg) Total Biomass		碳储量（TgC） Tatal NPP	
			2001	2004	2001	2004
开放灌木地 Open Shrubland	441.93	198.87	41.94	33.05	18.87	14.87
萨瓦纳林 Woody Savannas	542.99	244.35	213.66	220.24	96.15	99.12
萨瓦纳 Savannas	528.26	237.72	48.50	22.56	21.82	10.15
典型草地 Typical Grassland	388.01	174.60	95.69	113.37	43.06	51.02
永久湿地 Permanent Wetland	396.82	178.57	4.66	7.18	2.09	3.23
总计 Total			404.44	396.40	181.99	178.38

图2. 4. 2001年利用NPP建立的我国南方草山草坡分布图

Fig 2.4. the distribution map of typical grassland in the south of China using NPP in 2001

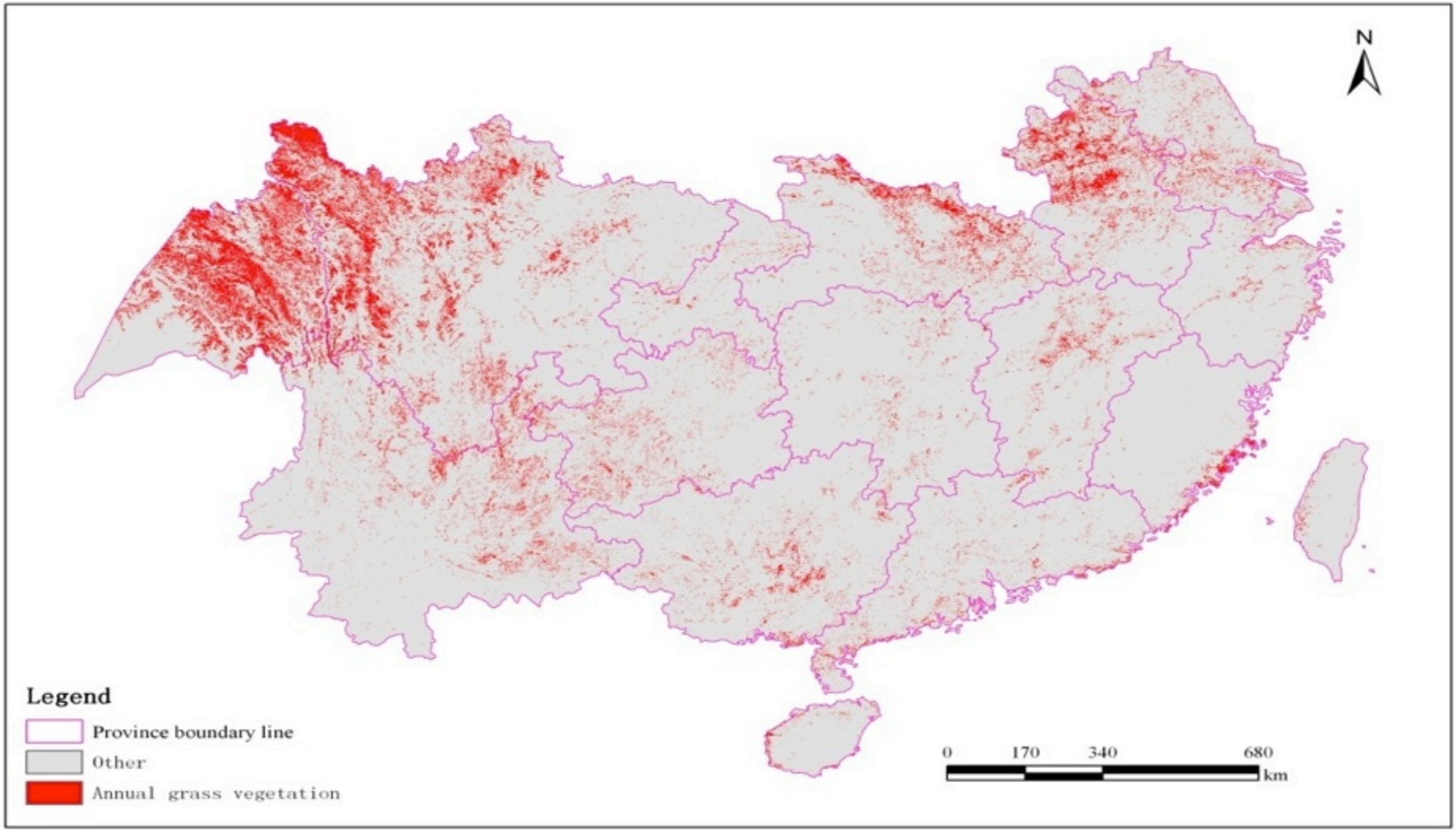


图2.5. 2004年利用NPP建立的我国南方各类型草地分布图
Fig 2.5. the distribution map of typical grassland in the south of China using NPP in 2004

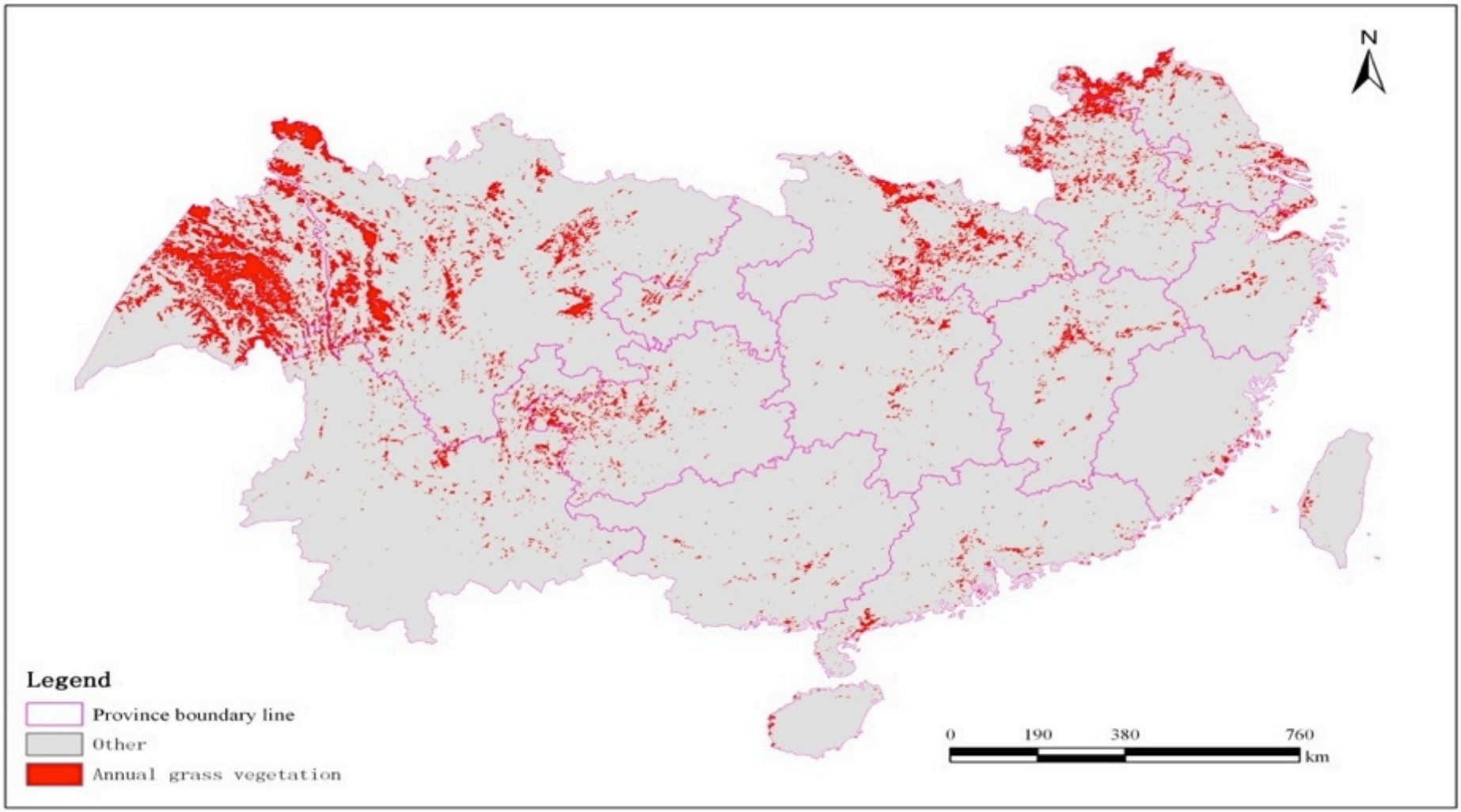


表2.2. 2001-2004年我国南方草山草坡植被碳储量
Table 2.2. the carbon storage of typical grassland in the south of China in 2001-2004

年份 Year	生物量密度（g/m^2） Mean Biomass	碳密度（gC/m^2） Mean NPP	生物量（Tg） Total Biomass	碳储量（TgC） Total NPP
2001年	374.04	168.32	83.09	37.39
2004年	363.51	163.58	88.98	40.04

3.Temporal and spatial distribution of grassland and NPP in Inner Mongolia

图3.1. 基于MODIS-IGBP分类图的内蒙古土地利用重分类图 (8类)
Fig.3.1. Land Cover Map of Inner Mongolia Based on MODIS IGBP Data (8 Types)

