



Web-based database on worldwide glacier and permafrost disasters



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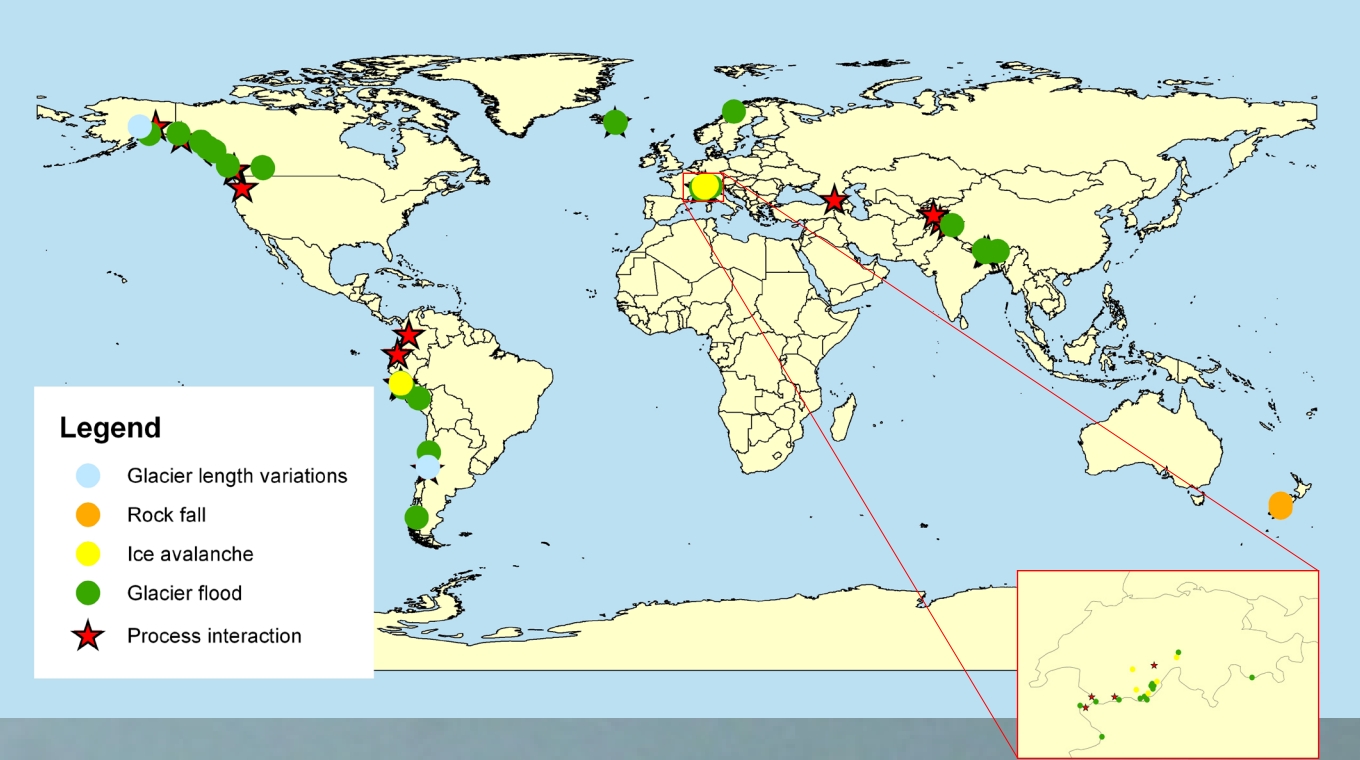
Introduction

As a consequence of the global retreat of glaciers and the thawing of permafrost in high mountain areas, a change in hazard situation takes place. To estimate the significance and the extent of natural hazards in glacial and periglacial regions, the Working Group on Glacier and Permafrost Hazards in Mountains (Gaphaz) in cooperation with the World Glacier Monitoring Service (WGMS) established a first database on glacier and permafrost disasters. Systematic documentation and analysis of past events is fundamental for a better understanding of involved processes.

Event data was collected using different sources and systematically organized in a database. The events were categorized by involved processes:

- glacier floods
- ice avalanches
- glacier length variations
- rock falls
- volcano and earthquake related interactions
- others

The database will be available on the web for an interested community and a wider public from <http://jern.uio.no/remotesensing/gaphaz>.



