ExtremA 2018

A Review of Extreme Natural Hazard Events in Austria

Katrin Sattler (1), Martin Mergili (1,2), Thomas Glade (1), Susanne Mehlhorn (3), and Florian Rudolf-Miklau (3)

(1) University of Vienna, Department of Geography and Regional Research, Vienna, Austria, (2) BOKU University, Institute of Applied Geology, Vienna, Austria,
(3) The Austrian Federal Ministry for Sustainability and Tourism, Department III/5 Torrent and Avalanche Control, Vienna, Austria

BUNDESMINISTERIUM FÜR NACHHALTIGKEIT UND TOURISMUS

WILDBACH- UND LAWINENVERBAUUNG

ENGAGE Geomorphological Systems & Risk Research

universität wien

Challenge Extreme Events

Extreme natural hazard events, generally characterised by **low probability of occurence & high impact**, are **difficult to predict and manage**.

Reasons are:

- Limited awareness, experience, and data due to **long recurrence intervals or singularity of events**;
- Often **complex process interactions** involving threshold effects, tipping points, or other nonlinear phenomena; and
- The potentially **large number of people and high economic values** affected.

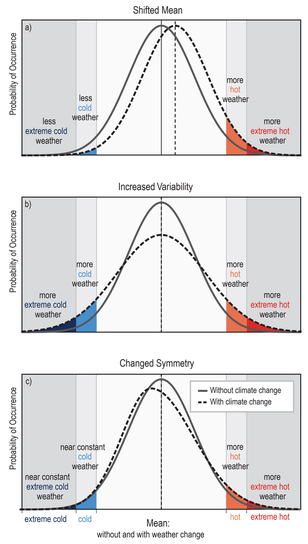
Hence, extreme natural hazard events have a high potential to evolve into natural disasters. But design and implementation of **risk reduction strategies and measures** often represent a **great challenge for all stakeholders** involved.

However, planning for extreme natural hazard events is becoming increasingly important, especially with climate model projections indicating an **increased likelihood of occurrence** of extreme events in future [1].

Robust, clear, and easily accessible information about natural hazards and their likely consequences will be a valuable tool for decision makers tasked with the design of appropriate risk management practices in a constantly changing world.

Debris flow in Afritz, Carinthia, August 2016
© Photo: BMNT/ WLV

Changes in basic conditions likely affect occurance and intensity of extreme events, as shown by the example of the effects of temperature distribution changes on extreme values of the distributions.
Source: Adapted from [2].



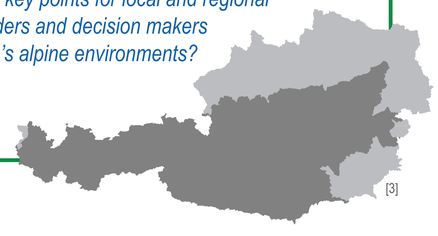
Project

ExtremA 2018 launched by

Austrian Federal Ministry of Sustainability and Tourism
&
ENGAGE – Geomorphological Systems and Risk Research
Vienna University, Institute for Geography and Regional Research

to increase current knowledge on extreme natural hazard events in the Austrian Alps.

- *What does this mean for the Austrian Alps?*
- *What is an extreme event in the context of flooding, landslides, drought, or glacial outburst flood in the Austrian Alps?*
- *What are key points for local and regional stakeholders and decision makers in Austria's alpine environments?*



[3]

Aims

- **Assemble current knowledge** on extreme events in the Austrian Alps, their causes and consequences, and possible climatic and societal influences.
- **Cover a wide range of topics**, including meteorological, hydrological, gravitational, geophysical hazards, their interactions, as well as societal aspects such as land use, vulnerability, and economic considerations.
- **Compile a comprehensive, scientifically robust, yet easily understood assessment report** that serves as a valuable information resource for stakeholders and decision makers and supports the political discourse on management of risks associated with future extreme events.
- **Publish in German as Open Acess** in both hard copy and digital version for a wide audience.

Avalanche in Gschnitz valley, Tyrol, 2009
© Photo: BMNT/ WLV

References:

[1] APCC (Austrian Panel on Climate Change), 2014. Österreichischer Sachstandsbericht Klimawandel 2014 (AAR14). Verlag der Österreichischen Akademie der Wissenschaften, 1096 p.
[2] IPCC, 2012: Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 3-21. Figure SPM.3, p.7.
[3] Austrian territory sourced from ArivalO under CC BY-SA 2.0 and extent of European Alps arcgis.com/accomaxi under CC-BY.

EGU General Assembly
EGU2018-10246

The Assessment

Challenge Extreme Events
Overview of alpine natural hazards
What are extreme events?

Extreme events by processes and process domains

Meteorological extreme events
Heat and drought
Storm
Heavy precipitation and hail
Forest fire

Hydrological extreme events
Flooding
Flash floods
Fluvial sediment events
Soil erosion

Gravitational extreme events
Complex large-scale landslides
Bergsturz, sackung and rockfall
Debris, soil slides and earthflows
Debris flows
Snow avalanches

Glacial and periglacial extreme events
Permafrost hazards
Glacial hazards

Other extreme events
Earthquakes
Multi-hazards and cascades

Societal aspects
Land use and land policy
Protection forests
Critcial Infrastructure
Vulnerability
Economic considerations
Civil protection management

REVIEWS THE CURRENT KNOWLEDGE ON EXTREME NATURAL HAZARD EVENTS IN THE AUSTRIAN ALPS

ExtremA

Supported by national and international experts, the project assembles the currently available knowledge on extreme events of individual processes and process domains and their societal aspects. Topics include:

- *Definitions and terminology*
  What is an EXTREME event in the context of process X?
- *Historical development*
  How did the research of process X develop through time?
  Are historical trends detectable in occurance and intensity of process X through time?
- *Case studies with focus on the Austrian alpine environment*
- *Assessment of current knowledge and uncertainties relating to EXTREME events of process X*
  What are the available base data, methodologies, and modelling approaches?
  Are current approaches able to describe EXTREME events of process X?
- *Possible future developments and resulting challenges*
- *Perspectives and options for action*
  Are new ways of data collection, modelling approaches, or scenarios required?
  Different scales of measures; from local geotechnical measures to hazard zoning.
- *Technical literature and further reading*

Flooding in the Paznaun valley, Tyrol, August 2005
© Photo: ASI / Land Tirol /BH Landeck

Extreme glacial discharge, Jamtalferner, Tyrol, August 2017
© Photo: Andrea Fischer

Rockslide destroyed protection tunnel, East Tyrol, 2013
© Photo: Martin Mergili

Flooding in Schärding, Upper Austria, June 2013
© Photo: Land OÖ/ Silber

Forest fire in Neunkirchen, Lower Austria, August 2013
© Photo: Mortimer Müller