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Petrographic Notes on the Loesses of the Des Moines Drift Lobe

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Introduction

Recent field study has resulted in the reclassification of the glacial drifts of northwestern Iowa. The Bemis moraine of Leverett (1932, pp. 57-61) is believed to be the Cary drift, and the Altamont and younger moraines (Leverett, 1932, pp. 67-75) have been designated the Mankato drift.

The Cary and Mankato drifts are both overlain by discontinuous loess mantles. Loess has not been recognized previously on the Des Moines lobe either by geologists (Kay and Graham, 1943, p. 205) or by soil scientists (Riecken and Smith, 1949, pp. 2a, 3a, 13-16; McMiller, 1945).

The loess overlying the Cary drift does not differ materially from the loess on the Mankato drift in field examination. Both loesses are brown, leached, poorly to well-sorted silts. Thicknesses generally vary from 24 to 36 inches; maximum thickness observed in the field was 51 inches and the minimum identifiable was 15 inches.

Quantitative textural and mineralogical analyses were made of samples collected during field study. Characteristics of the loesses are here recorded.

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Location of Sample Sites

Eight samples were collected in the Cary and in the Mankato drift regions. Distribution of the samples of each suite parallels its respective drift border (fig. 1). Sampling sites were restricted to flat ridge crests and crests of the swells of ground moraines.

Textural Analyses

Textures of the samples were determined by mechanical analysis. Approximately twenty grams of each sample were dispersed in N/100 sodium oxalate solution. A Cenco mechanical analysis

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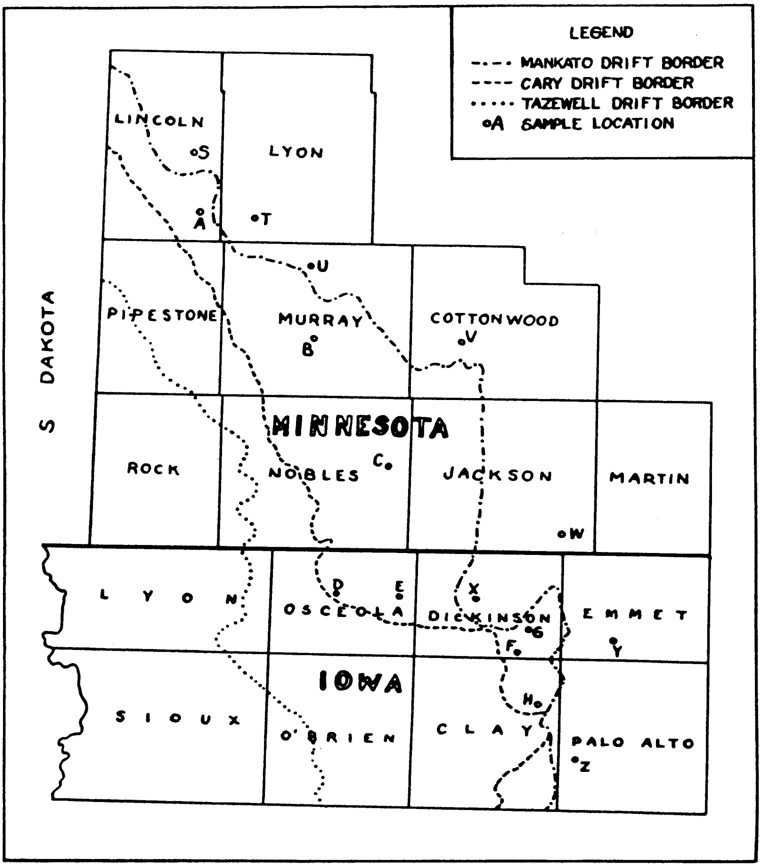

FIG. 1. LOCATIONS OF LOESS SAMPLES

stirrer was used to aid dispersion. Each sample was subjected to a ten minute run in the stirrer. The pipette method of analysis with settling rates based on Stokes' law was utilized. Sand fractions were determined by screening.

