Plinius Conference Abstracts
Vol. 17, Plinius17-84, 2022
https://doi.org/10.5194/egusphere-plinius17-84
17th Plinius Conference on Mediterranean Risks

RESILIENCE Project - Extreme Storms in the Italian North-East: frequency, impacts and projected changes

Eleonora Dallan[1], **Marco Borga**[1], Francesco Marra[2], Giorgia Fosser[3], Mario Martina[3], Marco Marani[4], Carlo Gregoretti[1], Emanuele Lingua[1], Antonio Canale[5], Massimiliano Massimiliano[1], Martino Bernard[1], Maximiliano Costa[1], Luigi Cesarini[3], Giorgio Dalmasso[4], Maria Francesca Caruso[4], Valentina Zanaga[6], and Mattia Zaramella[1]

[1]University of Padua, Department of Land Environment Agriculture and Forestry, Legnaro, Italy (eleonora.dallan@unipd.it)
[2]National Research Council of Italy - Institute of Atmospheric Sciences and Climate (CNR-ISAC), Bologna, Italy
[3]University School for Advanced Studies - IUSS Pavia, Pavia, Italy
[4]Department of Civil, Environmental and Architectural Engineering, University of Padova, Padova, Italy
[5]Department of Statistical Sciences, Padova, Italy
[6]Consorzio Universitario Rovigo - C.U.R. Rovigo, Italy

The RESILIENCE project aims at developing an integrated methodology for assessing the impact of climatic variations and changes on the intense precipitation and wind regimes, and on the consequent triggering of flash floods, debris-flows and wind-related forest damages. A significant increase of short and intense precipitation is expected in the next future due to global warming, with consequent impacts on flash floods and hydro-geomorphic hazards such as shallow landslides and debris flows. Despite their societal importance, only few studies have explored potential climate change effects on these hydrological and hydro-geological processes. In fact, no accepted estimates of such changes to be used in engineering practice or environmental management planning exist so far, nationally or regionally.

The RESILIENCE project tries to address this specific knowledge gap. Two recent scientific advances are at the basis of the development of RESILIENCE. The first advance is the advent of high-resolution climate models, also called Convection-Permitting Climate Models (CPM), which improve the representation of both precipitation and wind field at the sub-daily scales compared to the standard coarser resolution Regional Climate Models. However, due to their computational costs, simulations are currently available for only short (typically ten years) time slices and few emission scenarios. These time series are too short to provide reliable statistics of extremes if analyzed using the classical extreme value methods. A second recent advance in the field of extreme value theory, the Metastatistical Extreme Value Distribution (MEVD), allows to overcome this limitation: it provides reliable extreme event probability estimates even from short time series, as in the case of CPM outputs, since it is based on all "ordinary events'' in the series instead of just yearly maxima or a few "peak-over-threshold" values per year as in the traditional methods.

Given this background, and focusing on the Veneto region in Italy as a study area, the specific objectives of RESILIENCE are 1) to quantify near (2041-2050) and far (2090-2099) future changes in precipitation and wind extremes probability at sub-daily temporal scales with respect to the baseline (1996-2005) using the MEVD approach and high-resolution COSMO-CLM simulations, 2) to quantify the associated future impacts on flash floods, debris flows and forest damages, 3) to provide data and hazard models to support flood and forest risk management plans in the Italian

North-East accounting for future climate changes.

RESILIENCE brings together an interdisciplinary group of scientists, from hydrologists, to climate modelers, to statisticians, to forest science experts, and is based on the interaction with three key Project Stakeholders. The project results will be communicated and disseminated to a wide audience of residents in the Veneto region and beyond, through collaborations with Museums, Academies and Local Authorities.