Geophysical Research Abstracts
Vol. 16, EGU2014-12697, 2014
EGU General Assembly 2014

Automatic delineation of geomorphological slope units

Massimiliano Alvioli (1), Ivan Marchesini (1), Federica Fiorucci (1), Francesca Ardizzone (1), Mauro Rossi (1,2), Paola Reichenbach (1), and Fausto Guzzetti (1)

(1) CNR-IRPI, Istituto di Ricerca per la Prevenzione Idrogeologica, Perugia, Italy, (2) Università degli Studi di Perugia, Dipartimento di Scienze della Terra, Piazza Università, I-06123, Perugia, Italy

Slope units are portions of land surface, defined by the general requirement of maximizing homogeneity within a single unit and heterogeneity between different units, but whose formal characterization and practical delineation has been done in different ways. This is often justified by the statement that the slope unit partitioning of a territory can be used to describe a variety of landforms and processes, and for the assessment of natural hazards. As a result, they need to be tailored according to the specific model in use. This may result in an ambiguous definition of such objects, while an objective definition is highly desirable, which would also allow their reproducibility.

We have developed a publicly accessible Web Processing Service (WPS) with the aim of incrementally achieve a satisfactory definition of slope unit. The service allows any user to connect to a CNR-IRPI (Perugia) server, upload his own Digital Elevation Model (DEM) and optional additional data, specify parameters constraining the size and aspect of slope units, and quickly obtain the result in a layer in vector format. The calculation is performed using a parallel algorithm, resulting in a processing time short enough to allow the user to tune the input parameters, repeating the process for a sufficient number of times in order to obtain a satisfactory result.

We use quantitative criteria to define and draw the slope units, depending on the input parameters. The algorithm starts from a hydrologically consistent partition of the study area into half-basins with a large number of contributing DEM cells. Each of the half-basins is then checked against a few requirements: maximum area required by the user and maximum standard deviation of the aspect on two orthogonal directions. Those specific half-basin that do not meet the requirements are partitioned further, requiring a lower number of contributing cells. The process is iterated until no half-basin exceeds the user-specified thresholds.

Our aim is to encourage users to test the algorithm on a large number of areas with different topographies so that new, meaningful requirements on the individual half-basins can be defined and included in our process, in order to achieve a robust and reproducible algorithm embodying a vast class of desiderata in the slope unit definition. This will eventually constitute a performing and customizable tool for the investigation of a variety of geomorphological phenomena.