Available online at www.sciencedirect.com

ScienceDirect

Procedia Earth and Planetary Science 16 (2016) 166 – 176

Procedia
Earth and Planetary Science

The Fourth Italian Workshop on Landslides

Assessing the potential effects of Climate Changes on landslide phenomena affecting pyroclastic covers in Nocera area (Southern Italy)

Alfredo Reder[a,b]*, Guido Rianna[a], Paola Mercogliano[a,c], Luca Pagano[b]

[a]*Regional Models and geo-Hydrological Impacts,CMCC Euro-Mediterranean Center on Climate Change, Via Maiorise, Capua 81043, Italy*
[b]*Dipartimento di Ingegneria Civile, Edile ed Ambientale, University "Federico II", Via Claudio 21, Napoli 80125, Italy*
[c]*CIRA – Centro Italiano Ricerche Aerospaziali, Via Maiorise, Capua 81043, Italy*

Abstract

The effects of Climate Changes (CC) on natural hazardsinduced byweather forcing representan issue which has beenwidely debated inthe last years.Climate projections allowed to detect clear indications about the future trend of the main atmospheric forcing although affected by significant uncertainties concerning the magnitude. However, the crucial role played by the specific geomorphological contexts makes much more challenging understanding how such variations could affect occurrence and magnitude of landslide hazards. These factors help understanding because it is often unreliable carrying out assessments on large areas but is often necessary trying to evaluate the potential effects of CC on geo-hydrological hazards at slope scale.The main aim of this paper is the definition of a framework for the evaluation of potential variations of occurrences of landslide events affecting slopes of NoceraInferiore (Southern Italy) under the effect of CC. Such slopeshave been affected in recent years, inseveral occasions, by flowslide phenomena inducing large economic lossesand fatalities. The framework, consisting of two macro components, is tested to check its predictive capability of landslide behavior. It is then applied to provide a prediction of "potential" events for near and long time horizon scenarios. The study highlightspotential variations (increases) in triggering frequency under the effect of different concentration scenarios and time horizons.

© 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of the organizing committee of IWL 2015

*Keywords:*climate change; flowslide, pyroclastic soil, threshold; scenario

* Corresponding author. Tel.: +39 0823 623164.
E-mail address: alfredo.reder@cmcc.it

1878-5220 © 2016 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).
Peer-review under responsibility of the organizing committee of IWL 2015
doi:10.1016/j.proeps.2016.10.018

1. Introduction

The WMO[1] has estimated at global scale a remarkable increase (+20%, 370,000 persons) over the period 2001-2010 compared to the previous period 1991-2000 in the number of fatalities due to disasters directly induced by extreme weather events. However, as pointed out by ISDR[2], developing countries experienced the overwhelming majority of victims (95% in the period 1970-2008) while developed countries suffered the greatest losses in terms of costs and assets.

Different causes are recognized as responsible of such increasing trends: e.g., variations in magnitude and frequency of extreme weather events induced by Climate Changes (CC), increase in exposure due to rapid urbanization processes in hazardous areas, variations of land use (often resulting in increase of impervious areas) in susceptible areas. The relative significance of these factors is often hard to detect, not only for objective reasons,e.g. the complexity of socio-economic and geomorphological contexts, but also for subjective ones,such as political opinions[3]. In this perspective, the evaluations of ongoing or future trends of natural disasters at global, regional or local scale are often carried out through simplified analysis, in which only the effect of the variation of a single forcing is taken into account, while those related to the other ones are assumed negligible or of lesser importance[4].

In this regard, the evaluation of the effects of CC on the variations of weather forcing inducing geo-hydrological hazards has received an increasing interest during the last years,fostering a fruitful debate in the scientific community[4,5,6].

For the Italian domain, for example, several studies have been carried out in last years: Vezzoli et al[7] analyzed the potential variations induced by CC under two RCPs in 2100 in future discharges of Po River.Comegna et al[8]and Rianna et al[9] estimated the variations (essentially, decelerations) in slow slope movement rates affecting the clayey slopes respectively for Costa dellaGaveta (Basilicata Region) and Orvieto (Umbria Region).Gariano et al[10]assessed at large scale for Calabria Region the changes in occurrence of rainfall-induced landslides in the 20th century, but without discriminating between natural and anthropic variations in hazards. Finally, concerning the Alpine area, Stoffel et al[11] studied the changes in frequency, seasonal distribution and number of shallow landslide occurrences in Piedmont (North-Western Italy) from 1900 to 2011 retrieving two periods with a significant increase in landslide occurrences in 1980-2011, potentially associated to increases in air temperature inducing snow melting processes.

In this study, a modeling chain is proposed and adopted for the evaluation of potential variations of occurrences of landslide events affecting slopes of NoceraInferiore (Southern Italy) under the effect of CC. Oversuch slopes, pyroclastic covers mantling carbonate massifs have been historically affectedby slope instability phenomena,which caused remarkable economic damages and, in some cases, fatalities. The concurrent expected increase in urbanization[12]and then in exposed assets entails that the development of adequate adaptation strategies (in terms of land use planning or disaster management) represents a crucial issue for the area.

The paper initially describes the geological features and the landslide events historically known in the study area (§ 2). Subsequently, a procedure to couple climate change data and impact model for the hazard assessment is proposed (§ 3). Finally,the main findings are displayed for climate simulations (§ 4.1) and integrated hazard assessments(§ 4.2) providing some hints about “potential” hazard variations due to climate change.

2. Description of study area: the NoceraInferiore case-history

NoceraInferiore is a town of Campania Region (Southern Italy) located at the base of the LattariMts (Fig. 1). Its slopes are covered by pyroclastic deposits resulting from several eruptions of Somma-Vesuvius over the last 10,000 years. According to the macrozoningproposed by Picarelli et al[13],for the LattariMtstwo subareas are detectable. In particular, the Northern sector of the mountains (Fd zone in Fig. 1) is characterized by pyroclastic covers with thicknesses hardly exceeding 2 m (in recent years, such area experienced large flowslides) while the Southern sector (Fe zonein Fig. 1) is characterized by pyroclastic covers less than 1 m thick (only small flowslides have been detected in recent years). In both cases the covers rest on fractured limestones.

Download English Version:

https://daneshyari.com/en/article/4674646

Download Persian Version:

https://daneshyari.com/article/4674646

Daneshyari.com