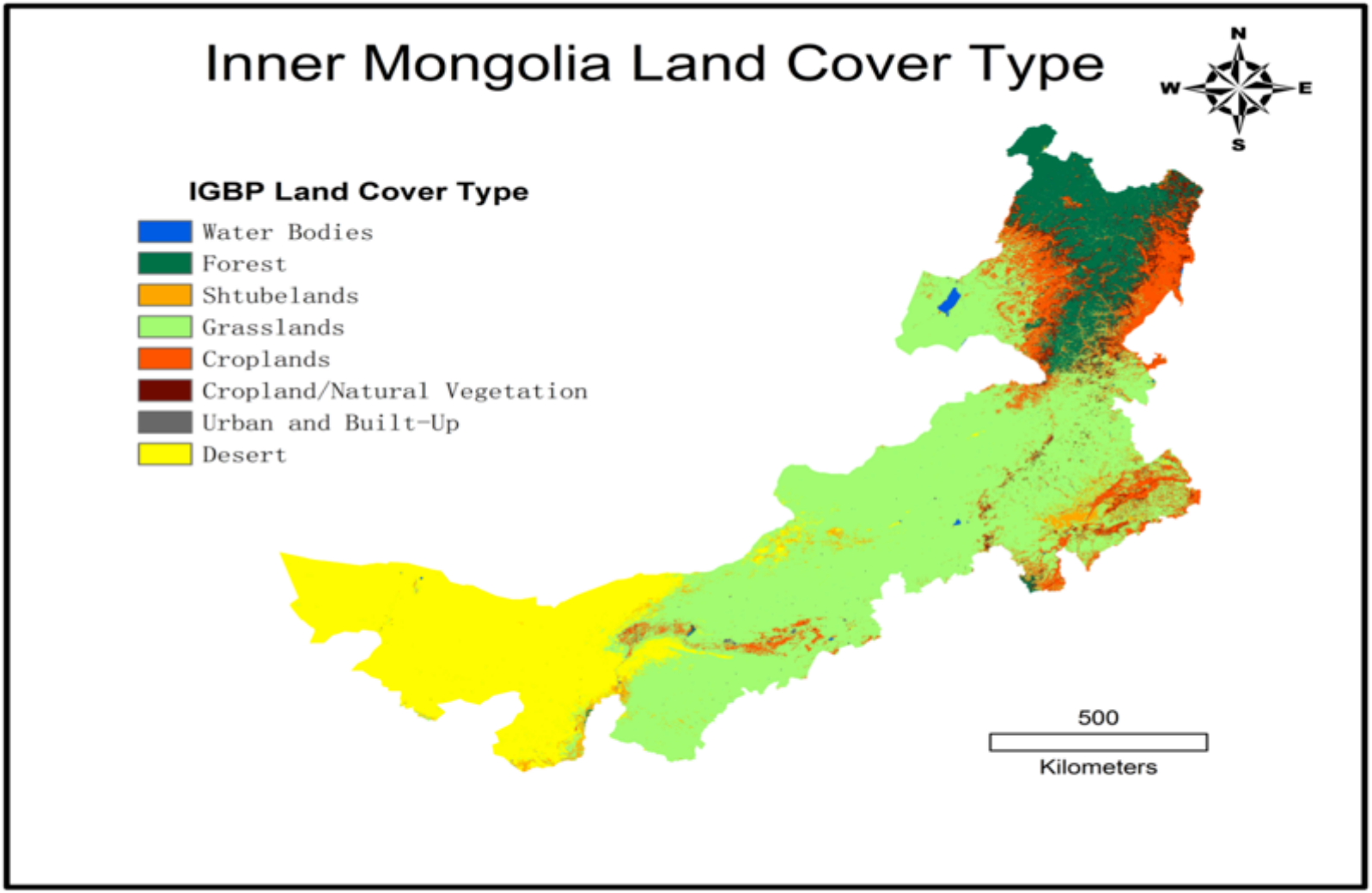


图3.2. 内蒙古草地分布图
Fig.3.2. Grassland Map of Inner Mongolia

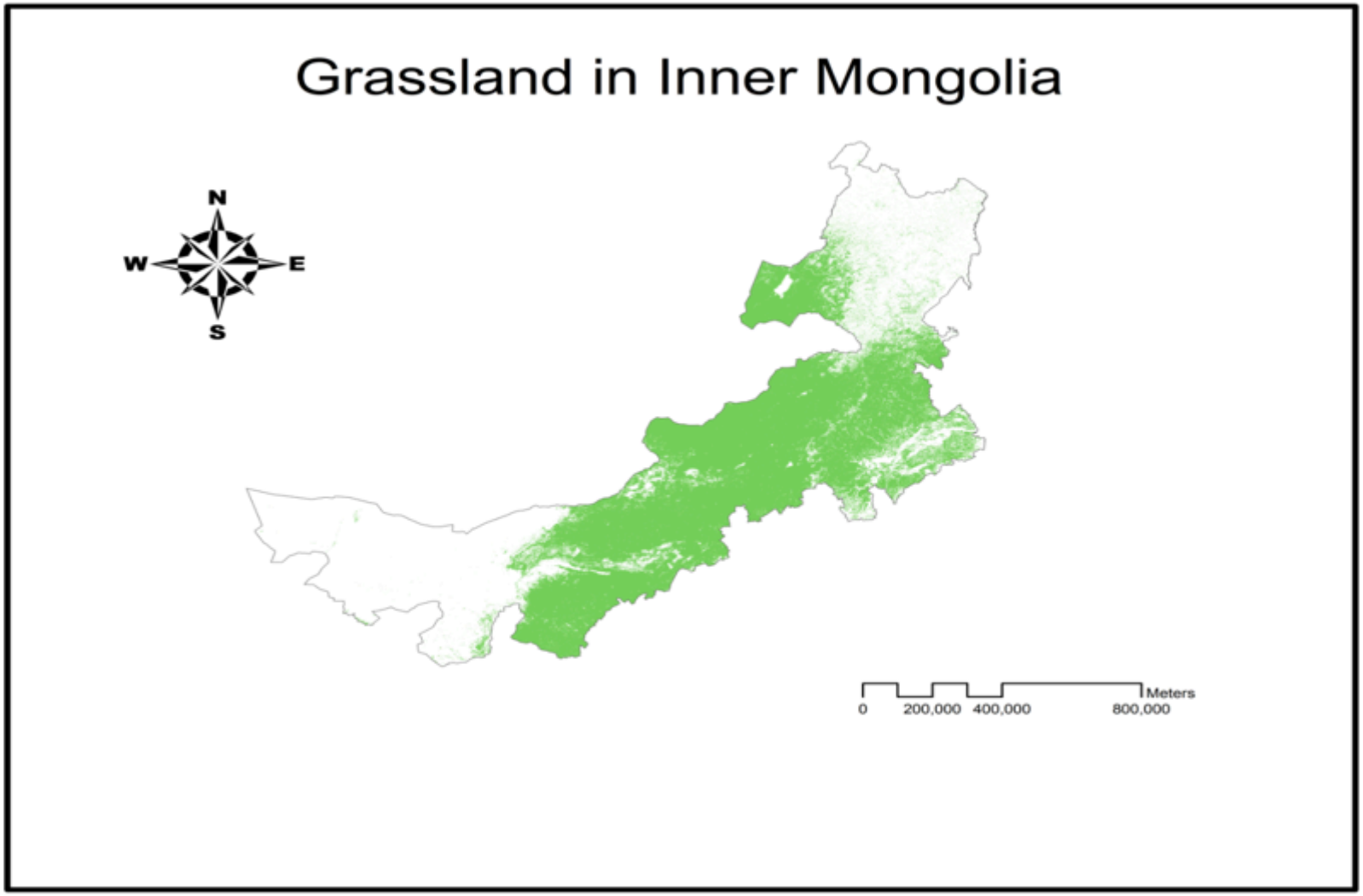
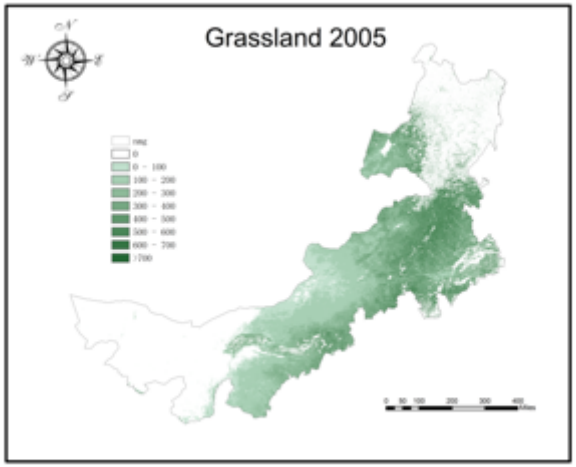
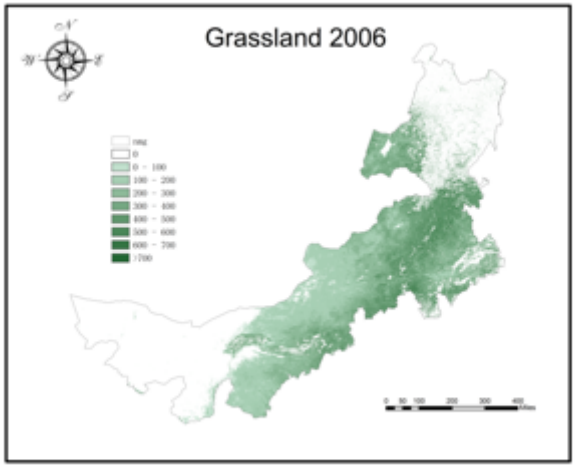
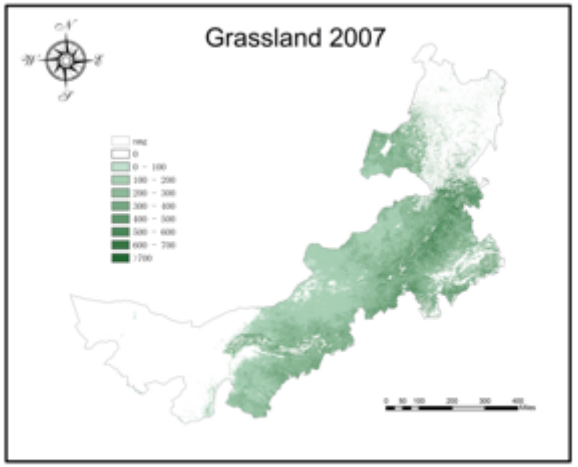


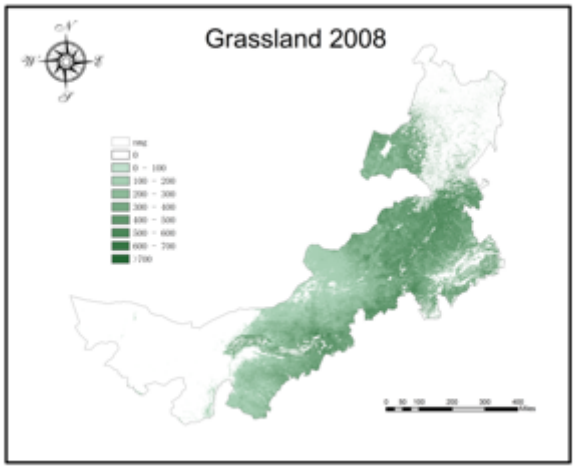
图3. 3. 2005-2010年内蒙古草地NPP分布图

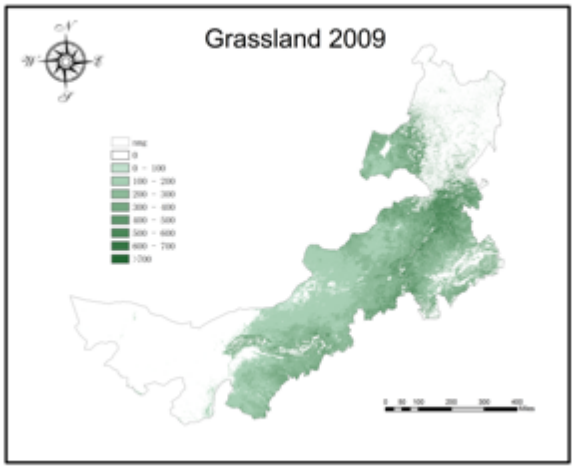
Fig.3.3. Spatial Distribution of Grassland NPP of Inner Mongolia During 2005 to 2010











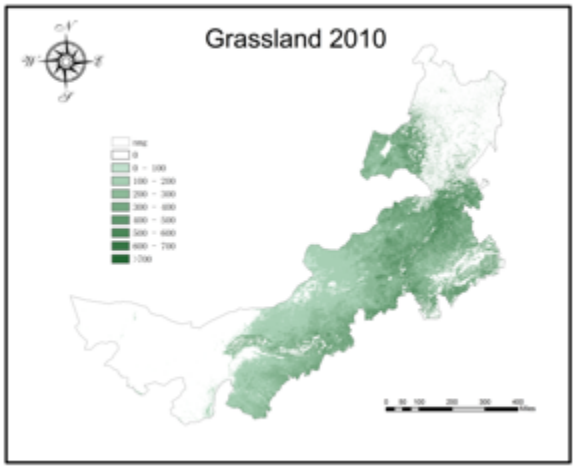


图3.4. 2005-2010年内蒙古草地NPP分布动态图

Fig.3.4. Spatial Distribution of Grassland NPP of Inner Mongolia During 2005 to 2010

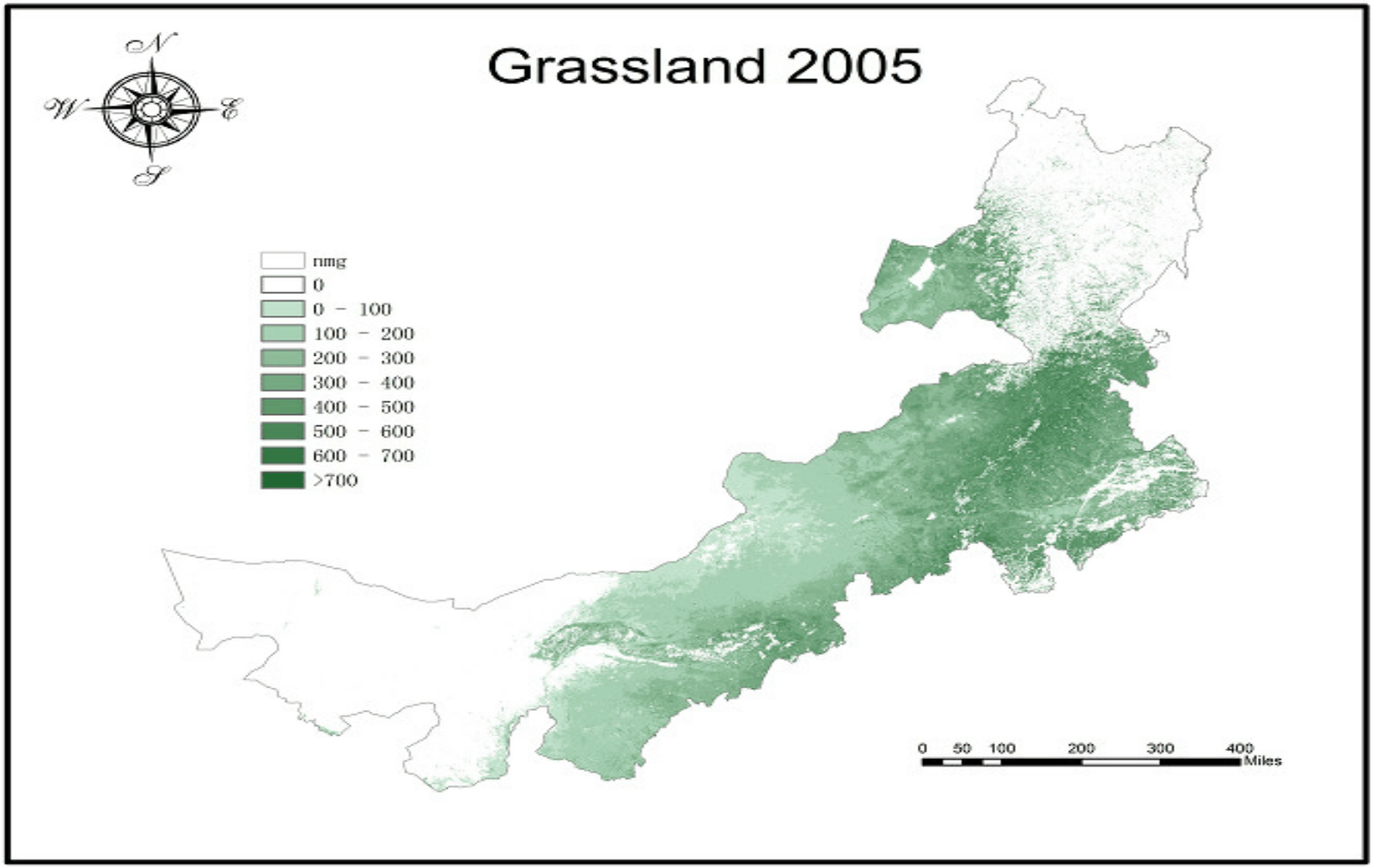
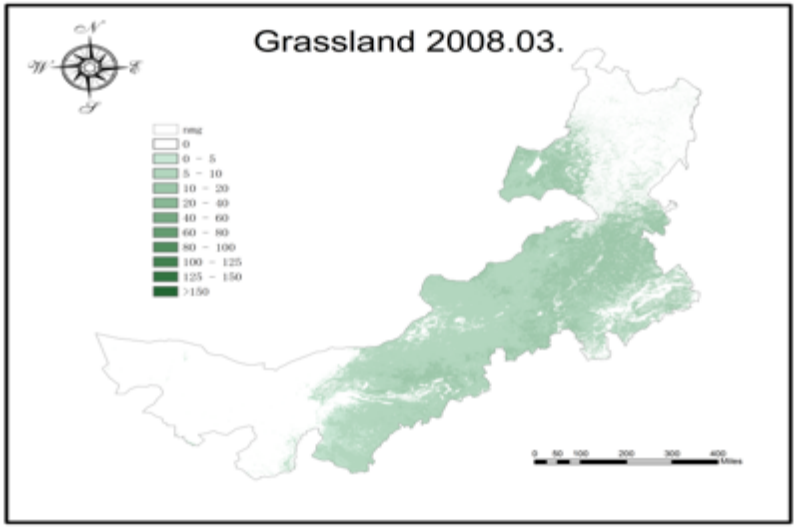
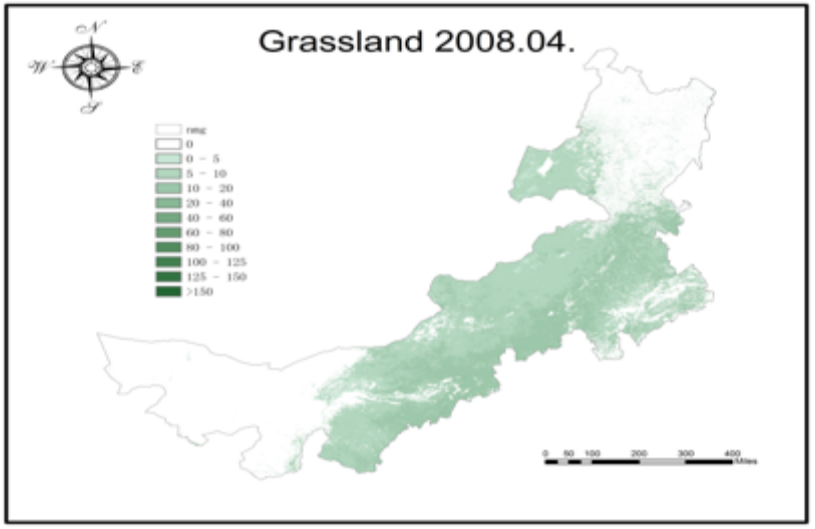
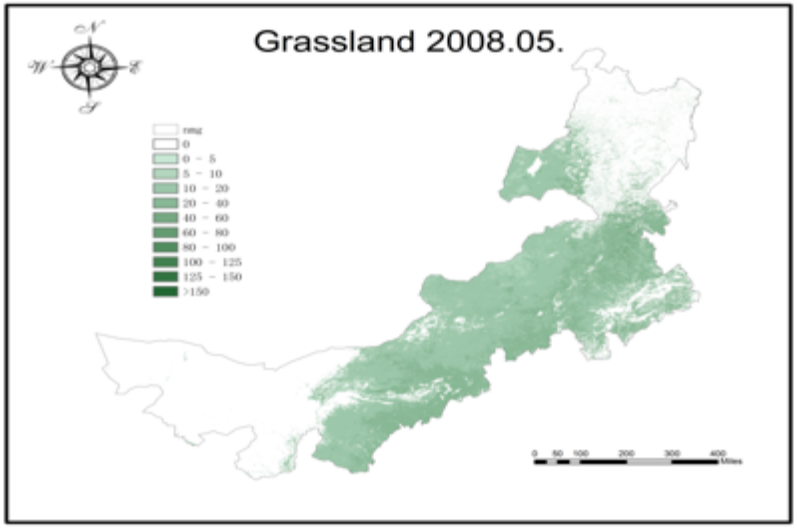


