

Environmental Risk Analysis in Relationship with Rainfall: the Amalfi Coast as a Case Study

Analisi del Rischio legato ad Eventi Climatici: La Costiera Amalfitana come Caso di Studio di un'Area di Particolare Fragilità Idro-geomorfologica

Giulia Caneva, David Rossi, Luca Salvati, Valentina Savo

Dipartimento di Biologia, Università di Roma Tre, Viale Marconi 446, 00146 Roma.e-

mail: caneva@uniroma3.it; vsavo@uniroma3.it;

Dipartimento Scienze della Terra, Università di Roma "La Sapienza", P.le A. Moro, 5,

00185 Roma e-mail: david.rossi@uniroma1.it

Riassunto: Alcune problematiche di rischio ambientale sono riconducibili alla presenza di rilevanti e concentrate precipitazioni su versanti acclivi ed in peculiari condizioni edafiche. La Costa di Amalfi rappresenta un caso di studio di particolare interesse in relazione a questi fattori e a tal fine i dati pluviometrici, spazializzati con applicativo GIS, sono stati analizzati in funzione del rischio di instabilità dei versanti e di quello di erosione, utilizzando alcuni indici agroclimatici e l'equazione USLE. Questi sono stati utilizzati per la creazione di mappe tematiche e per analizzare qualitativamente una loro correlazione con eventi franosi registrati. Zone bioclimatiche ed equazione USLE sono stati anche correlati tra loro per analizzare e prevedere l'entità dei fattori di rischio.

Keywords: Bioclimatic analysis, Amalfi coast, rainfall, indicators, water erosion, GIS.

1. Introduction

A detailed bioclimatic analysis of the Amalfi coast has been carried out through a GIS approach considering a period of forty years (from 1959 to 1999). A bioclimatic map is useful to define homogenous zones on climatic features and potential vegetation and a support to depict some environmental characteristics of an area. The Amalfi coast is located in a tectonically uplifted region, mainly composed by Mesozoic carbonate deposits with recent sedimentary and volcanoclastic covers. This area has a peculiar geomorphology, with deep valleys and cliffs or steep slope walls (the main surface area has a slope between 24° and 33°). Amalfi coast is susceptible to landslides because high slope and different permeability of carbonate bedrock lead to a low stability of overlying volcanic strata, while heavy rain could be a trigger for these events (Esposito et al. 2003).

2. Environmental risk in Amalfi coastal area: preliminary results

The climatic analysis indicates that the amounts of rainfall measured by the gauging stations of the area are very high, ranging from 894 mm (564 mm in Capri) to 1803 mm

in the mountain area close to the sea. Basically, autumn is the rainiest season (22 gauge stations - 68.8%) and for ten stations (31.2%) the maximum rainfall occurs in winter. Analysing the thermotype it can be pointed out that all coast stations have are in the Thermomediterranean bioclimate belt, as some hill places near the sea. Inland and high montain areas, instead, have a mesomediterranean or thermotemperate bioclimate. The ombrotype instead ranges form “Low dry” (Capri) to “Upper Humid” (Tramonti-Chiunzi). The bioclimatic zone is essentially Mediterranean with a typically irregular rainfall, while circumscribed areas have been classified in the Temperate zone.

A slope map has been produced to identify areas more prone to gravitative processes. It can be inferred that the greater slopes are not evenly distributed, but bounded to coast areas and in proximity of some streams which have a SE, and subordinately S, flow direction. It has been possible to point out that areas with greater slope are not the higher ones but they range mostly between 500 m and 800 m, and for this reason, this altitude interval should be the most critic in the study area.

Pedological data have been collected to evaluate the distribution of volcanic covers and it has been pointed out that these deposits, mostly pumice, are spread on the top of many ridges, especially in the northern and central part of the study area and with their faculty of retain water could contribute or trigger to landslides.

Based on such considerations, the erosion risk has been evaluated through the application of USLE equation contemplating both soil and climatic data (Salvati et al. 2005). An estimation of water erosion was carried out in the different bio-climatic zones based on GIS approach (Table 1). It was observed that termophilous zones are generally more prone to erosion phenomena. These kind of data have been related with the localization of 150 landslides occurred in the area during the period analyzed for bioclimate (see the AVI project, www.sici.irpi.cnr.it/index.htm).

Table 1: *Erosion evaluation compared to bioclimatic belts.*

BIOTYPICBELT	ID	No. Pixels	MIN	MAX	RANGE	MEAN	STD	SUM	MEDIAN
Upper Thermomedit/Low Humid	1	227	0	99	99	33,9	29,7	7690,0	28
Low-Upper Thermomedit/Upper Subhumid	2	197	0	98	98	32,9	29,4	6488,0	28
Mesomedit sup/Upper Subhumid-Low Humid	3	155	0	97	97	21,3	28,7	3294,0	6
Thermotemperate/Upper Humid	4	53	2	97	95	39,7	35,9	2104,0	24
Mesomedit inf-sup/Upper Subhumid	5	151	0	98	98	30,2	31,8	4564,0	8
Mesomedit inf-sup/Upper Subhumid-Low Humid	6	128	0	95	95	26,5	29,1	3394,0	6
Mesomedit inf/Upper Subhumid	7	148	0	99	99	23,2	27,3	3436,0	6
Low Thermomedit/Low Subhumid	8	24	0	99	99	32,9	31,1	789,0	13
Upper Thermomedit/Low-Upper Humid	9	149	0	90	90	21,8	21,9	3255,0	14
Upper Thermomedit/Upper Subhumid	10	79	0	45	45	6,9	9,2	543,0	3
Low Mesomedit/Low-Upper Humid	11	101	0	85	85	24,5	27,0	2473,0	7
Upper Mesomedit /Low Humid	12	81	0	98	98	8,3	18,9	675,0	3

References

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