

Variability of DTM-derived, morphometric parameters versus cell size. An example of application in Calabria (Southern Italy)

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Applications of DTM-derived morphometry are nowadays common in many fields of land-use planning, including the protection from natural hazards (cf. e.g. Iovine et al. 2013; 2014). For example, the mathematical modelling of physical processes that occur at slope or basin scales makes extensive use of quantitative parameters that describe the shape of Earth surface. Unfortunately, the values of these parameters depend on the detail with which the territory is represented. Therefore, different relationships must be adopted to describe the same physical processes at different scales.

In this study, as part of a wide-ranging research aimed at modelling of geo-hydrological processes, a systematic and rigorous assessment of variability of the morphometric parameters against cell sizes is addressed. The study area under consideration is the whole Calabrian territory, extended about 15075 square kilometres. The region has recently been zoned into eleven homogeneous geomorphological sectors (Antronico et al., 2010). For each geomorphological sector, DTMs have been derived from topographic maps at 1:5000 scale, with cell sizes of 5, 10, 20 and 40 m. The following morphometric parameters – among those most frequently used in land management - have then been evaluated for the above DTMs: altitude, steepness of slope, aspect, plan and profile curvatures, slope length, topographical wetness index, stream power index, topographic position index, terrain ruggedness index, slope length factor.

The first results show a marked dependence on cell size for some of the considered parameters. In other cases, such dependence seems not significant. Mathematical relationships are proposed between cell size and considered parameters, also taking into account the geomorphological contexts examined. Based on the above relationships, the most suitable scale to be used for modelling physical processes in a given area of interest can be selected.

References

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