图3. 5. 2008年3-10月内蒙古NPP分布图

Fig.3.5. Spatial Distribution of Graaland NPP of Inner Monglia from March to June in 2008







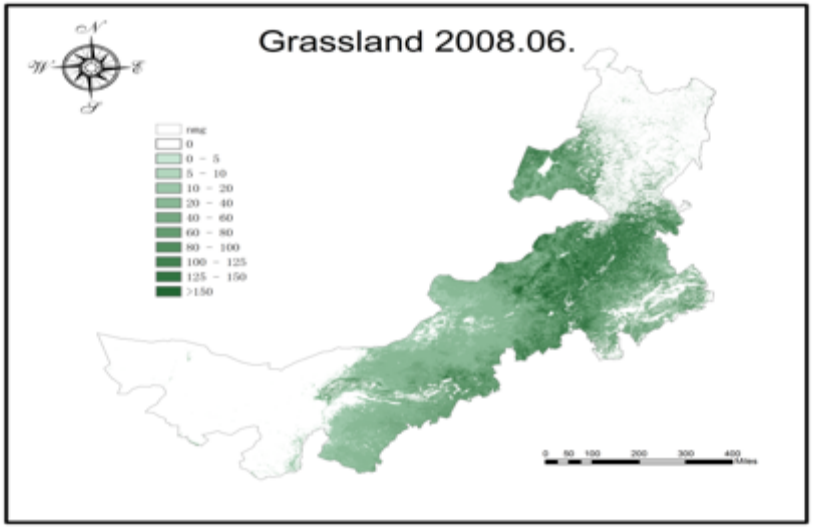
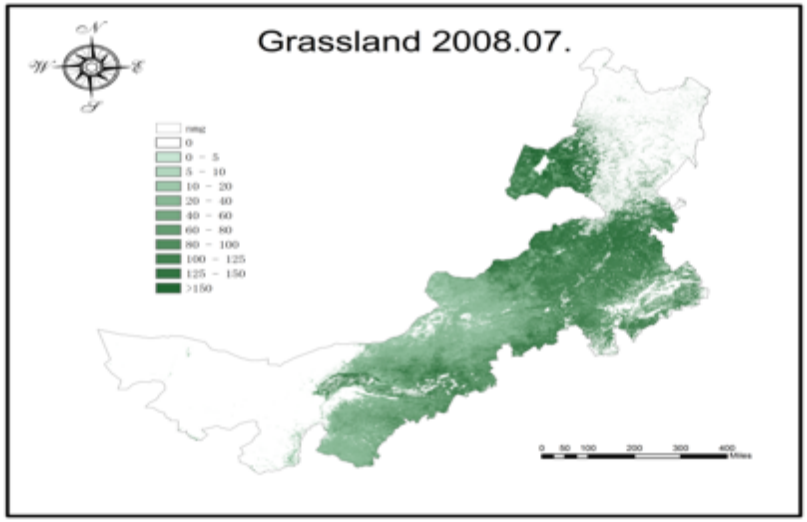
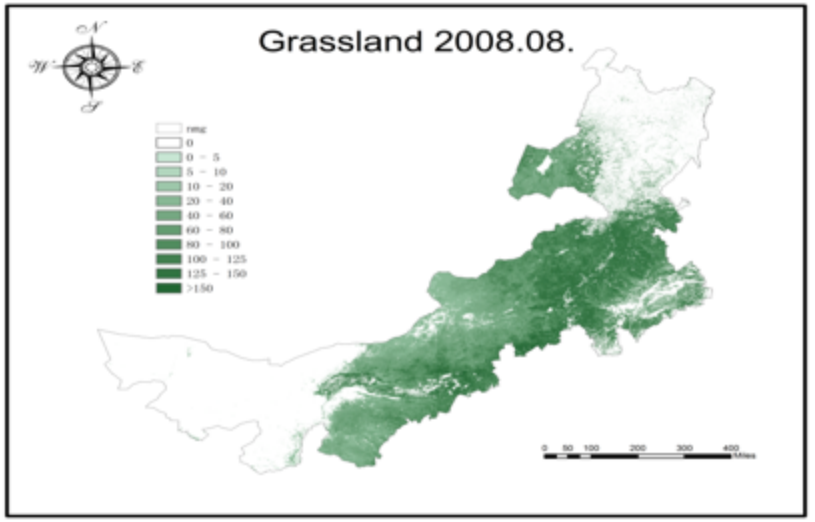
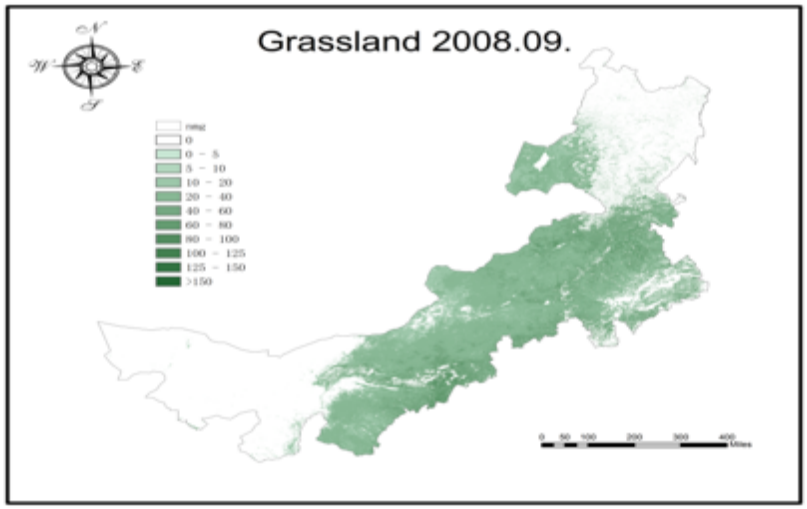


图3. 6.　2008年3-10月内蒙古NPP分布图

Fig.3.6.　Spatial Distribution of Graaland NPP of Inner Monglia from July to Octomber in 2008







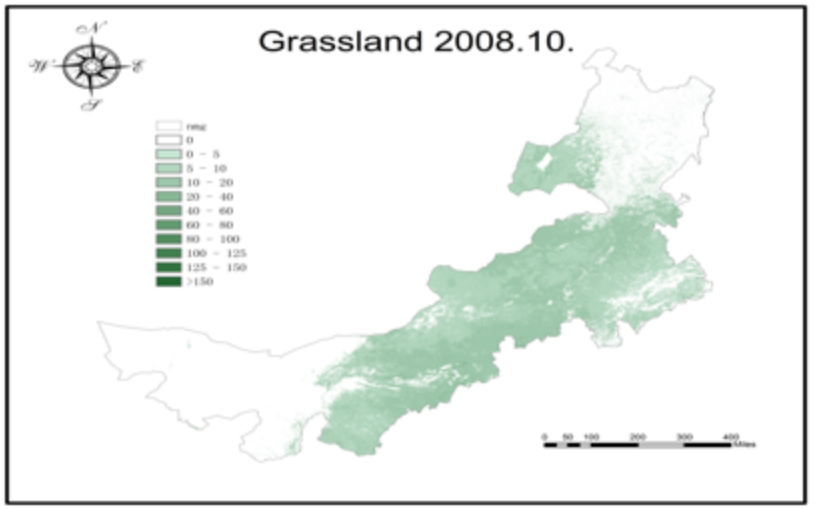


图3. 7.　2008年3-10月内蒙古NPP分布图

Fig. 3.7.　Spatial Distribution of Graaland NPP of Inner Monglia from March to Octomber in 2008

