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The RISC-KIT storm impact database: A new tool in support of DRR

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ABSTRACT

This paper presents a new storm impact database for European coastlines that facilitates the upload, browsing and download of a broad range of physical and impact information related to historical and recent marine storm events. The database is transparent in terms of open access to raw data and metadata, makes use of version control systems through the OpenEarth repository and promotes the use of international standards. A total of 298 storm events are currently stored in the database from the ten RISC-KIT case study sites, including historical events dating back to the sixteenth century. To demonstrate the application of the tool, examples of typical event data contained within the database as well as the ability of the database to identify impacts of events across regions are presented. It is envisaged that this database will expand beyond the ten case study sites, with the aim of promoting and greatly improving the collection and reporting of extreme hydro-meteorological events across Europe into the future.

1. Introduction

A key first step in the disaster risk reduction (DRR) chain is the understanding of the present and historic context of an area in terms of past and current hazards and their associated impacts (Twigg, 2015). With regards to extreme hydro-meteorological events, information about the location, timing and severity of the event and how this impacts society and the environment as a whole are crucial to decision makers and coastal managers alike, enabling them (among other things) to raise risk awareness, identify trends, locate critical "hot-spot" areas and uncover common issues between regions (Van Dongeren et al., 2014). This information can in turn be used to assess coastal risk for present and future hazard probabilities and ultimately lead to better-designed DRR plans (Van Dongeren et al., 2017).

A large amount (>terabytes) of observational (e.g. tides, waves, winds), hindcast and reanalyses data of marine events, such as ERA-40 (Uppala et al., 2005), NCEP (National Center for Environmental Prediction) and HIPOCAS (Hindcast of Dynamic Processes of the Ocean and Coastal Areas of Europe (Sotillo et al., 2006)), are available in raw format, but require data pre-processing to extract key forcing variables related to individual marine events for a specific coastal area (e.g., Harley et al., 2010). Likewise, information with regards to the impacts of marine events is often routinely collected (but stored locally) by government agencies such as local geological services, reinsurers, in media reports and academic studies. However, there are currently very few tools available to provide detailed and readily-available information relating the environmental forcing conditions of a marine event to their subsequent impacts. Furthermore, impacts have mostly been assessed in terms of economic losses and loss of life without taking into account the broader social, cultural and environmental aspects that are critical to DRR considerations (Martinez et al., 2017). One of the most advanced examples of such a tool is the SurgeWatch database built by Haigh et al. (2015) for the United Kingdom. The database is simple to use, readily accessible and contains data for a long time span of almost 100 years. The SurgeWatch database however is a national example, while the focus here is on a European scale.

Several European Union (EU) funded projects have made inroads into the development of an impact-oriented marine storm database for the European coastline. The EU Fourth Framework Program (FP4) project CODECS (COoperative ITS DEployment Coordination Support) established a database of instrumental records for the past 300 years, and qualitative information for the past 1000 years, but was restricted to the European Atlantic coast, between 37°S and 58°N (Betts et al., 2004; Dawson et al., 2004; Lozano et al., 2004). During the EU Sixth Framework Program (FP6), the HYDRATE Project (Hydrometeorological Data Resources And Technologies for Effective flash flood forecasting

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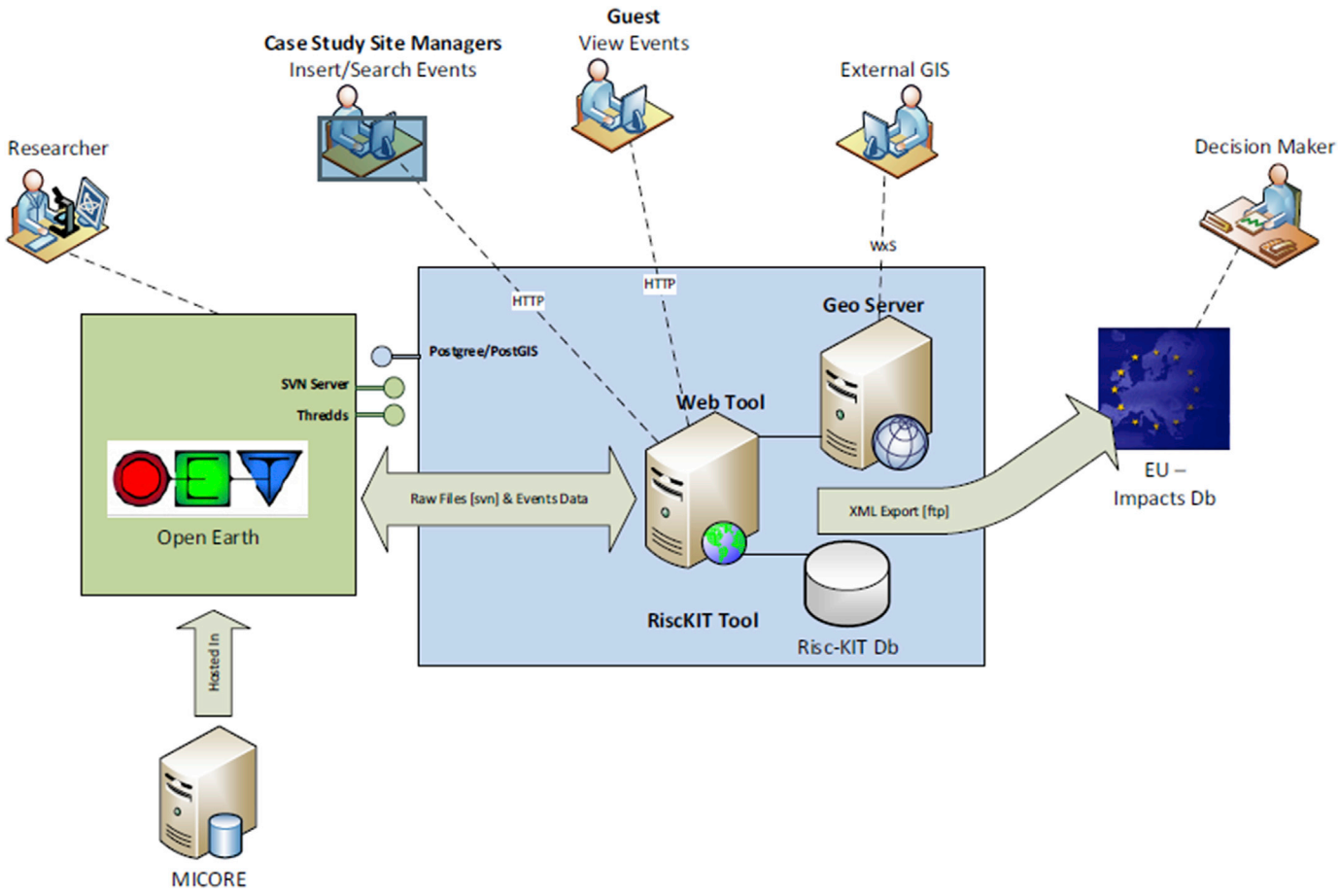

