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研究论文

地面测量与ASTER影像综合计算植被盖度

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摘要 选择我国北方温带典型草原作为研究对象，在研究区内分别针对植被盖度是高、中、低的地区随机选取49块样地，在每块样地内采用嵌套的方式作样方，样方尺度有60、30、15m 3个尺度，嵌套的方式是60m的样方嵌套30m的样方，30m的样方嵌套15m的样方。15m的样方内作3个1m的样方，30m的样方内作5个1m的样方，60m的样方内作10个1m的样方。对于每个1m的样方，采用将数码相机架设在离草本层2m高的位置，垂直对样方进行拍摄，并记录影像的方式估计植被盖度。基于以上地面实测数据以及ASTER遥感数据，建立植被盖度经验模型。模型建立的步骤主要包括以下内容：（1）利用植被盖度信息提取模型计算野外实测的各张数码相片的植被盖度值，在15、30m以及60m 3个样方尺度上计算各样方的植被盖度；（2）计算ASTER数据的各种植被指数（*RVI*，*NDVI*，*NDGI*）；（3）将地面样方与相应的ASTER影像像元在不同的尺度上相匹配。（4）基于某一样方尺度，计算与地面样方相对应区域内的ASTER影像像元植被指数的中值。（5）基于该样方尺度，建立地面实测植被盖度值与ASTER数据植被指数值之间的回归模型；（6）对回归模型进行显著性检验。在建立经验模型的过程中，研究植被指数（*NDVI*、*NDGI*以及*RVI*）与植被盖度的相关性以及地面样方尺度对经验模型的影响。此外，还将经验模型与目前广泛使用的亚像元分解模型作比较，检验亚像元分解模型在中国北方温带典型草原的适用性。结果表明，（1）对于中国北方典型草原区而言，利用植被指数NDVI监测草地的植被盖度是比较适宜的，它优于植被指数RVI，也比植被指数NDGI的效果好。（2）地面样方尺度的选择对于植被盖度经验模型的建立有很大的影响。就中国北方典型草原区来看，在地面作大样方，取其中值的方法在一定程度上可以克服由于地面的测量和遥感测量之间发生空间错配而产生的影响，有利于提高植被指数与植被盖度之间相关系数的显著水平。（3）60m×60m的样方尺度，基于NDVI的植被盖度经验模型相比，利用亚像元分解模型估测中国北方温带典型草原植被盖度的精度低于前者。

关键词 草地植被盖度；数码相片；样方尺度；ASTER遥感数据；植被指数；经验模型；亚像元分解模型

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The synthetically estimating vegetation fractional covera ge of grassland using field data and ASTER remote sensin g imagine

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Abstract In this thesis the temperate typical steppe of North China is taken as the research object. Within the research area 49 sample fields are chosen respectively from the areas with high, medium and low vegetation fractional coverage. Sample plots are taken from each sample field through the process of nesting. Namely, a 30m nested sample plot is chosen randomly from each 60m sample plot, and then a 15m nested sample plot is further chosen from each 30m sample plot. Within these sample plots of different sizes, three 1m sample plots are chosen from each 15m sample plot, five 1m sample plots are chosen from each 30m sample plot, and ten 1m sample plots are chosen from each 60m sample plot. For each 1m sample plot, a digital camera is positioned at a 2-meter height from the herbage with its lens directed vertically downwards towards the gr

ound and taking pictures of the herbage. The vegetation fractional coverage is estimated from th e patterns of the images thus taken by the camera. Based on the data thus obtained from the abov e-described field measurement and the data obtained through ASTER remote sensing, the experie ntial model of vegetation fractional coverage is established.

The procedures for the establishment of the model are as follows:

(1) the calculation of the vegetation fractional coverage indicated by each digital photo taken at th e field measurement and the vegetation fractional coverage of each sample field based on its parti cular size, using the model of extracting vegetation fractional coverage;

(2) the calculation of the various vegetation indices (*RVI*,*NDVI*,*NDGI*) indicated by the ASTER;

(3) the match of the sample fields and their corresponding areas of ASTER image pixels accordin g to the sample fields′ respective sizes;

(4) the calculation of the medians of the vegetation indices of a particular sample field′s correspon ding area of ASTER image pixels , based on the size of that particular sample field;

(5) the establishment of the regression model (including the lineal model and the nonlinear mode l) between the vegetation fractional coverage values derived from the field measurement and thos e derived from the ASTER data, based on the size of that particular sample field;

(6) the administration of a significance test on the regression model thus established.

In the establishment of the experiential model, the following two points are investigated: the correl ation between the vegetation indices (*NDVI*,*NDGI*,*RVI*) and the vegetation fractional coverage a nd the effects of the sizes of the sample plots on the experiential model. In addition, a compariso n is made between the experiential model and the sub-pixel model which is currently in wide use t o test the applicability of the sub-pixel model for the temperate typical steppe of North China. Th e results of the comparison show:

(1) For the monitoring of the vegetation fractional coverage of grassland of the temperate typical s teppe of North China, it is appropriate to use vegetation index *NDVI*, which is more effective an d relevant than *RVI* and *NDGI*;

(2) The establishment of experiential model of the vegetation fractional coverage is much affecte d by the choice of different sizes for the sample plots on the earth. With regard to the temperate t ypical steppe of North China, to choose large sample plots from the research area and select thei r medians can eliminate to some extent the negative effects brought about by a mismatch of the da ta of the field measurement and the data of the remote sensing measurement so as to enhance th e significance level of the correlation coefficient between the vegetation indices and the vegetatio n fractional coverage.

(3) Compared with the experiential model of vegetation fractional coverage based on large-size s ample plots, the accuracy of sub-pixel model is relatively weaker for the estimation of the vegetati on fractional coverage of the temperate typical steppe of North China.

Key words vegetation fractional coverage of grassland _ digital photo _ sample size _ ASTER imagine data _ vegetation index _ experiential model _ sub-pixel model

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