Data model

POLITICAL UNIT	WGMS ID	GLACIER NAME	KEYWORDS	LATITUDE	LONGITUDE	DAY	MONTH	YEAR	GLACIER LENGTH VARIATION	GLACIER FLOOD	ICE AVALANCHE	ROCK FALL	VOLCANO EARTHQUAKE INTERACTION	OTHER	PEAK DISCHARGE (m³/s)	VOLUME (km³)	EVENT DESCRIPTION	DAMAGE	DATA SOURCE	REMARKS
NP	904	LANGMOCHHE	Dig Tsho	27.8700	86.5800	4	8	1985	0	1	1	0	0	0	4'400.00	1'563.00	On August 4, 1985, a large ice avalanche (150 000 m³) overran the Langmoche Glacier and impacted into the lake Dig Tsho. A wave was generated and overtopped the moraine dam. Five people were killed and the destruction of a newly built hydroelectric power plant, 14 bridges, about 30 houses, and many hectares of agricultural land as well as a heavily damaged trail network, resulted from 6 million m³ water being released. Peak discharge was estimated to be 1'600 m³/s. The damage costs were estimated at 1.5 million US \$.	The damage to cultivated land, property, and vegetation was severe. 30 houses, 14 bridges between Langmoche Valley and Juba, a nearly complete small hydro-electricity powerplant was completely destroyed, and five people were killed. The damage costs were estimated at 1.5 million US \$.	Vuichard, D., Zimmermann, M. (1989): The Langmoche flash-flood, Khumbu Himal, Nepal. Mountain Research and Development, 6 (1), 99 - 104.	People of the Kumbu area waited many years for a long-promised electrical power plant as a partial substitute for fuelwood. This will remain hypothetical with the destruction of the Hydel Project. The destruction of cultivable level land is one of the severest consequences of the event, as it may have deprived communities of their subsistence base.

Identification

Allows to identify the exact location of an event.

Date

This information cannot be the same for two events.

Event type

These attributes show which processes were involved (1 = process involved; 0 = process not involved).

Event description

These attributes contain information about the dimension of an event (such as volume or peak discharge) and a description of the event.

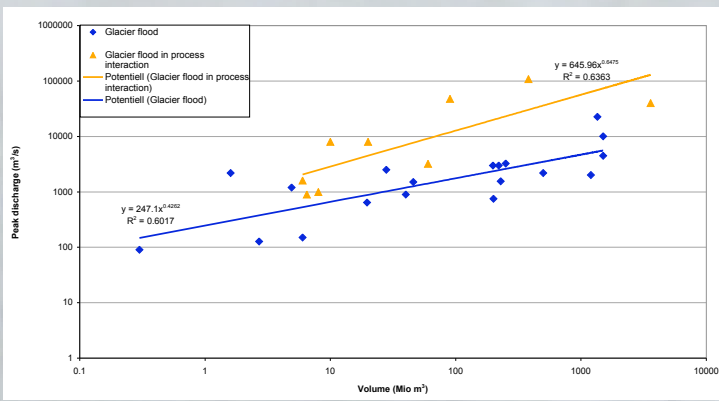
Additional information

These attributes give further information about additional damages, data sources and remarks, etc. (e. g. special studies carried out in connection with an event).

Results

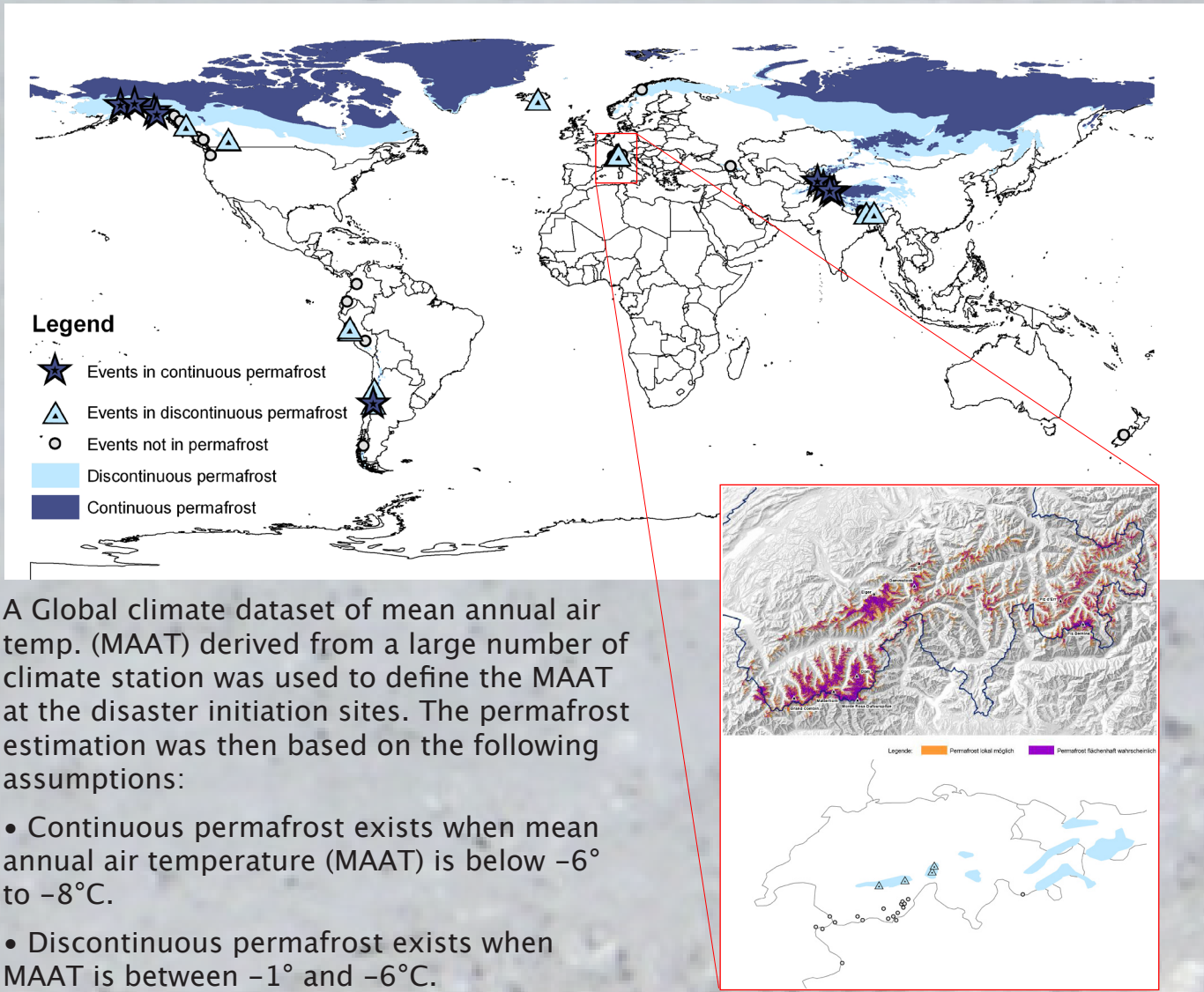
The events were analyzed with regard to involved processes, combination of factors, frequency and magnitude, or regional occurrence of events. Two examples:

