



## On the morphometric analysis of palaeosurfaces in southern Italy

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In this work we investigate the self-organized critical (SOC) properties of palaeosurfaces with the aim of distinguishing regions with a different Quaternary tectonic activity.

Palaeosurface reconstruction provides information on palaeo-environments and a method of assessing neotectonic effects. Techniques such as remote sensing and GIS can give a useful means for the rapid and insightfull quantification of spatial data properties. The SRTM DEM was used in this study. It has a spatial resolution of 90 m and an absolute vertical accuracy smaller than 16m. The main advantage of this DEM, obtained by means of the radar interferometry technique, is the homogeneous quality of topographic information due to consistency in data collection and analysis.

The Sila Massif (Calabrian Arc) and Campanian-Lucanian segment of the Campanian-Lucanian Apennines, both area in southern Apennines, Italy, were investigated. Maps of palaeosurfaces were derived by identifying on the DEM pixels with an altitude above 1000 m a.s.l. and a slope below 6 degrees. These values characterize all palaeosurfaces in southern Apennines and may change in other regions with a different tectonic climate history.

A quantile-quantile analysis of palaeosurfaces' areas showed a linear relationship and a clear knee between 300 and 500 squared meters in both the regions. This property can be explained in terms of the existence of two sub-populations.

The distribution of palaeosurfaces' area and orientation was derived. A set of palaeosurfaces with small areas and random orientation was found. For areas larger than 500 squared meters, a few palaeosurfaces with well defined directions were found.

The analysis of the cumulative area frequency distribution shows the existence of two populations in both the Sila Massif and Campanian-Lucanian Apennines. In both cases the threshold area value between the two populations is about 400 squared meters. Below this value, the surface fragmentation has the same scaling properties in both datasets. This property can be explained in terms of a common climatic-driven erosion process.

The temporal evolution of the erosion-induced fragmentation reduces the average area of fragmented surfaces so increasing the slope of the first part of the cumulative area frequency distribution.

Beyond the above threshold area value the cumulative area-frequency curves differ. The Sila Massif dataset is characterized by a Hurst coefficient  $H < 0.5$ . This denotes a greater dispersion in the distribution of area values with respect to Campanian-Lucanian Apennines dataset where  $H > 0.5$  where there is a lack of palaeosurfaces with larger areas. This different behaviour could be related to the different tectonic activity in the Sila Massif and Campanian-Lucanian Apennines.