

Loess Soils as a Geoecological Risk Factor in the Baikal Region

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Aside from geologic aspects concerning sedimentation patterns, the loess problem involves assessing loess soils as a geoecological risk factor as these formations are prone to hazardous properties: collapsibility, swelling, humidification, erodibility, floating earth, and creeping.

Based on regional evidence and using comprehensive information on composition, structural features, conditions and properties of loess soils a scale of stability criteria of these formations to geodynamic effects was developed. It includes 16 signatures: position in the section, stability to weathering, water stability (influence of additional humidification), plasticity, degree of water content, natural-humidity soil density, skeleton density, type of microfabric, composition of clay minerals, degree of freedom of active fine-dispersed phase, indices of strength and deformability (coefficients of compressibility and relative collapsibility), longitudinal seismic wave velocity, thixotropic properties (loss-of-strength coefficient under vibration), degree of floating earth hazard (sedimentation volume), and rheological properties (strength drop coefficient). Each criterion had several variants, from the most hazardous to relatively safe. Soil stability was assessed using arbitrary indices where 0 and 3(4) were assigned, respectively, to relatively safe and to the most hazardous. The maximum unfavorable, moderately favorable, weakly unfavorable and favorable (no hazard) combination of variants for all criteria was estimated, respectively, with 56, 26, 13 and 0 arbitrary indices.

Baikal region's loess soils are emplaced into the group of unstable sediments and show a very high level of behavior hazard (the sum of arbitrary indices being 40) under geodynamic effects.