Textures of the Cary and Mankato samples range from sandy silt to silt to clayey silt (fig. 2). Nine analyses of samples of the loess of the Tazewell drift region are also plotted for purposes of comparison. The wide textural range of the Cary and Mankato samples differs distinctly from the narrow range of the Tazewell samples. Variability of textures of the Cary and Mankato samples is illustrated also in figure 3. Median diameters are plotted against coefficients of sorting (Trask, 1932). Textures range from well sorted to poorly sorted. In comparison, the Tazewell samples are well sorted.

Mineral Analyses

Samples A, C, E, and G of the Cary suite and S, U, W, and Y of the Mankato suite were treated with hydrogen peroxide to remove organic material and hot phosphoric acid to remove iron oxide. Particles of the size 1/16-1/64 mm. were separated from the bulk of the samples. Aliquots of one to two grams of the separates were dispersed in bromoform and subjected to centrifuging for five minutes. Heavy and light mineral fractions were separated and made available for petrographic study.

The loesses of the Cary and Mankato drift contain the same heavy mineral assemblages in approximately the same proportions (fig. 4). Quantitative values of the abundance of mineral constituents were determined petrographically by grain counts of permanent slide mounts. Dominant constituents of the light fractions of all samples were quartz (70-75 percent), orthoclase (20-25 percent), and plagioclase (5-10 percent).

Most of the heavy and light grains show the effects of transport abrasion when examined under the binocular microscope. Surfaces of the grains are characterized by a distinctive pattern of percussion markings. The pattern is "brain-like" in expression. Sutures are unoriented. Frosting and pitting is evident. Shapes of the grains vary with sub-rounded > sub-angular > rounded grains in abun-

