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Depositional efficiency of the weichselian ice sheet. Central-West Poland.

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Formation of the ice-marginal landforms is the outcome of the relationship between ice flow velocity, amount of transported debris, ice masse‘s thermal regime and climatic condition. Idea of the depositional efficiency can be understood as an ice stream transport capacity, measured on the margin of the ice sheet. In the other words, it is the difference between the amount of debris supplied to the margin of actively flowing ice and the quantity of material carried out on the distant forefield of the ice sheet by the meltwater. Final glacial landscape is the product of a combination of erosion and accumulation during transgression and recession of the ice masses. Based on investigations of glacial landforms and deposits in the Central-west Poland we propose several models of glacial landsystems formation and their interpretation in context of ice sheet dynamic.

Three models of glacial landforms creation can be proposed during ice sheet advance. Generally, continual transgression of ice sheet leads to the formation of flat surfaces with possible ice flow bedforms. Transgression interrupted with stops produces hummocky surfaces and the orientation of hillocks and, consequently, morphological lineation, depends on the concentration of the material on the ice margin.

During recession, a constant speed of the ice sheet’s retreat, interrupted with rhythmically repeated periods of stops, leads to the formation of ice-cored moraine ridges. The relief produced as a result of their degradation has a clear morphological and geological lineation, parallel to the head of the withdrawing ice masses. Any deviations from the “ideal” model lead to different types of concentration of the materials released at the ice sheet margin. Long periods of dynamic equilibrium of the ice margin results in the concentration of fluvioglacial and ablational material in the form of ice-lobe contact sedimentary scarps. On the other hand, fast retreat of the ice margins will result in a relief devoid of distinct hills and morphological lineation. Most significant examples of the latter case include flat till plain covered with a thin layer of ablational deposits. The lack of deposits from the recession period means that depositional efficiency of the ice sheet was extremely low.

Based on the above mentioning models, we can order the recessional glacial landforms according to the time needed for their formation and in this way get a certain kind of a time-scale. This scale allows us, indirectly, to define on geomorphological basis, a relative speed of the recession of the ice sheet margin. Considering the relatively short period over which the glacial relief in the Poland was formed, we can suppose that large outwashes and the related ice lobe contact sedimentary scarps represent the periods of stops of the weichselian ice sheet margin measured in hundreds of years. The forms created with the ice-cored moraine ridges can represent periods of maximum one hundred years, whereas the termoglacial fans – periods of a few tens of years.