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研究论文

中国区域植被地上与地下生物量模拟

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摘要 应用大气-植被相互作用模型AVIM2在0.1°×0.1°经纬度网格上估算了中国区域植被总生物量、地下和地上生物量以及根茎比的空间分布格局。研究了植被生物量和根茎比的空间分布与水热限制条件的关系。研究表明：中国植被总生物量、地下和地上生物量受水热条件影响明显，空间分布趋势基本相似，即在暖湿的东南和西南地区生物量大，而在干冷的西部地区生物量小。同类植被生物量的空间分布有显著区域差异，气温高、降水量大的区域植被生物量大；低温和干旱地区的植被生物量小。除灌木以外，植被生物量大小的空间分布受水分的影响大于温度。中国区域植被根茎比的空间分布存在明显区域差异，全国大致以大兴安岭、太行山、秦岭以及青藏高原东南侧一线为界线，界线东南植被根茎比较小；界线以西，植被根茎比较大。植被根茎比的空间分布与年平均气温、土壤湿度和年降水量显著反相关，水分因子对根茎比空间分布的影响大于温度。

关键词 生物量； 根茎比； AVIM2； 中国

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Modeling study of vegetation shoot and root biomass in China

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Abstract The spatial patterns of total vegetation biomass, shoot and root biomass, as well as root to shoot (R/S) ratio were estimated by the atmospheric-vegetation interaction model (AVIM2) at the resolution of 0.1°×0.1° grids across China. The relationships between soil moisture, precipitation, temperature, and the spatial distributions of vegetation biomass as well as the R/S ratio were also studied.

The results indicate that the spatial distributions of total biomass, root and shoot biomass as well as R/S ratio were limited by both water and energy. During the study period of 19611990, total carbon stocks in vegetation in China is estimated to be 14.04 Gt C (1Gt=1015g), with a mean value of 1.54kg C /m2. The total vegetation biomass and shoot biomass have the same overall pattern in spatial distributions: the highest values occurred at the northeast and northwest areas of China and the lowest value located at the west areas of China. In terms of regional distribution, valley bottom area of southwestern China are dominated by evergreen broadleaf forest and needle leaf forest where water and heat conditions are excellent and total biomass is the highest, above 10kg C /m2. Part of hilly and mountainous areas in southeastern coastal zone of China where dominated by evergreen needle leaf forest, with total vegetation biomass of 510 kg C /m2. In southern part of Qinghai-Tibet Plateau, hilly and mountainous areas of southwestern province Yunnan and Guizhou, part of the areas south of the Huaihe River as well as Great Xing'an and Changbai mountains in Northeast China, vegetation is dominated by deciduous broadleaf forest, deciduous needle leaf forest and mixed forest, with vegetation total biomass above 5kg C /m2. Total crop biomass in northern China is about 0.7kg C /m2; the total biomass of alpine steppe and desert steppe in Inner Mongolia Plateau and southern part of Qinghai-Tibet Plateau ranges mostly from 0.2 t

o 0.5 kg C /m^2; and that in desert and semi-desert areas of western China is less then 0.2 kg C / m^2.
For the same vegetation type, the total biomass is positively correlated with precipitation, soil moi sture, and temperature. Vegetations growing in warm and humid areas, their total biomass is great er than those growing in the cold and dry area. Excepting for shrub lands, the correlation coefficie nts of total vegetation biomass to precipitation and soil moisture are greater than that to temperatu re. This means that the influence of water availability on the spatial distribution of total biomass i s greater than energy.
The spatial patterns of R/S ratio in China have significant spatial variation. A boundary was foun d along Great Xing'an, Taihang Mountain, Qin Mountain and the southeast of Tibetan Plateau. Th e R/S ratios on the southeast areas of the boundary are much smaller than those on the west area s. The simulated mean R/S ratios of croplands, shrub lands, deserts and grasslands are 0.19, 0.9 1, 5.5 and 5.2, respectively. The R/S ratios of forest in China range form 0.19 to 0.36. The spatia l distribution of R/S ratio is negatively related to that of annual mean temperature, soil moisture an d annual precipitation. The correlation coefficients of R/S ratio to precipitation and soil moisture a re greater than that to temperature, suggesting that the R/S ratios of vegetations growing in war m and humid areas are smaller than those growing in cold and dry areas, and the influence of th e water on the spatial distribution of R/S is greater than energy.

Key words root to shoot ratio R/S _ AVIM2 _ China； spatial distribution

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