

滩涂土壤电磁感应仪与方差四叉树法采样布局研究 Application of Electromagnetic Induction (EM38) and Variance Quad-tree (VQT) Method on Spatial Sampling Scheme in Coastal Saline Region

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关键词: 电磁感应仪 方差四叉树 滩涂 土壤采样 空间变异

摘要: 将电磁感应仪EM38和方差四叉树法VQT相结合,以EM38测量的土壤表观电导率作为土壤盐分的辅助变量,以表观电导率的空间分布为先验信息,利用VQT法对苏北滩涂围垦地土壤盐分的优化采样布局进行了设计、验证与精度评价。结果表明,VQT法设计的采样方案经Kriging插值形成的空间分布图与原始图件极其相似,但两者的样点数目相差近1/2。相同的样本数目,VQT法获取的空间分布图与原始图件的相似度高于网格采样法;同样的成图精度,VQT法需要的样本数量小于网格采样法;在允许最大偏差指数为10%的条件下,VQT法采样效率比网格法提高17.3%。该方法具有可根据局部部位变异大小进行密集或稀疏采样的优势,EM38和VQT法的结合运用为滩涂区降低采样成本、提高采样效率提供了有效手段与理论依据。 Electromagnetic induction (EM38) and variance quad-tree (VQT) were both applied in the field of the coastal reclamation area in north Jiangsu Province. Apparent soil electrical conductivity (ECa) measured with EM38 was used as an ancillary variable of soil salinity, and the spatial distribution of ECa was used as priori information. The optimized sampling pattern of soil salinity was designed and validated by using VQT method, and the precision of the sampling design was evaluated. Results showed that the kriged spatial distribution map of the VQT scheme was highly similar to the kriged map of total sampling sites, while sampling quantity of the former was almost 1/2 of that of the latter. With the same sampling quantity, the kriged map of VQT scheme was more similar to the kriged map of total sites than that of grid sampling scheme. With the same mapping accuracy, the sampling quantity of the VQT scheme was less than that of grid sampling scheme. Under the condition of permitted maximum difference index of 10%, the sampling efficiency of VQT method could be improved by 17.3%. The advantage of the VQT method was that the scheme sampled sparsely or intensively in terms of variability in local parts of the study area. The associated application of EM38 and VQT method provided efficient tools and theoretical basis for saving cost and improving efficiency in coastal saline region.

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