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The deposition of loess is generally attributed to a monsoonal climate system. Recently it has been shown that such a system existed already at the end of the Eocene on the northeastern Tibetan Plateau (Licht et al., 2014). One of the main arguments to prove the supply of loess by monsoonal winds is the use of grain size properties.
The lower part of the Shuiwan section (Eocene) consists of metre-scale alternations of mudstone and gypsum beds; the upper part (Oligocene) is mainly mudstone (Dupont-Nivet et al., 2007; Abels et al., 2010). Sediments are categorized in six grain-size types based on the grain-size distribution and the mode of the silt grain sizes as measured using laser diffraction. Sediments of type 1, the only type with a unimodal grain-size distribution, consist exclusively of clay-sized particles (modal value of 2-2.5 μm). Types 2-6 have a multimodal composition. They contain an additional silt-sized fraction with a modal size of c. 16 μm in type 2; c. 26 μm in type 3 and c. 31 μm in type 4. Type 5 is a mixture of previous types, and type 6 contains in addition a slight amount of sand. Similar bimodal grain-size distributions occur in the Neogene Red Clay and in the Pleistocene loess of the Chinese Loess Plateau.
All three silt fractions (with modal sizes 16, 26 and 31 μm) represent typical loess sediments, transported by dust storms in suspension at different altitudes. Their exact grain size depends on wind velocity, source material and transport distance. The 'clay component' may have settled from high suspension clouds in the air down to dry ground or to standing water. This clay population is considered to be the product of background dust deposition, primarily transported by westerly winds. It has been shown that medium and coarse silt fractions (including the 26 and 31 μm fractions) have been supplied by the winter monsoon, while the origin of the 16 μm fraction is still debated.
Both clay and silt fractions have kept their original aeolian grain-size characteristics after potential reworking at the site of primary deposition. The lower (Eocene) facies of mudstone and gypsum deposition points to an ephemeral lake environment, more particularly the distal part of a mud flat in generally (semi-) arid conditions. The succession of an original far-distance wind supply followed by deposition into a shallow lake during relatively wet periods fits to grain-size and other sediment characteristics of this facies. In the upper part of the Shuiwan section (Oligocene), (episodic) subaerial conditions probably alternated with the occasional presence of shallow water (mudflats).