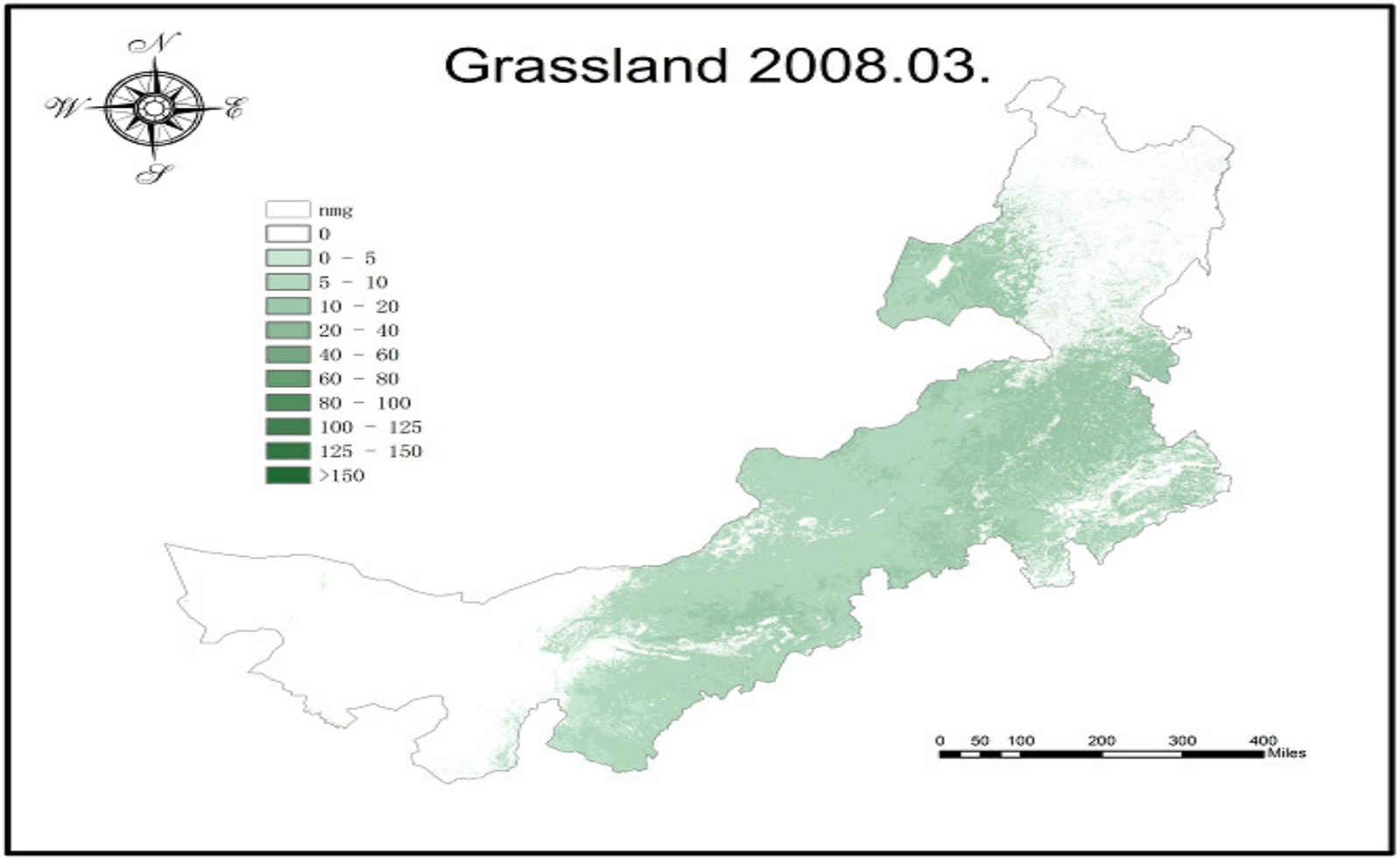


图3.8. 各植被类型2005-2010年NPP密度比较 Gg C $m^{-2}yr^{-1}$

Fig.3.8. Mean NPP for Different Vegetation Types During 2005 to 2010

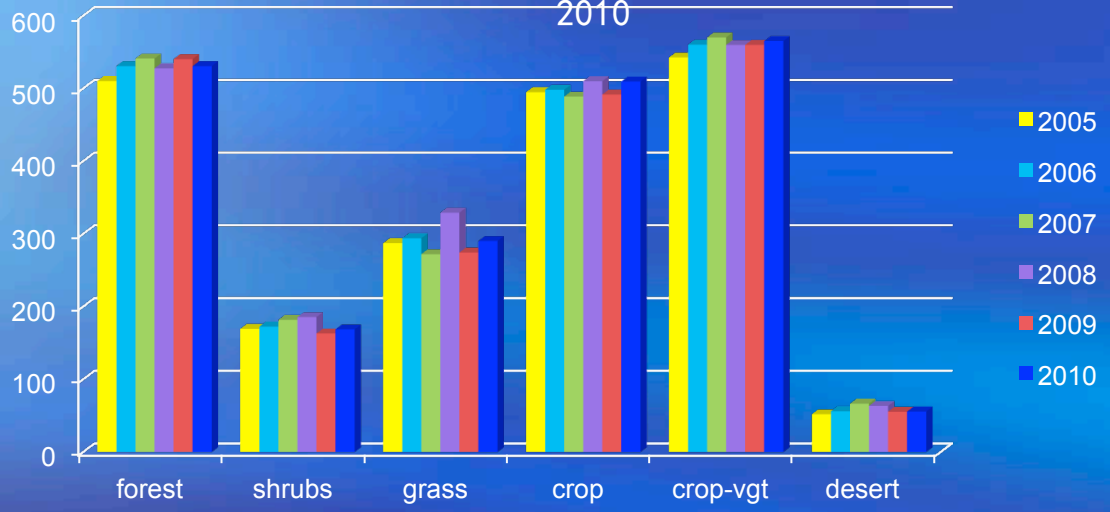


图3.9. 各植被类型6年平均NPP密度比较 Gg C $m^{-2}yr^{-1}$

Fig.3.9 .Average Mean NPP for Different Vegetation Types from 2005 to 2010

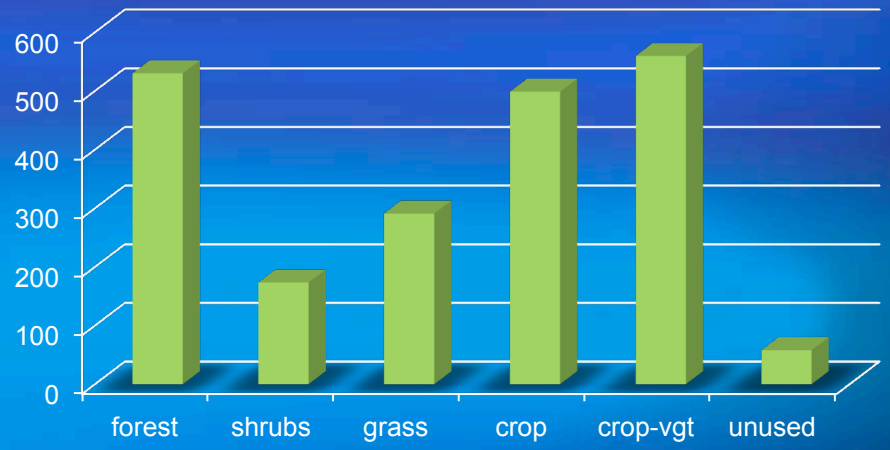


图 3.10. 各植被类型2005-2010年NPP总量比较 Gg C yr^{-1}

Fig.3.10. Total NPP for different Vegetation Types from 2005 to 2010

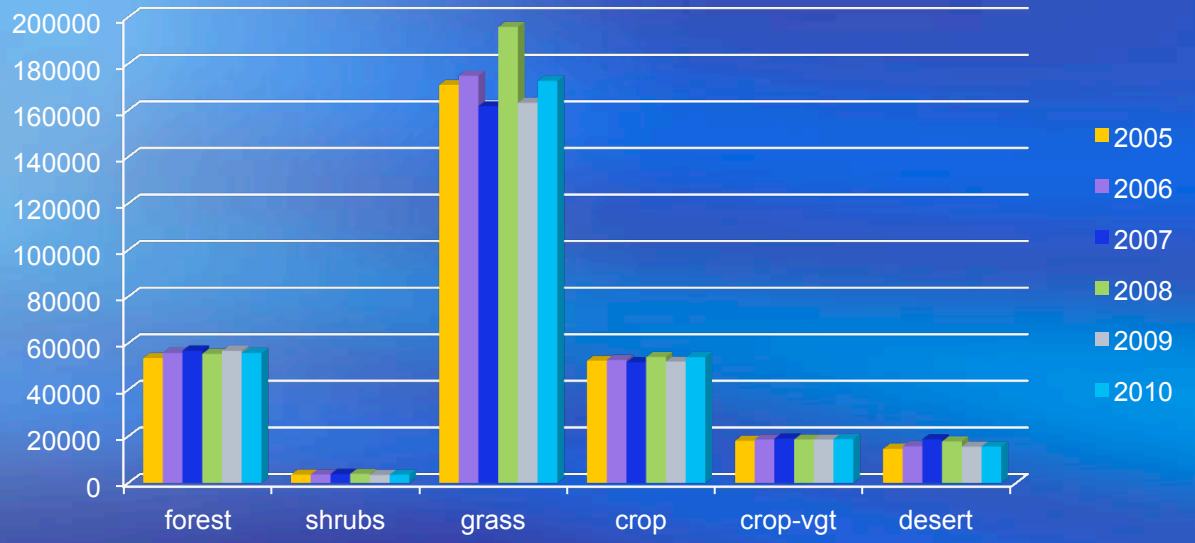


图3.11. 2001-2010年内蒙古NPP总量比较 单位：Gg C yr^{-1}

Fig3.11. Average Total NPP of Inner Mongolia from 2005 to 2010

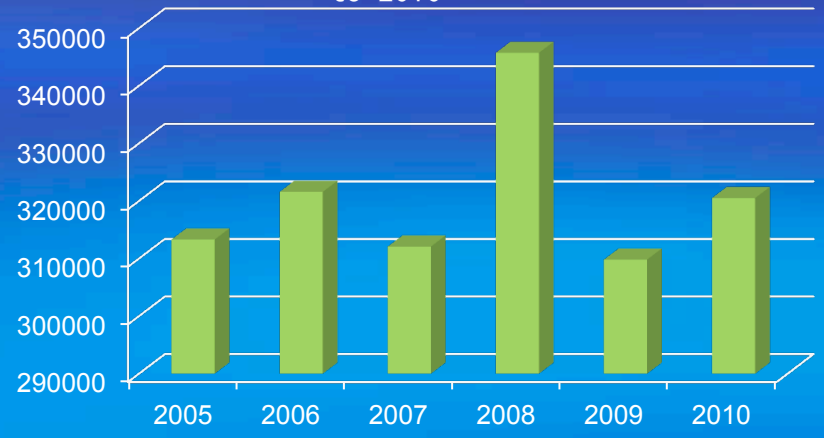


图3.12. 各植被类型6年平均NPP总量比较

Fig.3.12. Average Percentage of Total NPP from 2005 to 2010

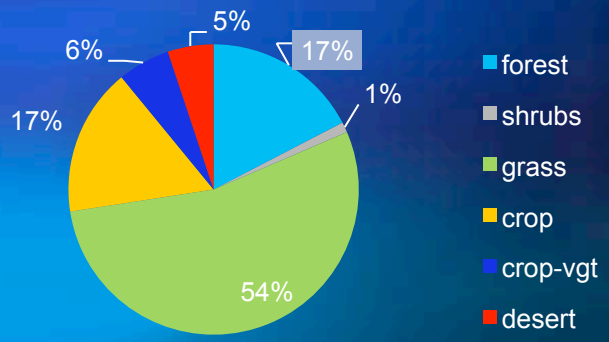


图3.13. 12个月份各植被类型平均NPP密度 单位：Gg C $m^{-2}yr^{-1}$

Fig.3.13. Average Monthly Mean NPP for Different Vegetation Type from 2005 to 2010

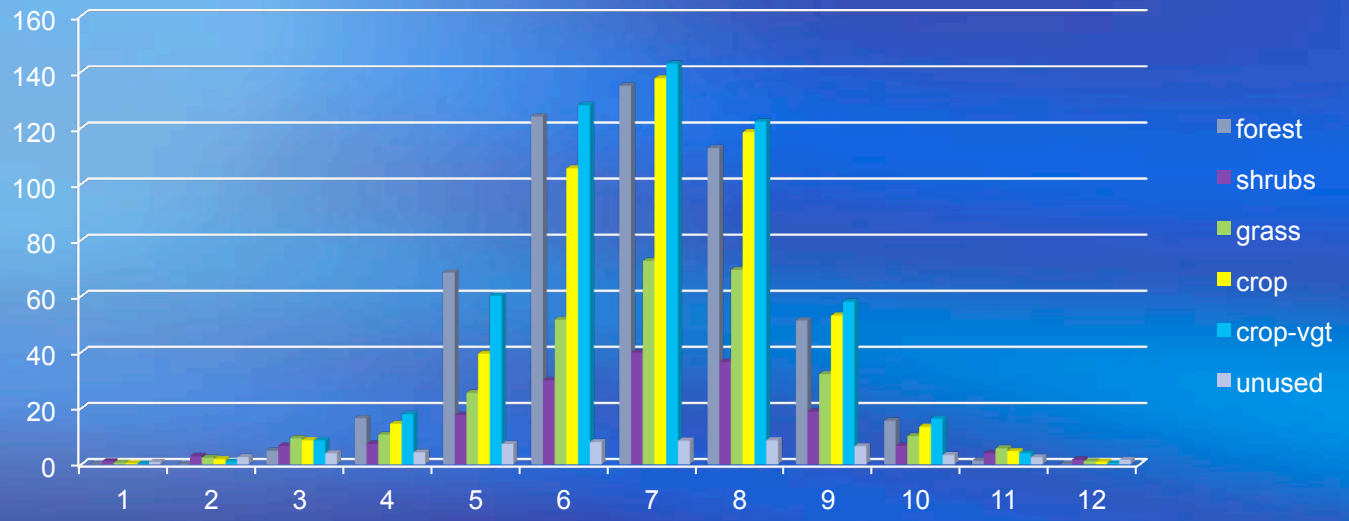
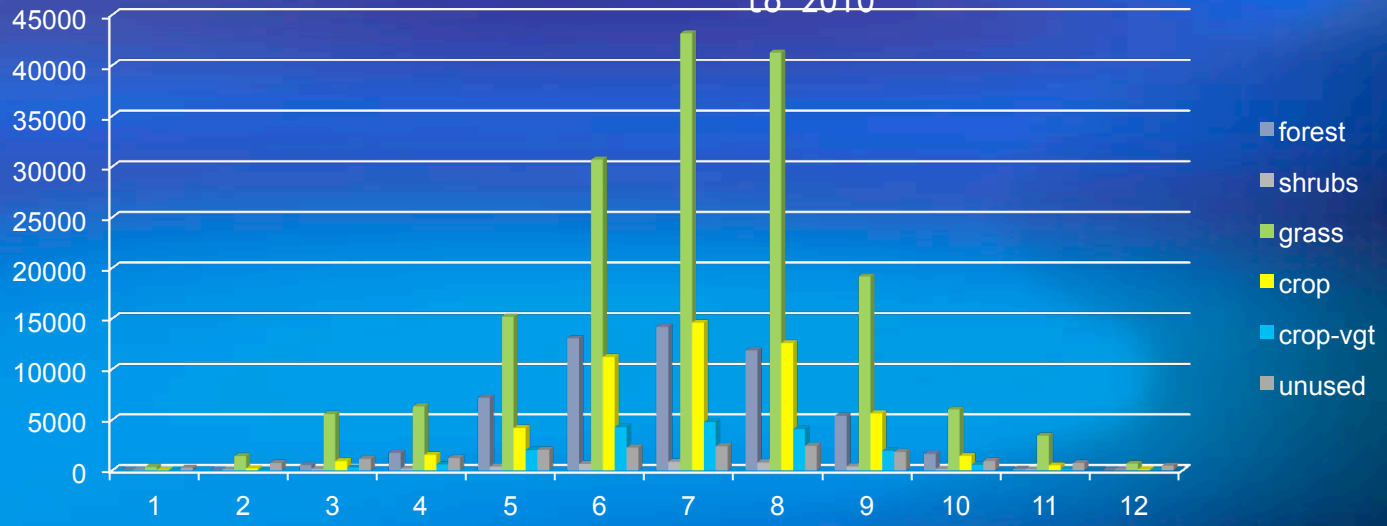


图3.14. 12个月份各植被类型平均NPP总量 单位：Gg C yr^{-1}

Fig.3.14. Average Monthly Mean NPP for Different Vegetation Type from 2005 to 2010



