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Spatial distribution of colluvial deposits and correlations with the modern land surface

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Colluvial deposits are the main indicator of agricultural erosion in the past. Soils are transformed or disapeared, but colluvial deposits of different historical periods are still preserved. In these deposits much information on the palaeo- land use and environment are stored. Quantification of geoarchaeological investigations of colluvial deposits spatial variability and related mass transport during Holocene are important. Moreover, statistical properties of colluvial deposits are practically unknown. Hence, the goal of present investigation is the calculation and explanation of the basic statistical properties of colluvial deposits, correlations among colluvial layers thickness as well as with the modern land surface.
The study area is the small valley. It is located in Northern Germany (54 degree 6' 31" E; 10 degree 15' 2.76" N). Modern soils of the considered region are Cambisols and Luvisols. First colluvial deposits have been formed due to erosion during Early Neolithic time. In total 5 colluvial layers were exposed. The digital elevation model (DEM) with 1 m grid mesh was used for calculation of the morphometric variables. The relationships were detected with the help of non parametric correlation of Spearman.
Thickness of all colluvial layers has non Gaussian statistical distribution. Two facts of bimodal statistical distribution were established. In one case bimodal distribution was detected because data were collected from two different relief elements such as valley bottom and valley slopes. In another case, probably, it is a result of soil formation process that took place in colluvial depositions.
The best correlations with the modern land surface were found between the total thickness of colluvial deposits and maximal catchment area (85 %). Comparison of colluvial layers thickness shows negative correlations between upper (relatively young) and dipper (relatively old) colluvial layers. This fact is explained based on correlations between thickness of colluvial layers and morphometric variables of modern land surface. Obtained results showed that initial decelerative terraces were buried due to long accumulation of colluvial matter. In result inversion of decelerative and accelerative terraces on slope has been happened. So, the body of modern accelerative terraces statistically consist of old colluvial matter. Statistical maximum of youngest colluvial deposits locates in modern decelerative terraces.