Geophysical Research Abstracts
Vol. 13, EGU2011-12023, 2011
EGU General Assembly 2011

Can we predict and control complex, self-organized systems?

Margreth Keiler and Kirsten von Elverfeldt

University of Vienna, Department of Geography and Regional Research, Wien, Austria (margreth.keiler@univie.ac.at, ++43 (0)1 42779486)

The assumption that the behavior of geomorphic systems can be predicted and controlled is basic to any management approaches towards these systems. Especially in geomorphic high active regions like in alpine areas, along rivers, and at coast lines this assumption is the fundamental of natural hazard and risk management and has therefore a long tradition. However, extreme hazard events, such as the floods and landslides in the Eastern Alps in 2005 and their dimension as well as consequences, were unexpected for hazard experts. Furthermore, the numbers of examples for malfunctions of mitigation strategies like breaking check-dams in torrent catchments or beach nourishment at the coast are increasing. Additionally, most constructions to control geomorphic system (e.g. embankments) on a long term perspective produce unintended and often negative effects for the society entailing further constructions to counter the secondary effects. Concerning the described developments the question arises if we can predict and control geomorphic systems, in particular when geomorphic systems are regarded as complex and self-organized systems.

The perspective of complex, self-organized systems implies that even if the geomorphic system parameters are known, the consequences depend on the specific state the system is in, and on the system's history, and both are rarely (if at all) known. Thus, the same control action may have different outcomes according to the system state. Furthermore, during system control and steering already happen billions of other feedbacks which cannot be known or even influenced, as they happen simultaneously. Consequently, a long-term prediction and control of complex, self-organized geomorphic systems is highly improbable. This perspective contradicts the traditional realistic understanding which sees one of the most important tasks of science to predict future developments so that we can direct our acting accordingly.

In the presentation we point out the advantages and constraints as well as the differences between the traditional prediction/management approach and the perspective of complex, self-organized geomorphic systems. The different understanding and interpretations are highlighted with examples of geomorphic behavior and events. The challenge and possible solutions for management strategies according to the perspective of complex, self-organized geomorphic systems are discussed.