4.Biomass,NPP and carbon sinks of China from 2008 to 2010

图 4.1. 基于MODIS-IGBP分类图的全国土地利用分类图（8类）

Fig.4.1. Land Cover Map of China Based on MODIS IGBP Data （8 Types）

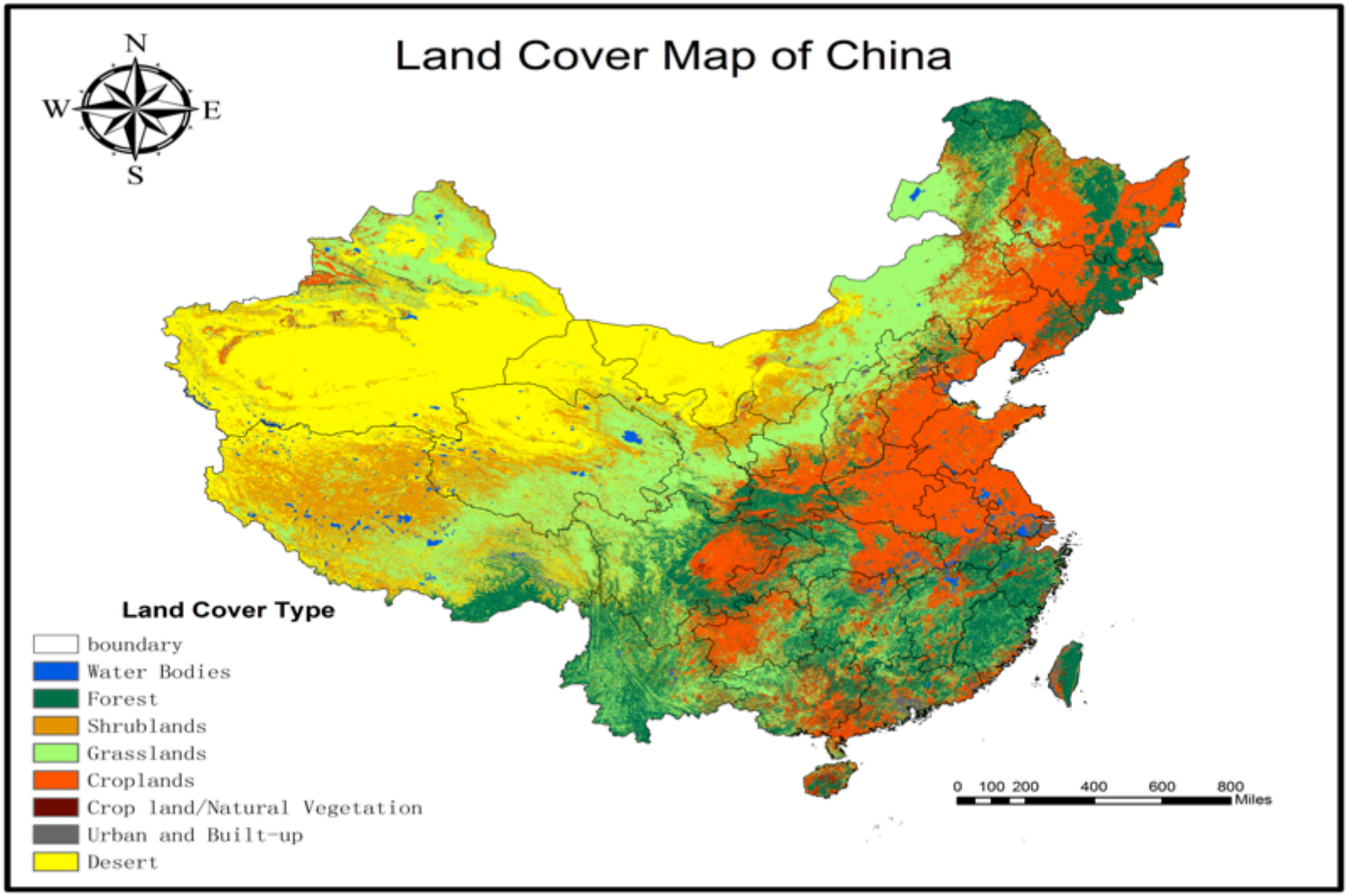


图4. 2.　全国草地分布图
Fig.4.2.　Grassland Map of China

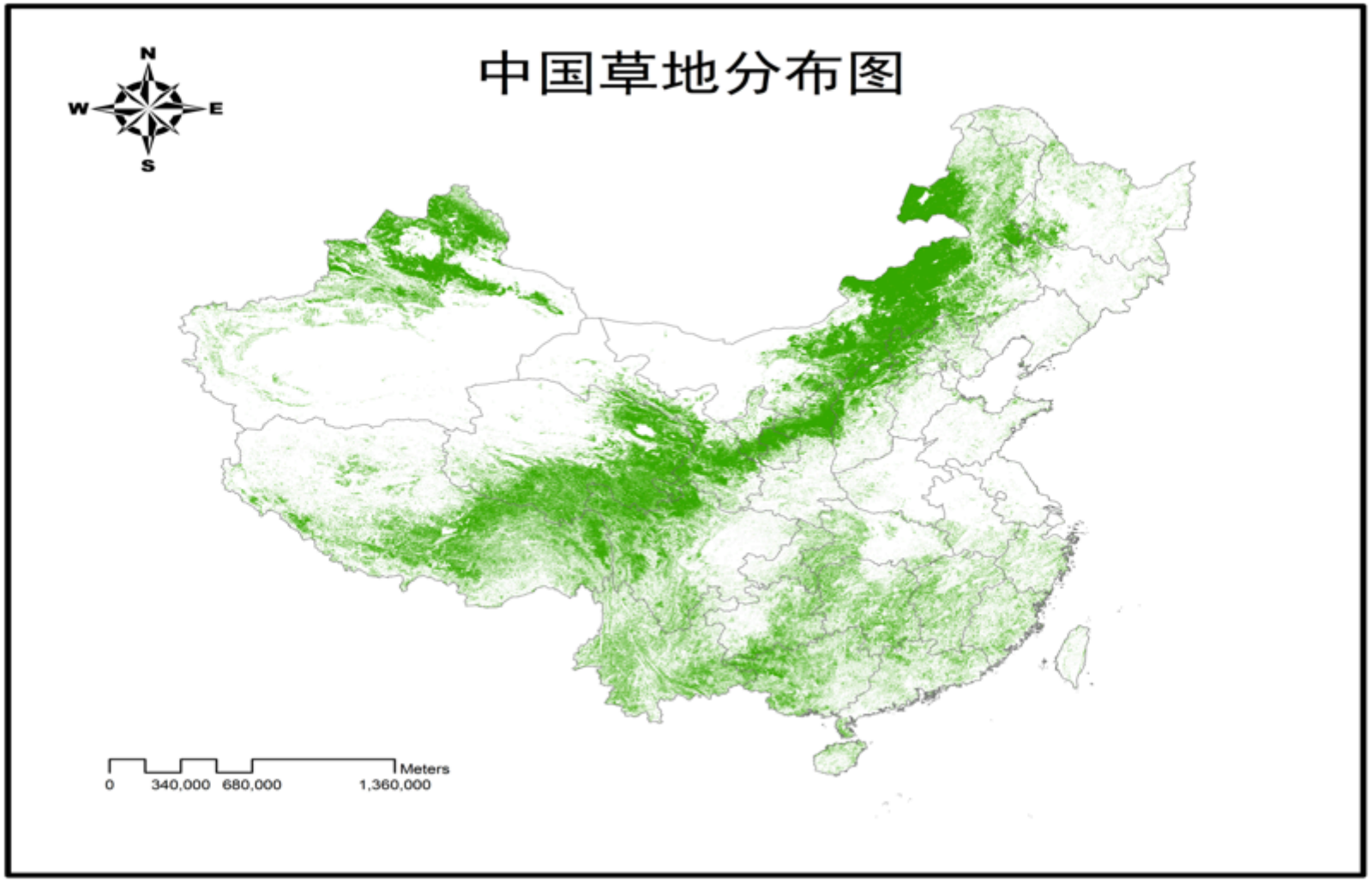


图4.3. 2008年全国各种植被类型年NPP分布图
Fig.4.3. Spatial Distribution of Annual Mean NPP of China for Different Vegetation Types in 2008

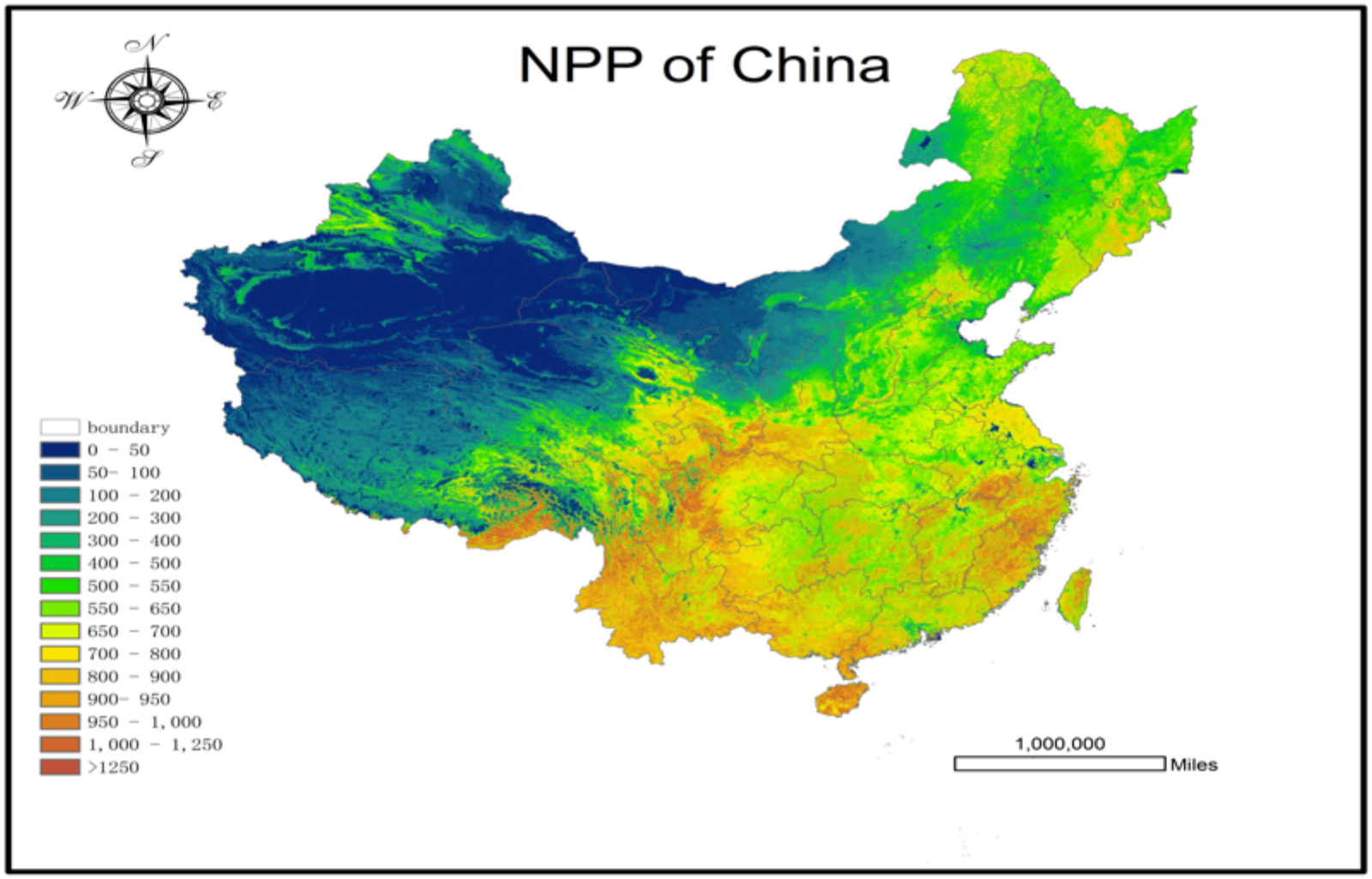


图4.4 2008年全国典型草地年NPP 分布图

Fig.4.4 Spacial Distribution of Annual Mean Grassland NPP of China in 2008

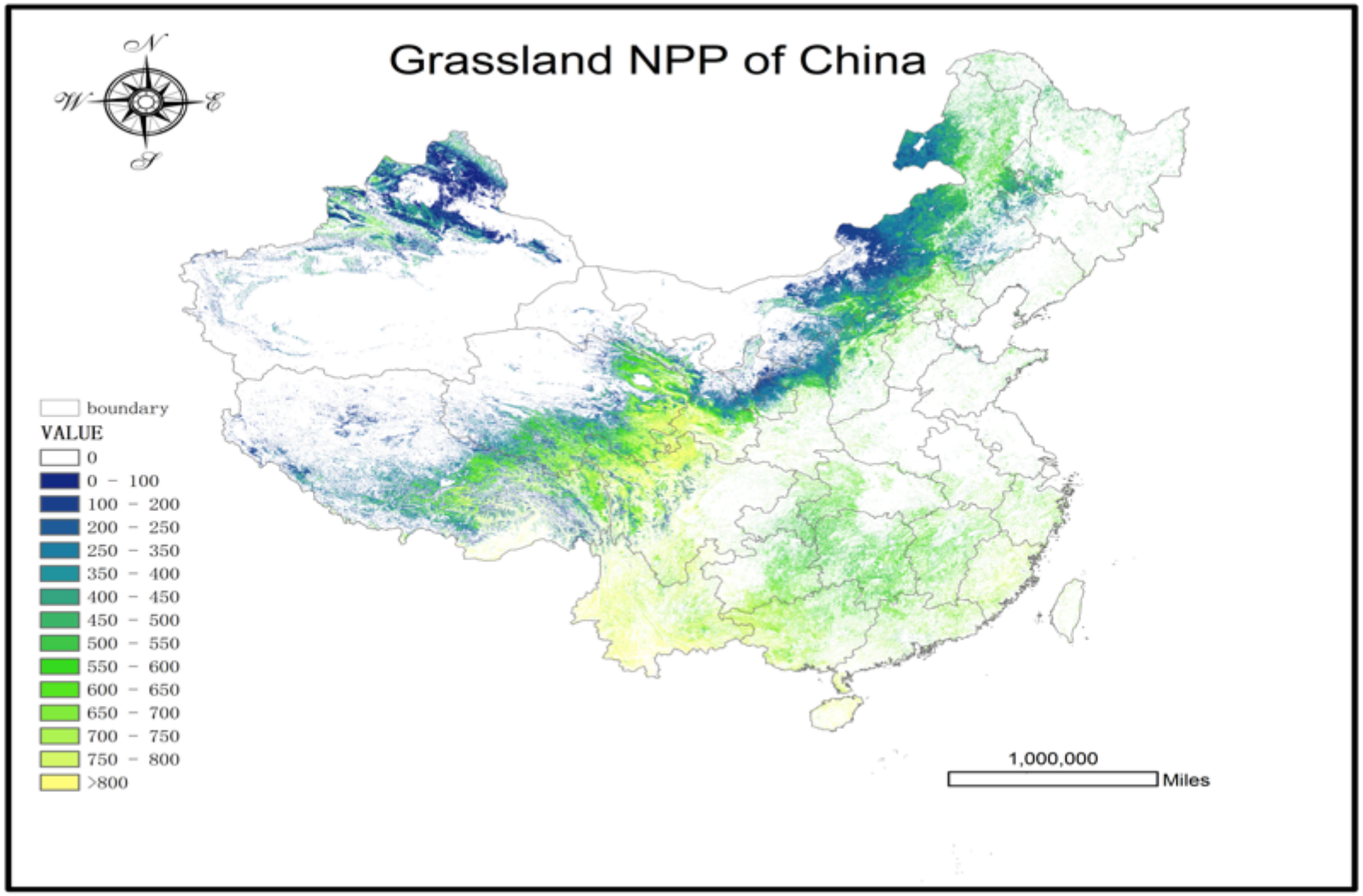
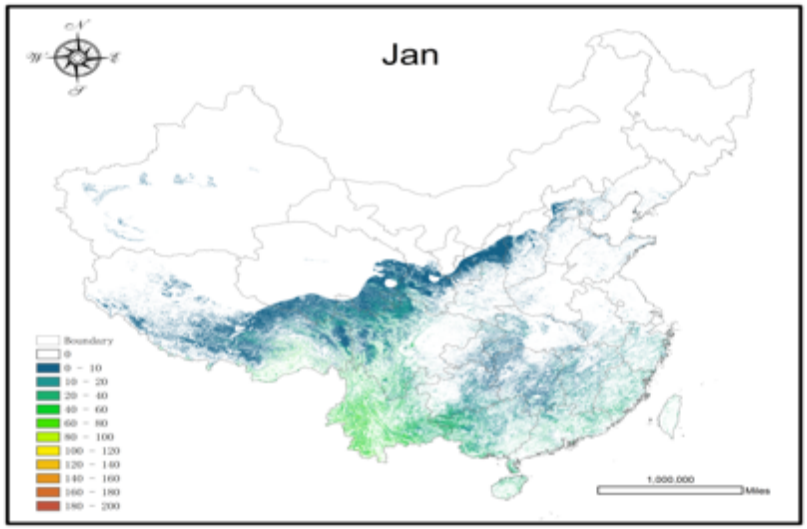
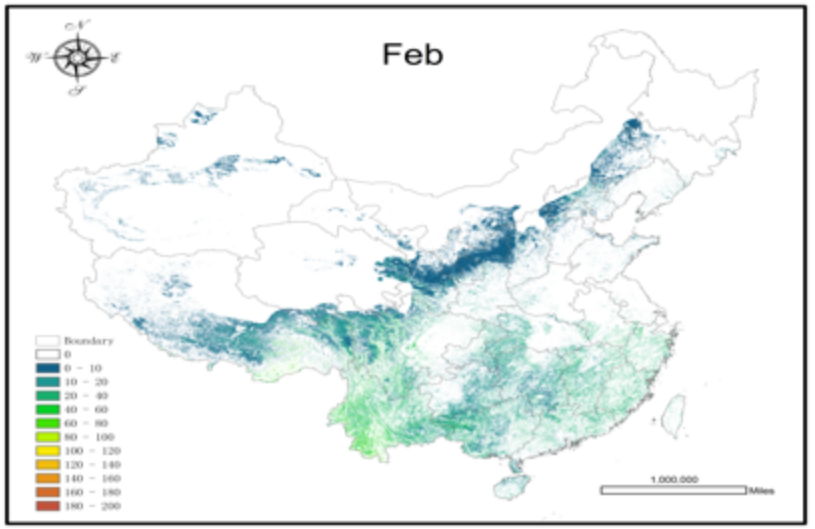
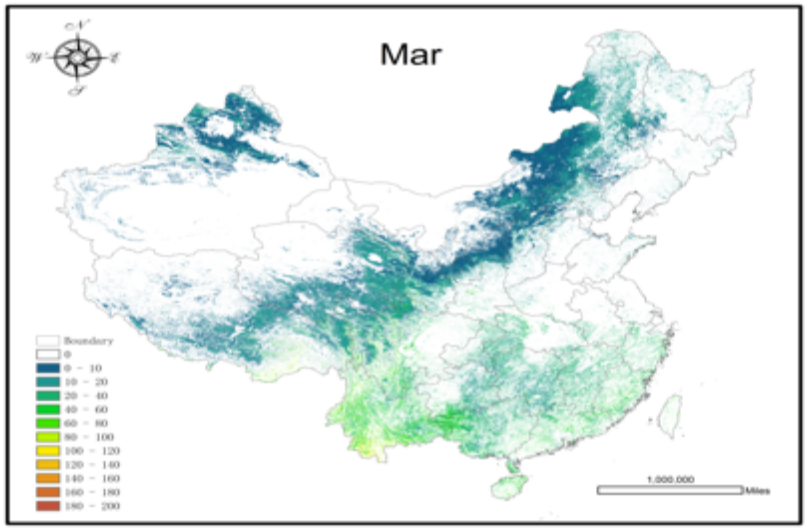