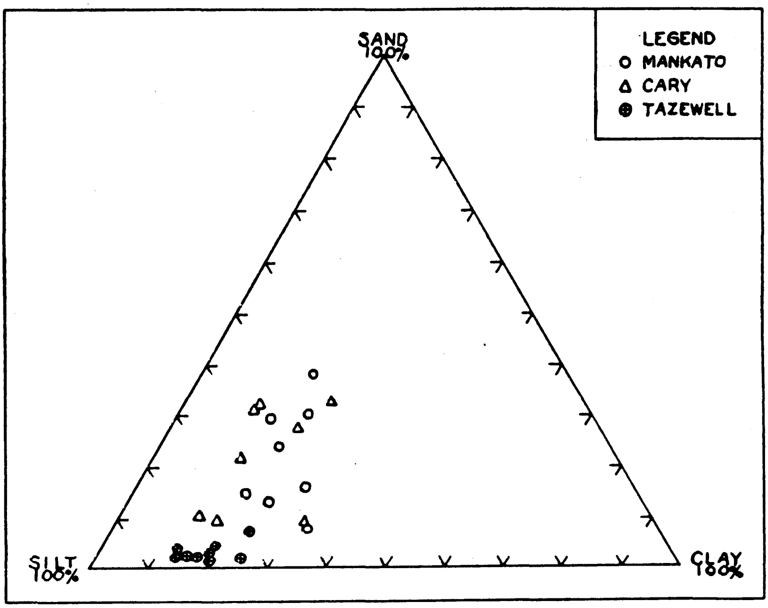

FIG. 2. TEXTURES OF LOESSES

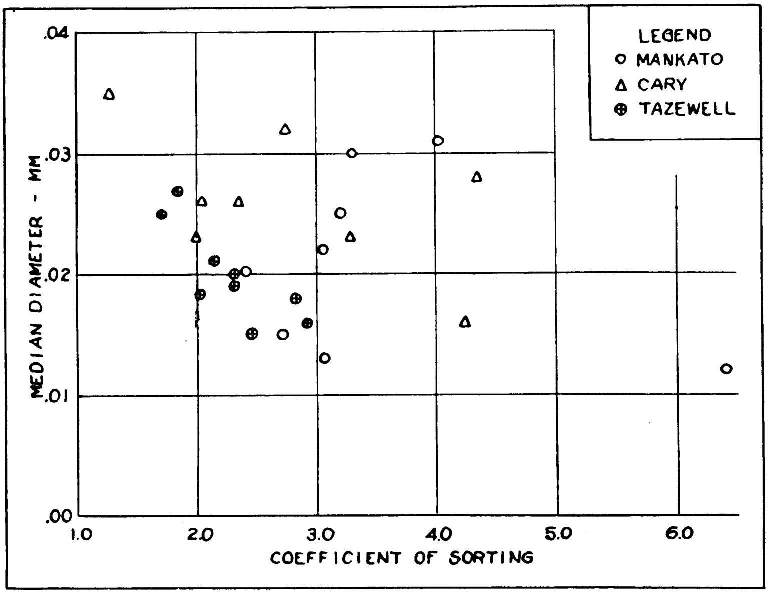

FIG. 3. SORTING OF LOESSES

dance. Percussion marks were not observed petrographically on the surfaces of grains from the leached or unleached tills that underlie the leached loesses. The brown, leached silts, therefore, are not leached horizons of soil profiles developed in till even though previous workers so recognized them.

Conclusions

Textural variations of the loesses of the Cary and Mankato drift regions indicate that the material was derived from local source areas. In nine of sixteen samples analyzed sand content ranged from 24 to 39 percent. In contrast, all of the Tazewell samples have a sand content of less than 10 percent. Field evidence has shown that this loess was derived from a major source area. A comparison of the coefficients of sorting of the three loesses supports these conclusions. Poor sorting of the Cary and Mankato loesses (fig. 3) may be explained by: (1) contemporaneous deposition of traction and suspended loads, and/or (2) mixing due to weathering contemporaneous with deposition of the traction and suspended loads. An adequate supply of sand was available from local outwash areas and/or the adjacent till surface. Source of the silt may have been more distant outwash or till areas. The sand is disseminated throughout the loess. It is not segregated in lenses or beds.

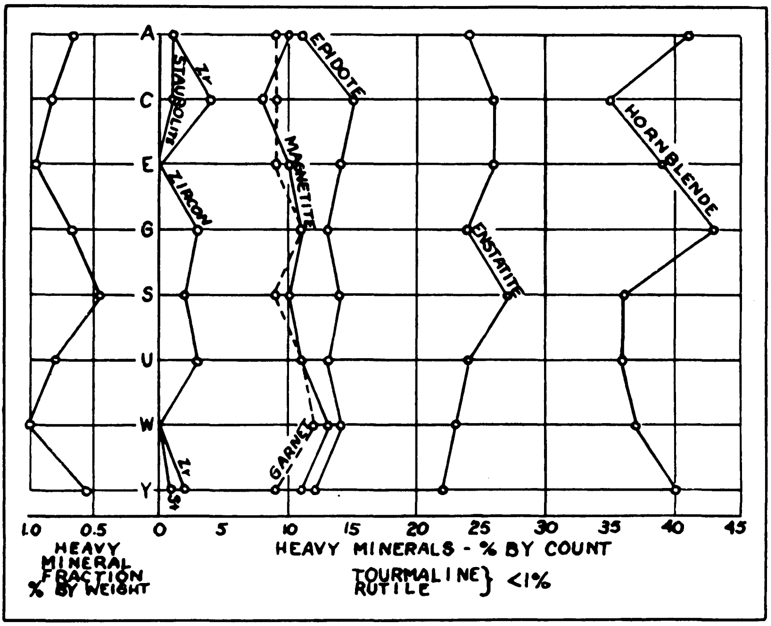

FIG. 4. HEAVY MINERAL SUITES OF LOESSES

Similar mineralogical compositions of the Cary and Mankato loesses indicate derivation from similar source materials. Percussion markings on grains show the abrasive effects of transport. Although similar surface configurations of grains are developed by transportation in water and wind, distribution of the material on the highest crests of moraines that are unmodified by fluvial or lacustrine activity precludes water transport to the present positions of rest.

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