A comparison study of geostatistical simulation for predicting soil texture

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Introduction

Soil texture controls many important ecological, hydrological, and geomorphic processes. To predict the spatial distribution of soil texture, three-dimensional (3-D) geostatistical modeling is an important approach.

Materials & methods

The study area is located near the Quzhou Experimental Station, China Agricultural University, Hebei Province (36° 51’ N, 115° 3’ E) in central North China Plain. Most of the area is flat, located in a loamy depression in the Zhang River’s alluvial fan. Soils are saline to varying degrees and derived from recent alluvial deposits. These soils are typically composed of layers originally deposited under flood conditions.

In this study, sequential indicator simulation (SIS) and transition probability indicator simulation (TPROGS) were used for predicting soil texture in an area of the Zhang River’s alluvial fan. A total of 139 soil profiles (Fig. 1) were sampled at intervals of 350 m from west to east, 300 m from north to south and 0.05 m in the vertical direction to a depth of 2 m covering 15 km² area.

Results & discussions

Training results (Fig 2) showed that auto-variograms (SIS) fitted the observations well in the vertical direction, but poorly in the horizontal direction, while the auto-transition probability (TPROGS) fitted well in both directions.

The TPROGS model slightly improved (3.6%) overall predictions compared to SIS. Both SIS and TPROGS models predicted soil texture classes near soil surface (0-0.5 m) better than that in the deep depth (0.5-2.0 m) (Fig. 4). However, the TPROGS model improved the prediction in the top soil indicating that the TPROGS can capture the variability of soil textures in vertical direction more efficiently than SIS.

Conclusion

The TPROGS model performed better than SIS for the near-surface (0-0.5 m) soils. It seems that under the circumstances of this study, TPROGS is a better model for predicting soil texture.

Main references


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