图4.5. 2008年全国草地1-4月NPP 分布图

Fig.4.5. Spacial Distribution of Average Monthly Grassland Mean NPP In 2008







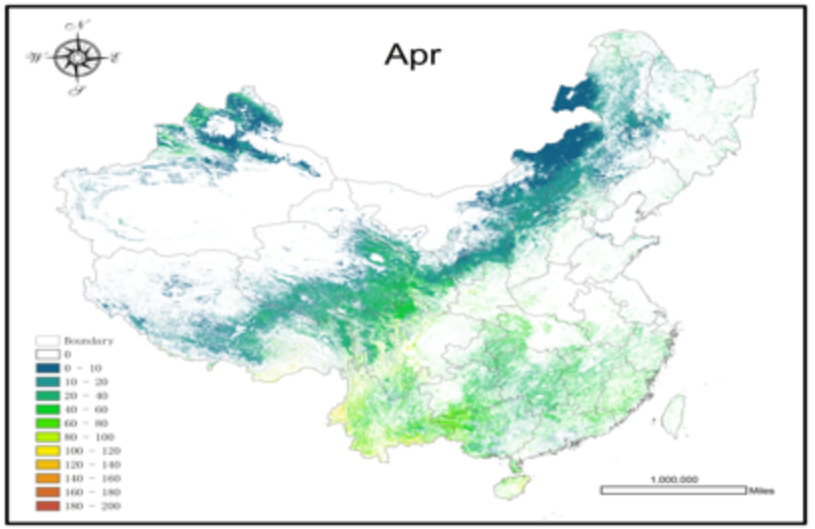
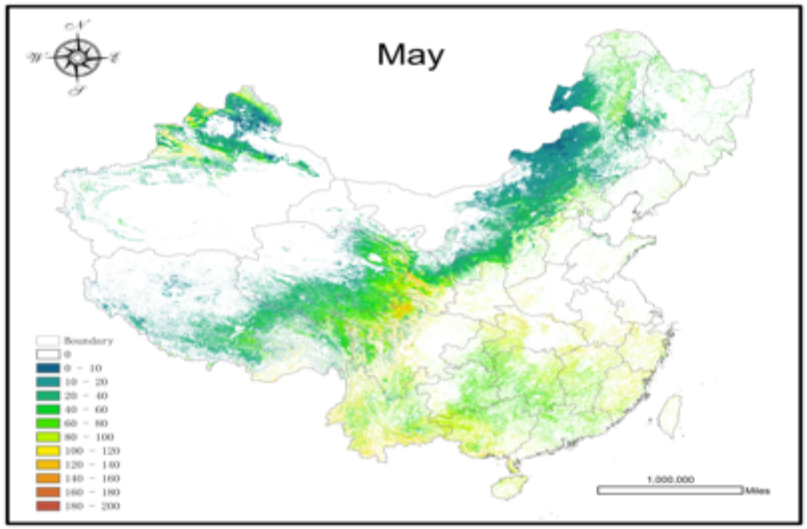
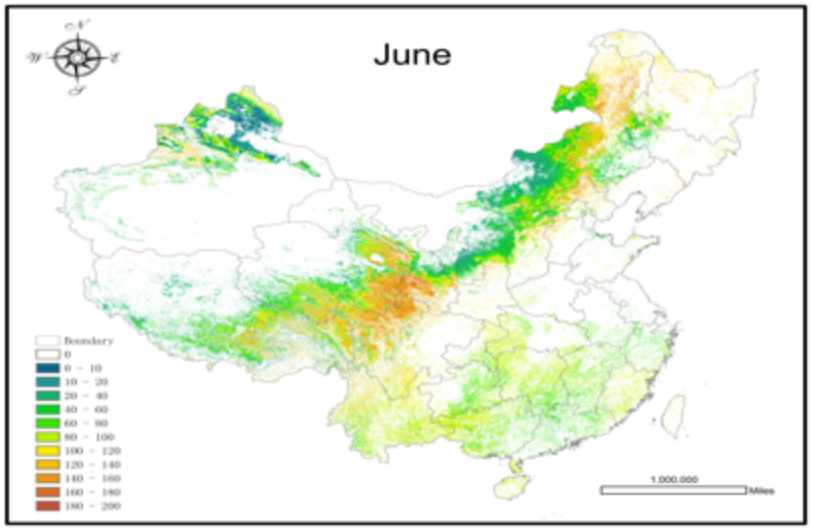
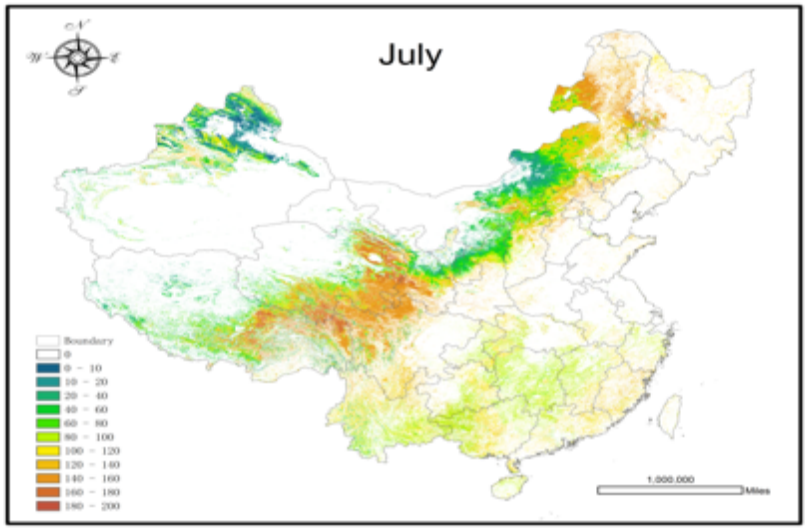


图4.6. 2008年全国草地5-8月NPP 分布图

Fig.4.6. Spacial Distribution of Average Monthly Grassland Mean NPP In 2008







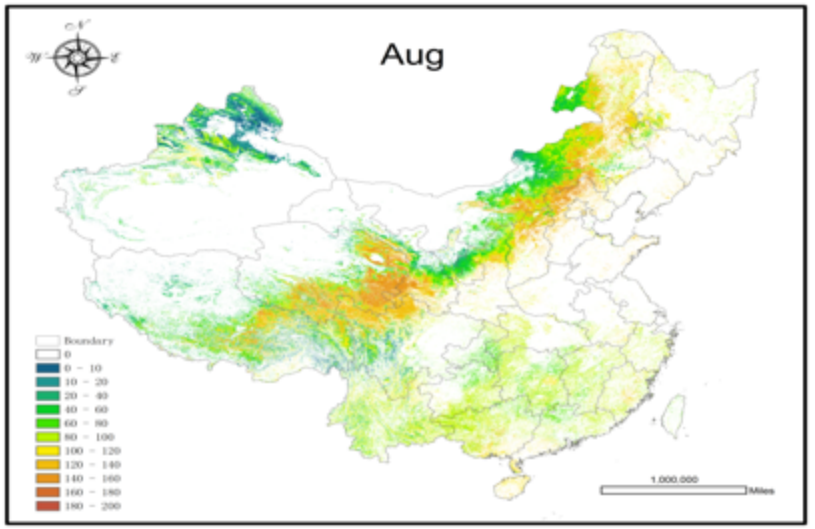
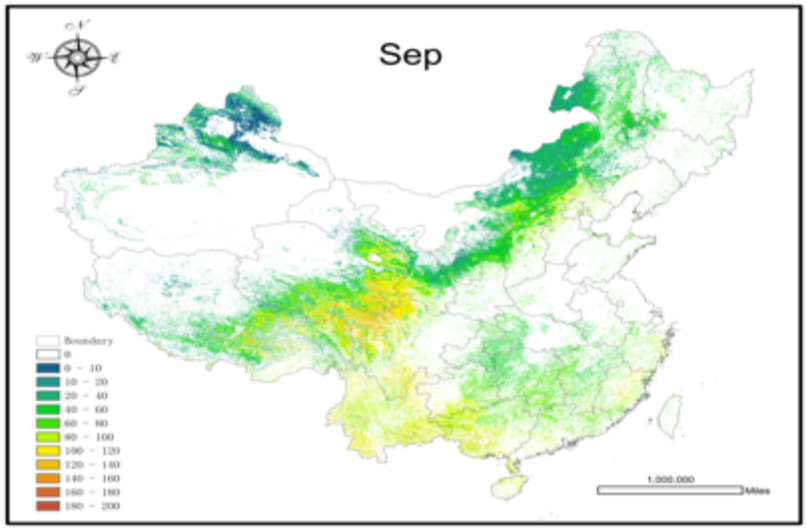
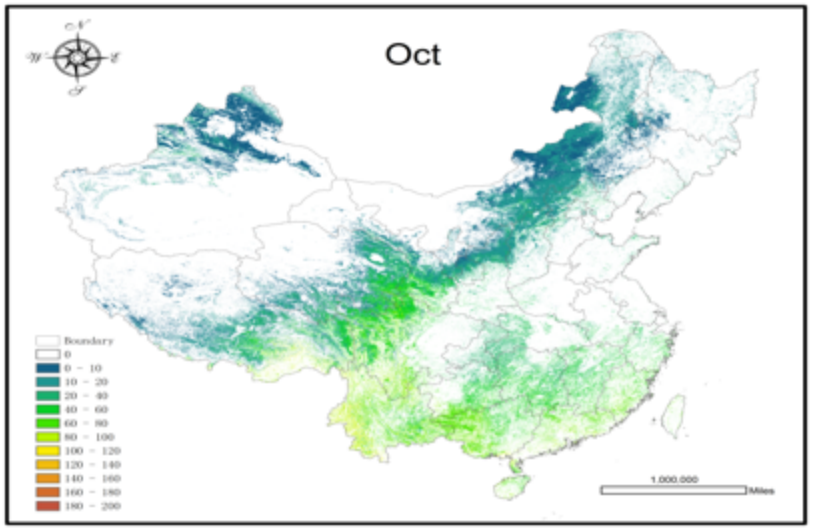
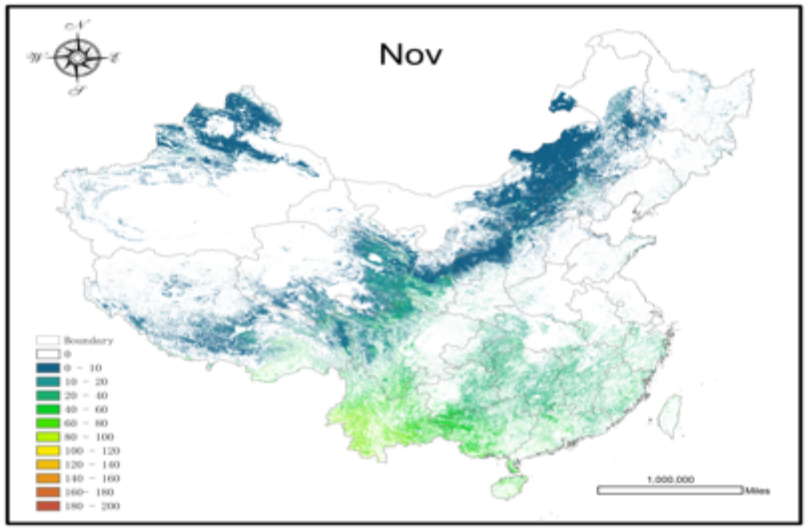


