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COMPUTER SIMULATION APPLIED TO HORIZONS GRAIN-SIZE DISTRIBUTION VARIATIONS IN SOILS

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The objective of this article is to summarize the principal method utilized in a recent thesis on the study of horizon grain-size distribution variation during soil formation.

Proceding by computer simulation, the parent material is compared to a collection of particles in which each element is characterized by a certain shape, size, mineralogical composition, and weathering degree (fig. 1). The goal is then to understand how a certain collection of particles should be transformed in order to reproduce the making of the soil, starting from the parent material by refering to evolution observed in the natural environment. In order to do this several models were developed to transform the soil, taking into account fragmentation, dissolution, and small particles (clay and silt) translocation. In practice this meant following the corresponding evolution of particle size distribution in the triangular diagram of soil texture (fig. 4, fig. 6, fig. 7, fig. 8).

These models, in spite of their over simplification, show a certain number of the same evolutions seen in nature, at least in the cases of fragmentation (fig. 9), clay translocation and dissolution (fig. 10). A computer program (SOLGENE) was developed that is capable of comparing and combining the different models of elementary transformations in such a way as to take into account the evolution of particle size distribution involving several mechanisms simultaneously.

In this article, it is not possible to delve into the details of the results obtained. It is the intention of the author to demonstrate the importance of this approach in order to indicate a certain number of new directions in Earth Science ; for example, showing the limited role of the transfer of fine fractions in the textural differentiation of soil profiles. Using simplified models can, after all, help to interpret a complex reality.

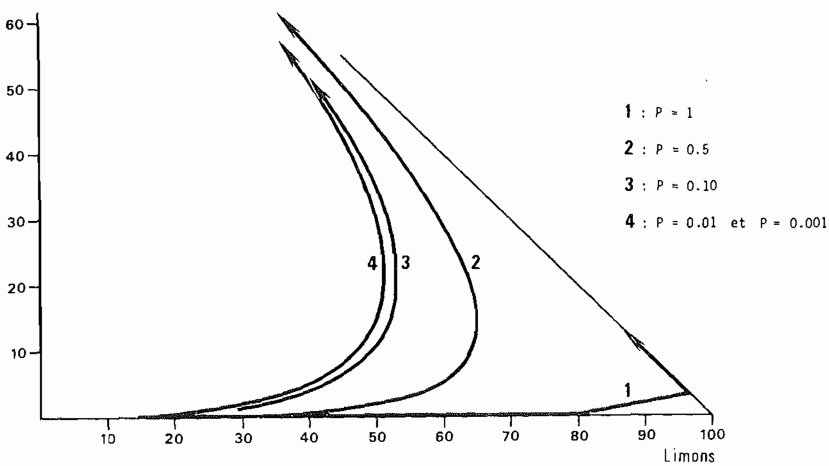

Figure 4 : Theorical breaking up of a coarse sand. Influence of P parameter (proportion of particles affected by this kind of transformation) (to be compared with fig. 9).

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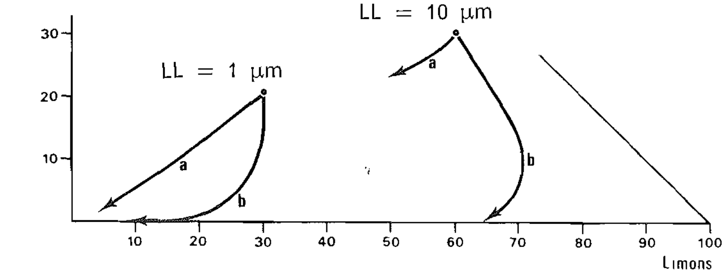

Figure 6 : Simulation of dissolution. Influence of LL parameter (thickness of the front of attack) (to be compared with fig. 10).

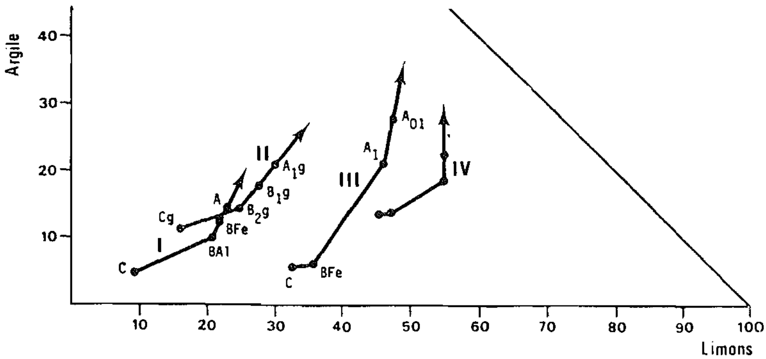

Figure 9 : Curves of natural profiles related to breaking up of soil skeleton.

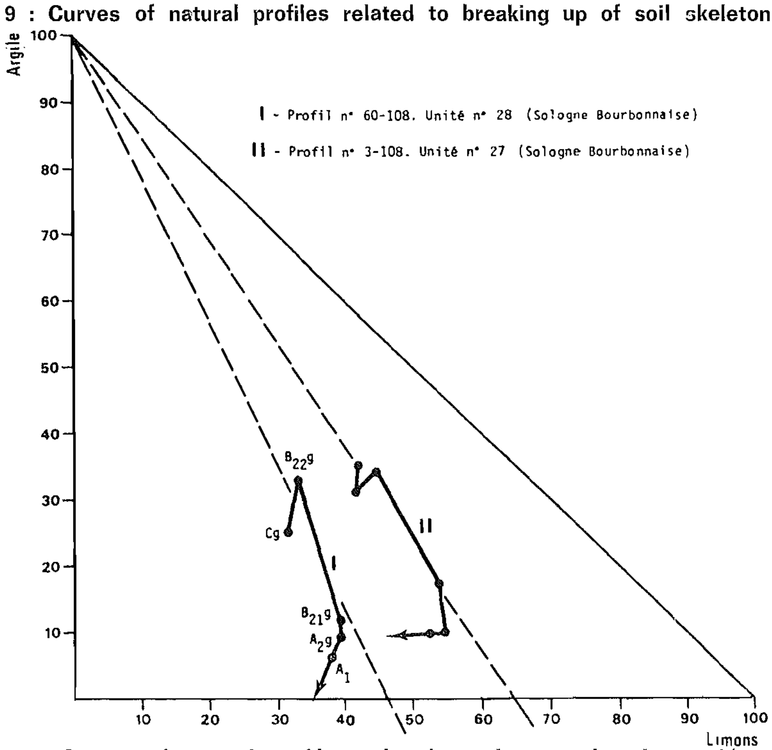

Figure 10 : Curves of natural profiles related to clay translocation and/or dissolution of soil skeleton.