Fig. 1. Schematic overview of the interaction between the RISC-KIT WEB-GIS impact-oriented database (in blue) and the OpenEarth backbone (in green) as well as the user interaction with it. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

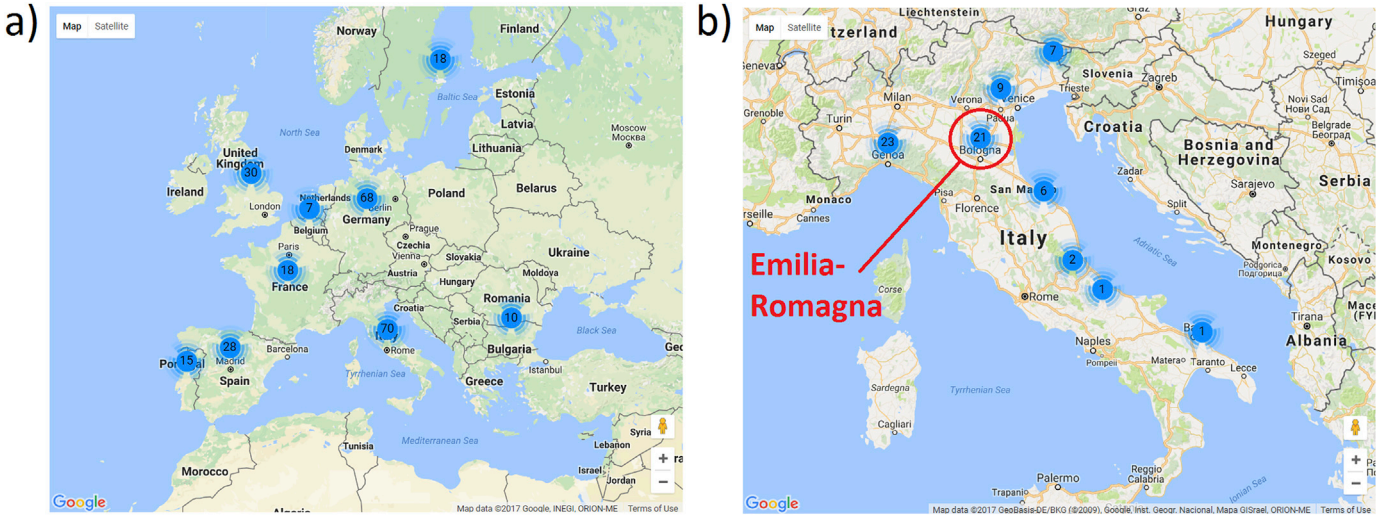

Fig. 2. Spatial distribution of event inventory: a) European Scale; b) National scale, using the example of Italy. The Italian region of Emilia-Romagna is circled in red. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

attempted a similar exercise at a European scale (six member states) for flash floods. In a recent paper Porcu and Carrassi (2009) linked events recorded based on ERA-40 reanalysis data with the MRNat-Cat archive by the Munich Re reinsurance company for all weather-induced disasters in the period 1992–1996. Their approach is interesting as they managed to identify the damage by cyclonic systems, but remains rather confined to a short time period of only several years.

In the EU Seventh Framework Program (FP7) project MICORE (Morphological Impacts and Coastal Risks induced by Extreme storm events), a database of marine storms and their impacts was assembled for nine case study sites across Europe and hosted on the open-source OpenEarth repository at Deltares, The Netherlands. A review of