图4.7. 2008年全国草地9-12月NPP 分布图

Fig.4.7. Spacial Distribution of Average Monthly Grassland Mean NPP In 2008







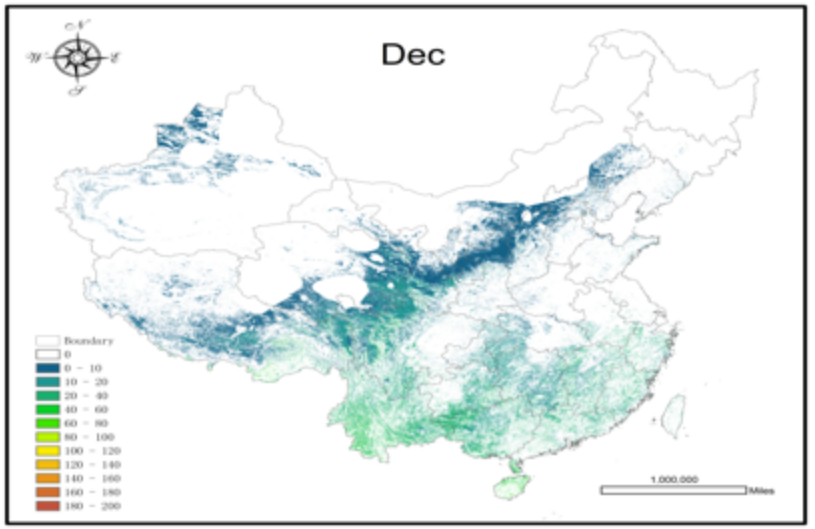


图4.8. 2008年全国草地1-12月NPP 分布图

Fig.4.8. Spatial Distribution of Average Monthly Grassland Mean NPP In 2008

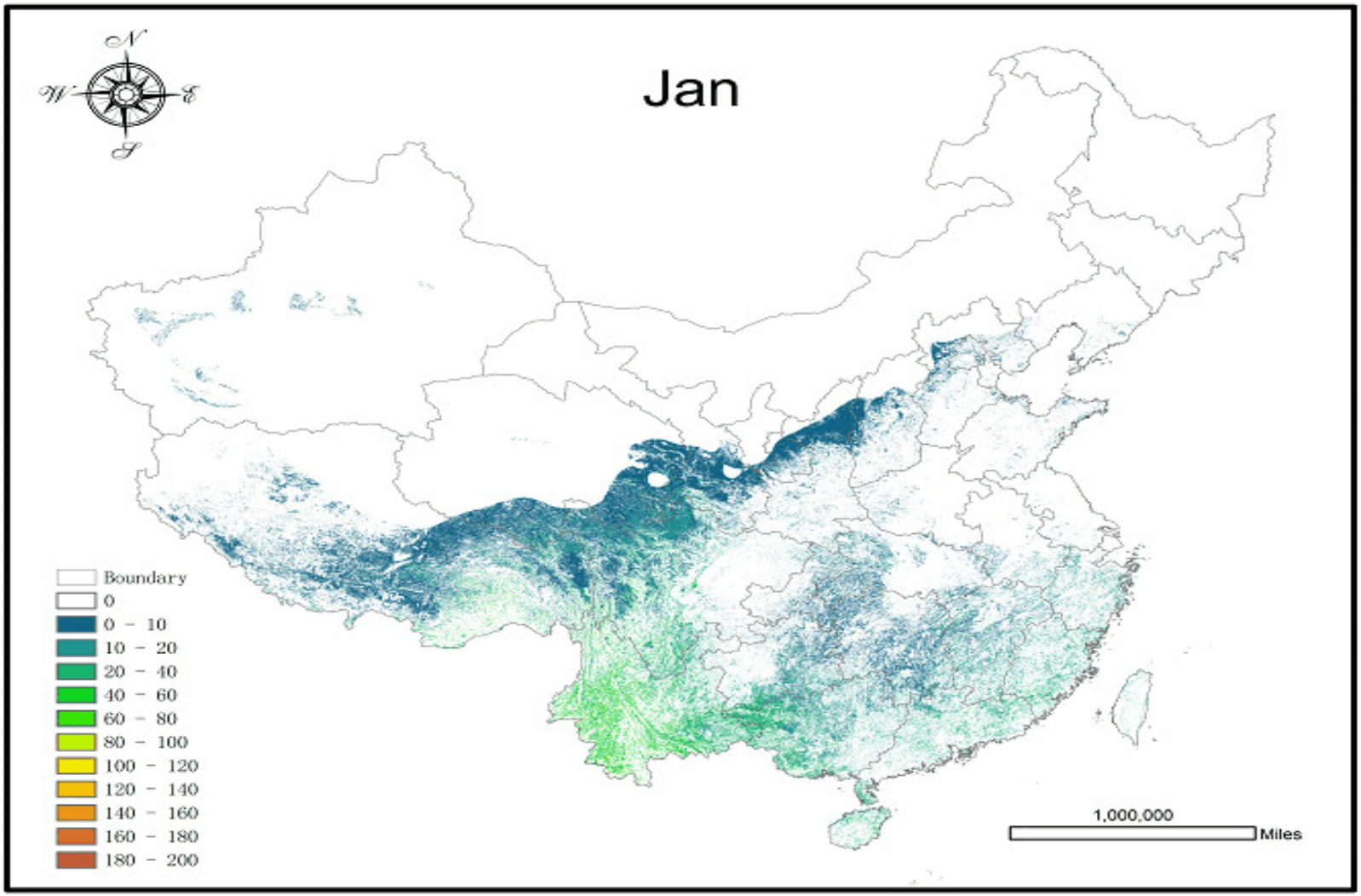


图4.9.　2010年全国草地NDVI分布图

Fig.4.9. Grassland NDVI distribution in China in2010

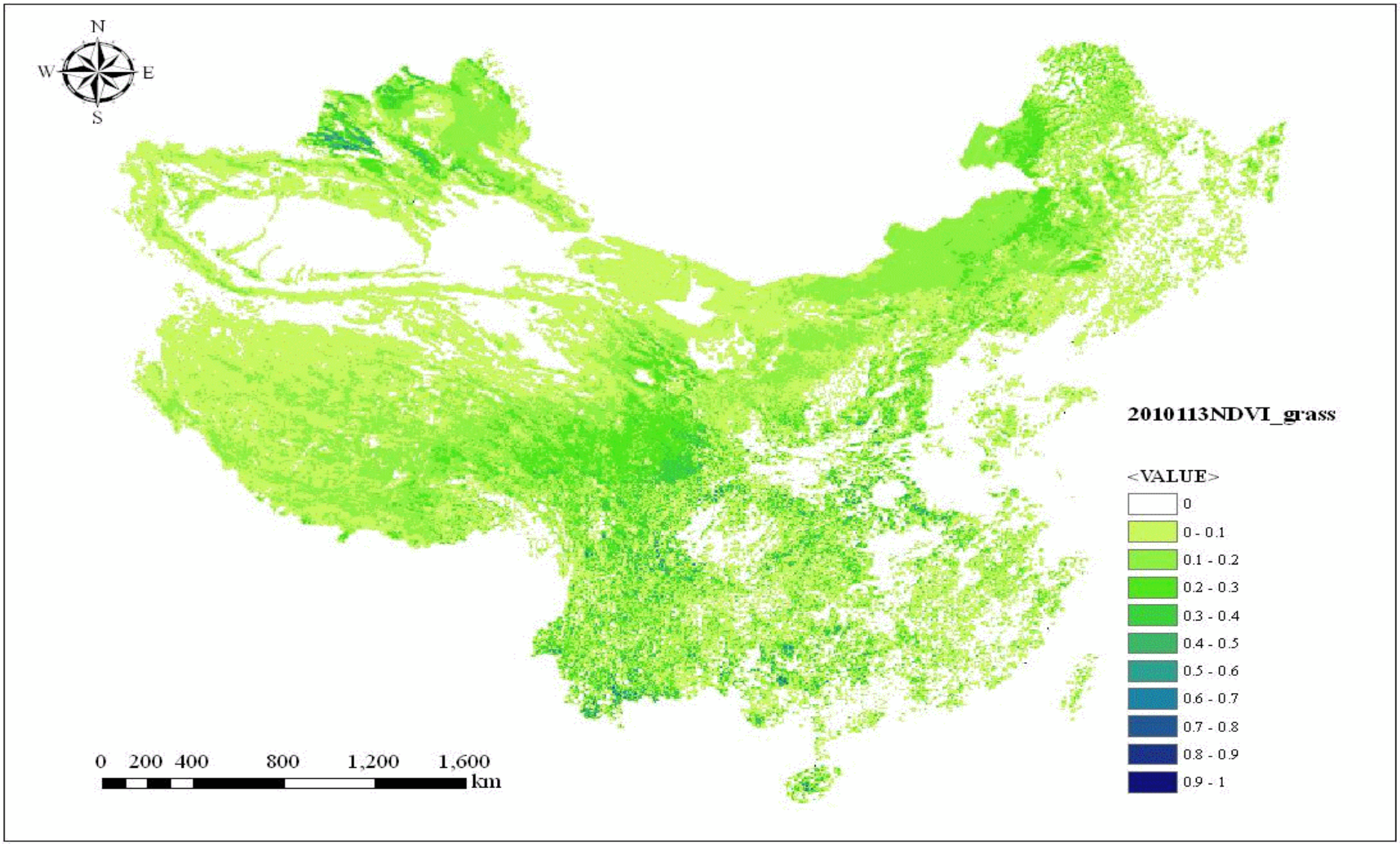


图4.10.　2010年4－10月全国草地NPP分布

Fig.4.10.　Distribution of grassland NPP from April to October in 2010 in China

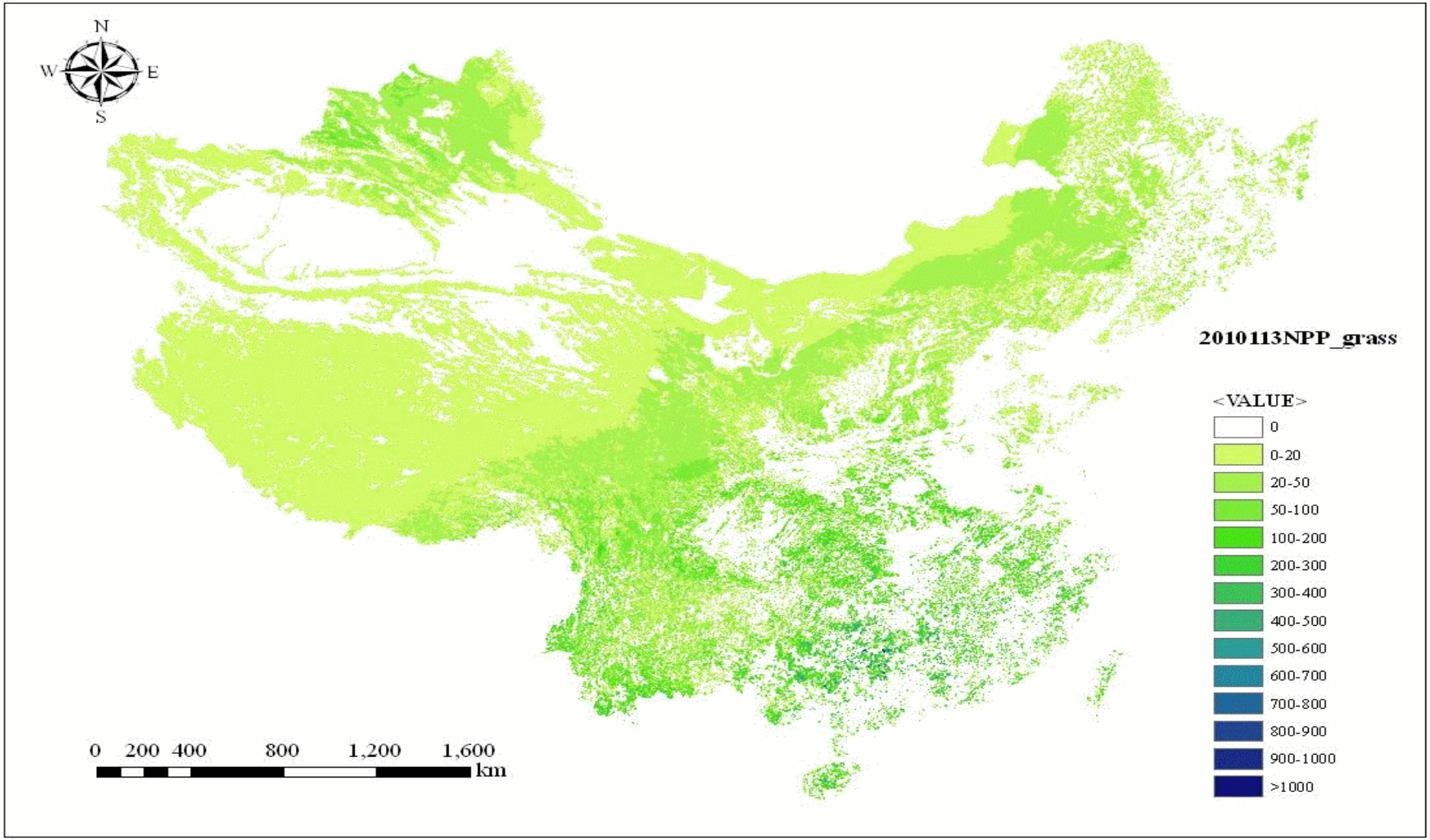


表4.1.　模拟值与实测值的比较

Table 4.1.　Comparison between simulation and observation values (gC/m^2/16day）

类型 Type	样本数 Sample amount	最大值 Maximum	最小值 minimum	平均值 Mean value	标准差 Standard deviation	根方均差 RMSE
实测值 Observation	66	496.862	11.136	150.163	16.115	75.076
模拟值 Simulation	66	614.503	24.037	167.012	19.134	

图4.11.　2010年8月草地NPP模拟值与实测值的比较

Fig.4.11. Comparison between simulation and observation values of grassland NPP

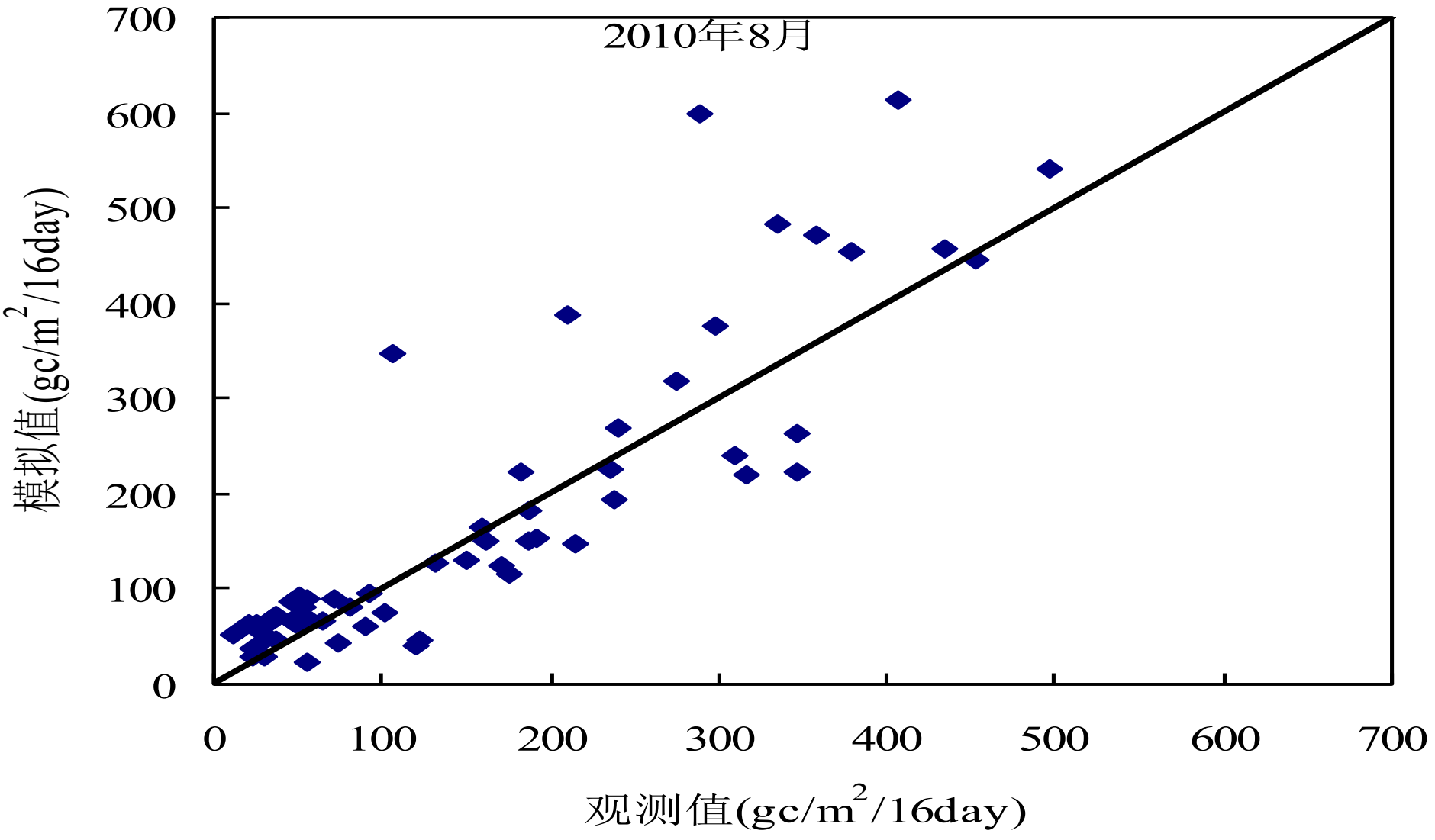
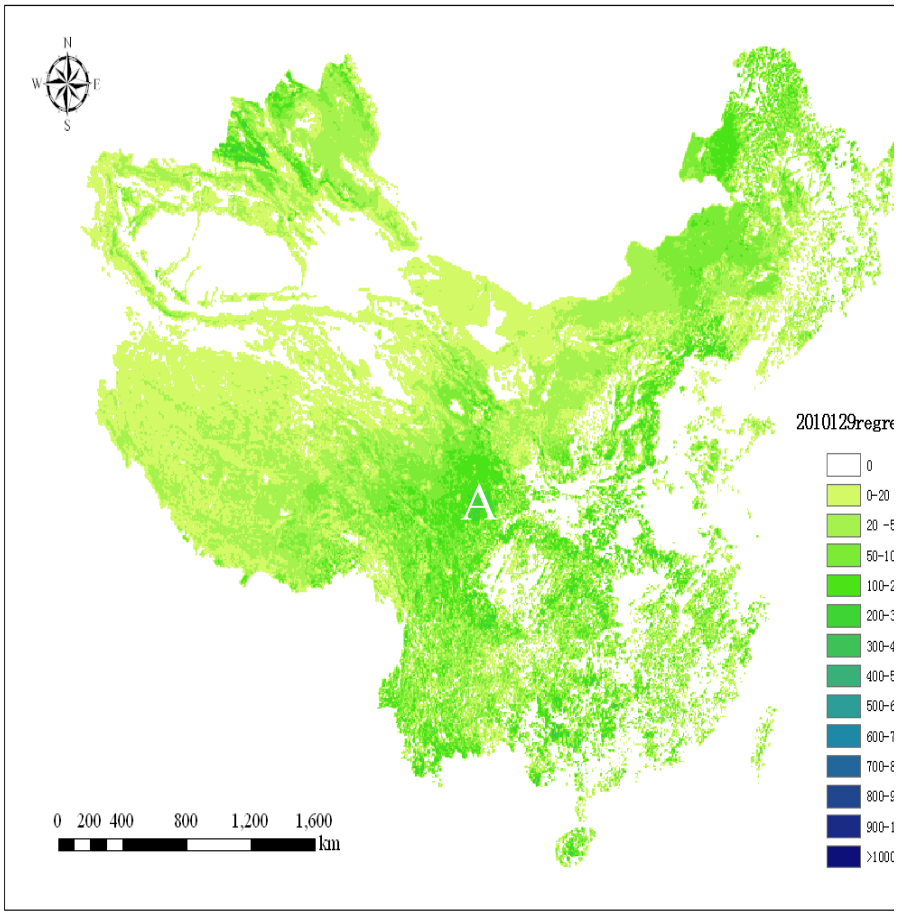


