

## 辅助时序数据用于土壤盐分空间预测及采样研究

### Spatial forecast and sampling of soil salinity by Kriging with temporally auxiliary data

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英文关键词: auxiliary data; soil salinity; co-Kriging; regression-Kriging; sampling size; prediction accuracy

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中文摘要:

以普通克里格法作为参考, 利用辅助数据的两种预测方法, 即协同克里格法和回归克里格法对海涂区土壤盐分进行空间内插计算, 并在目标变量的采样数目不断减少的情况下, 利用80个检验样本, 对比了这3种方法的预测精度。结果表明, 不论目标变量的样品数目如何减少, 利用了辅助变量的协同克里格法和回归克里格法的预测精度较普通克里格法都有了较大提高, 而且回归克里格法的预测精度总体上要好于协同克里格法。对不同样品数目下3种方法的预测误差进行T检验发现, 回归克里格法对普通克里格法和协同克里格法预测误差的减少在不同的样本数目下都达到了极显著水平。研究结果表明, 利用连续几个时段上辅助的时序数据, 来对同样点位上下一个时段的变量进行估值, 可以较大地提高估值精度, 节省采样成本。尤其是回归克里格法的回归部分可以是一般的线性模型, 也可以是非线性模型, 在预测时无疑更具灵活性。

英文摘要:

The study examined the performances of two interpolation methods which allow to account for auxiliary data: co-Kriging, regression-Kriging and tested against ordinary Kriging, to improve the interpolation of soil salinity. The prediction accuracy for the three methods was evaluated in the different sampling densities of the variable of interest by comparison with another group of 80 validation sample points. Results show that whatever the sample size of target variable decreased, co-Kriging and regression-Kriging performed better than ordinary Kriging using auxiliary variables. Moreover, regression-Kriging performed on average more accurate predictions than co-Kriging. The results of the T-test of interpolation error for ordinary Kriging, ordinary co-Kriging and regression-Kriging with different sample sizes indicate that regression-Kriging has the lowest interpolation error than ordinary Kriging and co-Kriging and significant reduction of the interpolation errors is achieved. So, regression-Kriging shows promise for predicting the subsequent soil properties from previously temporal data, or for predicting sparsely located soil properties from dense observations. Moreover, in regression-Kriging, the regression model can be more flexible, such as generalized linear models or non-linear models, which provides a possibility to include more ancillary variables.

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