

Theoretical and methodological premises of geomorphological forecasting

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ABSTRACT

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There are a number of yet-unsolved problems with regard to geomorphological prognosis. The theoretical and methodological foundations of geomorphic prediction are outlined. It is shown that there is a conceptual link between field studies of spatial structures and landscape evolution and delimiting trajectories of geomorphic systems. Several basic issues in applying this principle to forecasting are discussed. These include the role of characteristic and relaxation times of geomorphic systems and the concept of "geomorphological memory," complex responses, and the relative role of conceptual and statistical models. It is suggested that instability in geomorphic systems can be a source of order at higher hierarchical levels, and that this property can be exploited in practical forecasting.

Introduction

The ultimate goal of geomorphology, and any science, is prediction. With respect to geomorphic systems, the goal is to predict the behavior of entire geosystems. This is not only of scientific interest; the application of prognosis to practical problems is quite important in geomorphology. Prediction – the ability to foretell future evolution and outcomes – might be impossible for some geomorphic systems. However, forecasting – estimating or calculating possible, likely, or desired future outcomes – may be possible even if prediction is not. The purpose of this paper is to formally outline some fundamental theoretical and methodological premises of geomorphological forecasting.

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Conceptual representation of geosituations

In accordance with current ideas, a system is defined as a set of interconnected elements which form a single unit. Features of the unit are not derived solely from the individual elements and cannot be derived from them without taking into account the relations between elements. The reality of the system assumes the existence of the system itself, and of its parts and connections within a certain space P and time T . This defines a space–time PT , where points within are characterized by the coordinates (t, p) , implying consideration of spatial points $p \in P$ at time $t \in T$.

Geographical systems are formed by the geographical objects, elements, and connections situated on the surface of the earth, or at least within the geographical space P limited within a sphere, whose center coincides with the centre of the geoid and is defined by a ra-