图4.12.　回归模型(A)与本模型（B）模拟2010年第129天草地NPP结果

Fig.4.12. Results of grassland NPP forecasted by the regression model (A) and the PLA model (B) in the 129day in 2010



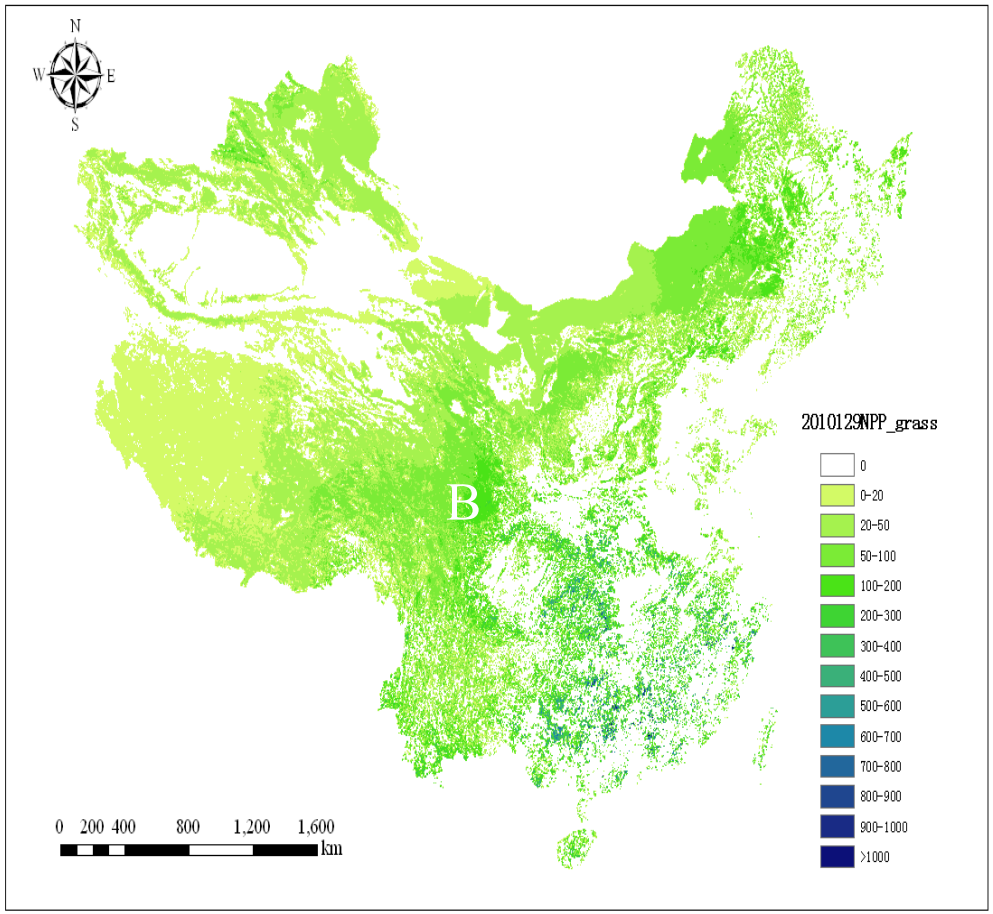


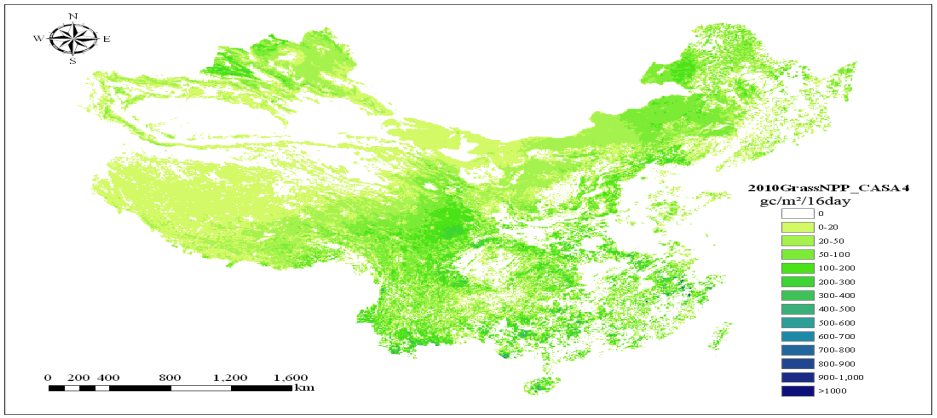
表4.2.　本模型（LPA）与回归模型的比较

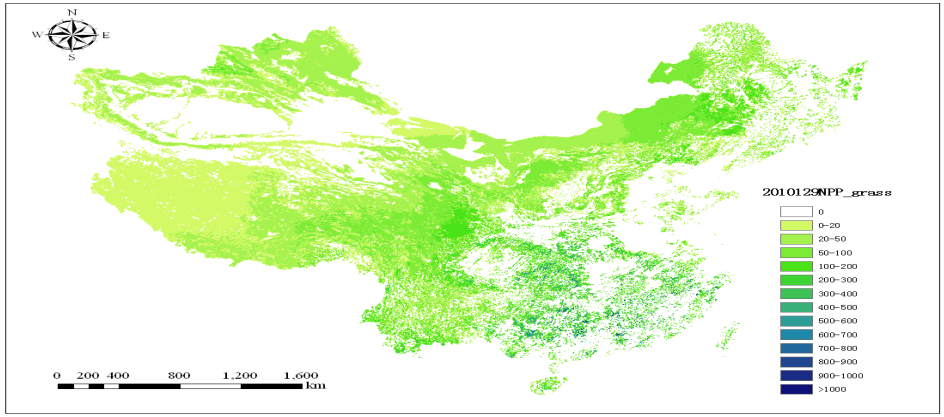
Table 4.2. Comparison between the LPA model and the regression model

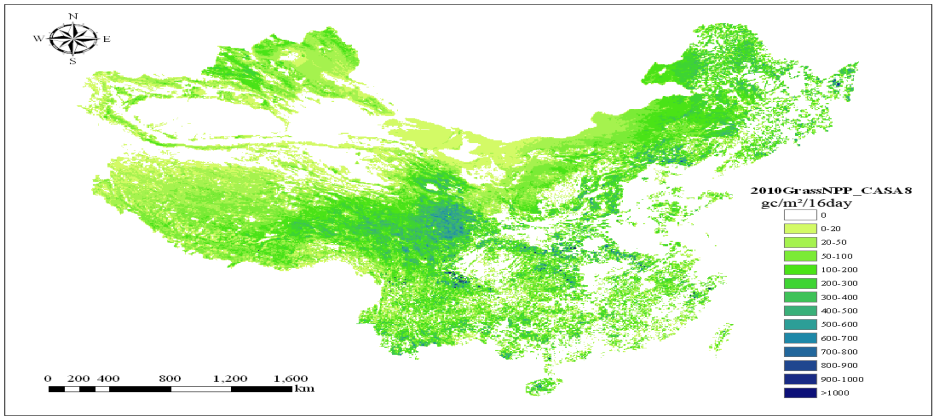
类型 Type	像元数 Cell amount	最大值 Maximum	最小值 minimum	平均值 Mean value	标准差 Standard deviation	根方均差 RMSE
回归预测值 Regression	427	437.327	8.329	90.036	95.334	77.921
模型模拟值 Simulation	427	956.494	8.354	86.878	110.109	

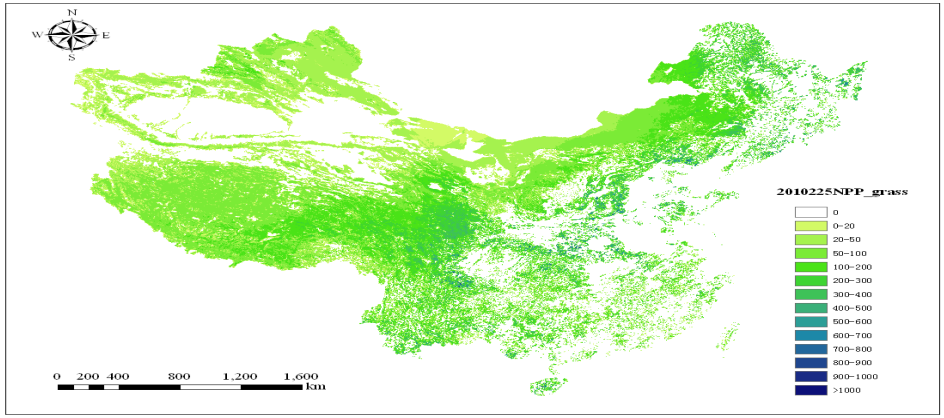
图4. 13.　CASA模型(A)与本模型（B）模拟2010年三个时期草地NPP结果

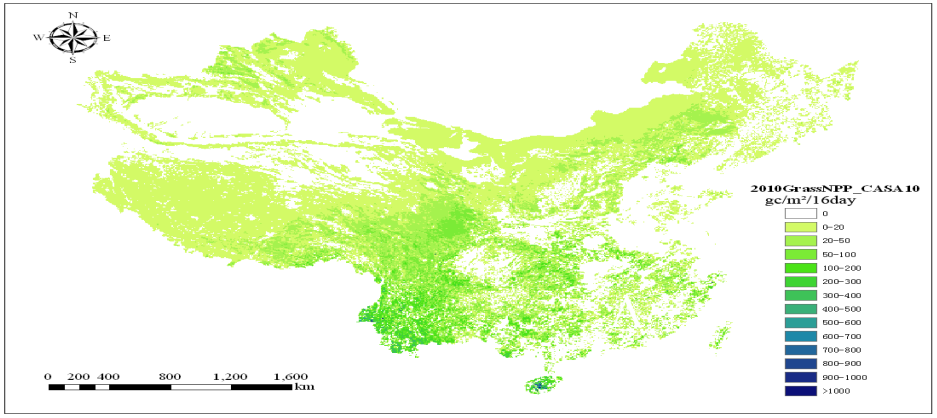
Fig.4.13. Results of grassland NPP forecasted by the CASA model (A) and the PLA model (B) in 2010











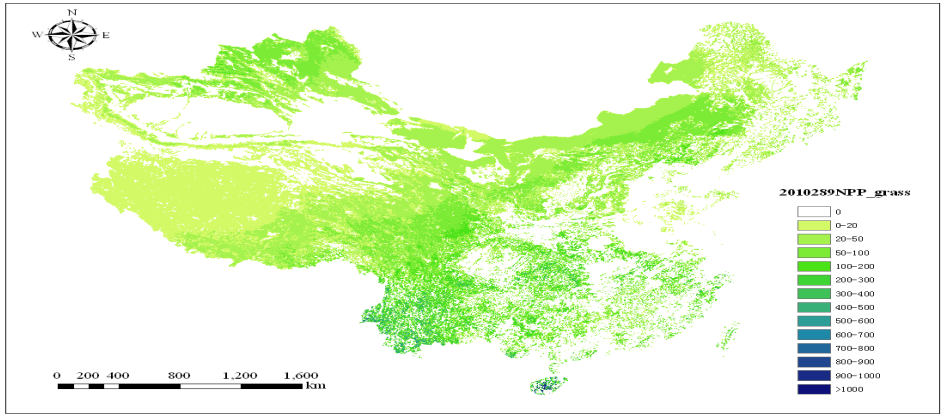


表4.3.　本模型（LPA）与CASA模型的比较

Table 4.3. Comparison between the LPA model and the CASA model (gC/m^2)

日期 Date	类型 Type	像元数 Cell amount	最大值 Maximum	最小值 minimum	平均值 Mean value	标准差 Standard deviation	根方均差 RMSE
2010年第129天	CASA	427	659.123	3.829	89.064	111.513	73.483
	LPA	427	956.494	8.354	86.878	110.109	
2010年第225天	CASA	427	962.801	5.541	195.064	209.348	128.649
	LPA	427	768.358	15.664	168.599	174.008	
2010年第289天	CASA	427	596.027	0.882	36.962	71.371	148.156
	LPA	427	728.718	8.886	73.031	102.021	

表4.4.　2010年草地NPP估算结果

Table 4.4. Estimation of grassland NPP in 2010

日期及		草地面积 10^4km^2	平均NPP gC/m^2	总NPP PgC
2010年	第113天	354.846	43.755	0.155
	第129天	354.846	86.878	0.308
	第145天	354.846	95.870	0.340
	第161天	354.846	100.509	0.357
	第177天	354.846	109.169	0.387
	第193天	354.846	170.213	0.604
	第209天	354.846	179.985	0.639
	第225天	354.846	168.599	0.598
	第241天	354.846	161.525	0.573
	第257天	354.846	135.129	0.479
	第273天	354.846	81.061	0.288
	第289天	354.846	73.031	0.259

5. 不同尺度的草地生态系统观测图片
Photos of estimation of grassland ecosystem at different scals

图5.1. 六种不同土地利用类型

Fig.5.1. 6 land use land cover types

图5.2. 野外实地调查与观测

Fig.5.2. Survey and observation on the grassland

图5.3. 在青藏高原高寒草甸实地调查与观测

Fig.5.3. Survey and observation on the Qinghai-Tibet plateau alpine meadows

图5.4. 在新疆进行野外土壤高光谱测定

Fig.5.4. Observation **high spectrum of soil in Xinjiang**

图5.5. 在新疆进行野外现场草地植被与土壤测定

Fig.5.5. Observation of grassland vegetation and soil in Xinjiang

五疙瘩样点

图5.6. 新疆主要典型草地类型及其现场观测

Fig.5.6. **Typical grassland type in Xinjiang**

图5.7.南方主要草山草坡现场调查与观测图示

Fig.5.7. **Observation of grassland in south China**





Thank You !