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1 Tectonics from topography: surface flow patterns and their correlation with active normal faults geometry in the northern Apennines

2 Taramelli A.(1, 2), Mirabella F.(1), Melelli L.(1), Barchi M.(1)

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(1) University of Perugia, Earth Science Department, Italy

(2) Lamont Doherty Earth Observatory of Columbia University, New York, USA

Ongoing extensional tectonics in the axial zone of the northern Apennines is evidenced by a large amount of data including geologic and geomorphologic surveys, geodetic measurements and the earthquakes record. However, low deformation rates make the localization of active faults not straight forward.

In this work we employ airborne and satellite remote sensing data coupled with field observations, aerial photograph interpretation and seismic data from mountain belts of the northern Apennine ridge (Mugello, Casentino and San Sepolcro Basins) which gives rise to new insights to provide a quantitative analysis. On a reach of any watershed basin was calculated a gradient-index that allows meaningful comparison of channel slope on stream-basin of different size. The index reflects the product of the channel slope and its contributing drainage area at a point. In an adjusted topography, changes in the gradient index values along a stream could correspond to an introduced load. Empirical analysis from the fluvial system shows results where

the area/slope index - frequency distributions in mountain belts of the northern Apennines appear to follow a power law scaling. Although the value of the power law exponent could varies from region of interest to region of interest for reasons yet unknown, its magnitude determines whether the infrequent load, or the many small tectonic events, dominates the relationship in a given mountain belt.

Moreover the relationship between channel slope and related stream basin is resulting from different factors in addition to tectonic control, as lithotype variations and morphogenetic processes influence. Therefore an accurate aerial photograph interpretation was done, finding out the geomorphologic evidences of an active tectonic control in order to identify the weight of these variables to check the remote sensing data interpretation.

These new insights into tectonic mechanisms and topography index distribution constitute a working hypothesis for the occurrence of correlation tested in this study.