Volume - Peak discharge relationship from glacier floods



Peak discharges from glacier floods interacting with other processes range higher than those from glacier floods only.

Global Permafrost estimation



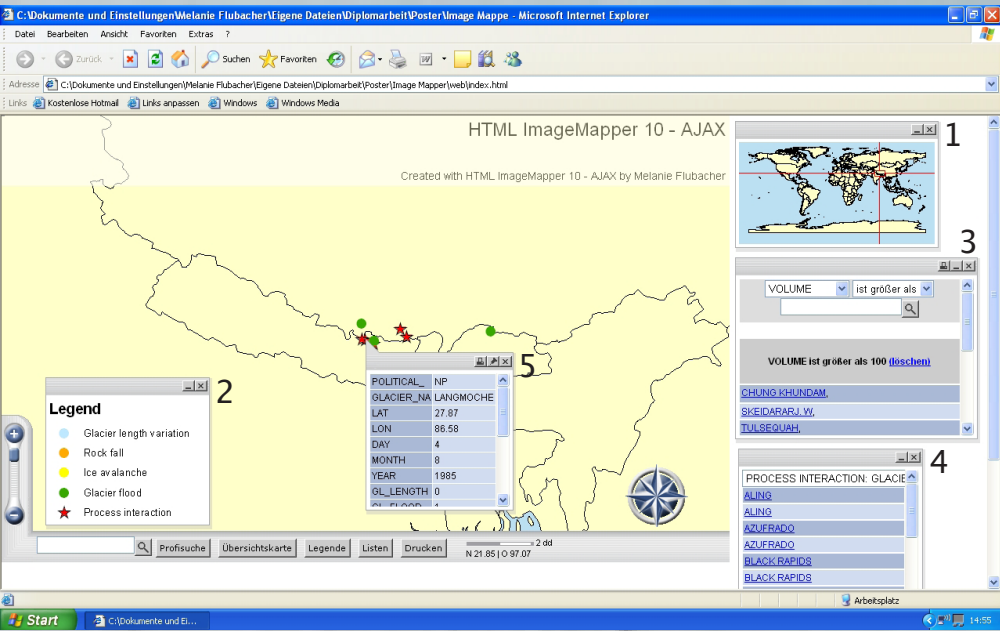
A Global climate dataset of mean annual air temp. (MAAT) derived from a large number of climate station was used to define the MAAT at the disaster initiation sites. The permafrost estimation was then based on the following assumptions:

- Continuous permafrost exists when mean annual air temperature (MAAT) is below -6° to -8° C.
- Discontinuous permafrost exists when MAAT is between -1° and -6° C.

This permafrost estimation provides a first assessment of permafrost conditions at the sites of the disasters. At regional to local scale, however, these estimations can yet differ substantially from more sophisticated methods (see example in Switzerland).

Online application

The data was prepared for the web application with ArcGIS 9.8. To generate HTML-Files ImageMapper from Alta 4 was used.



Tools:

- Survey map
- Legend
- Professional search
- List of glaciers with involved processes
- Attribute window (The attributes recorded are listed in this window)

The database is also implemented in google earth.



Outlook

This database is a first approach to document worldwide glacier and permafrost disasters, but does not claim in any regard to be complete. Please find more comments on the GAPHAZ webpage: <http://jern.uio.no/remotesensing/gaphaz>. The glacier and permafrost community is called to provide information to enlarge and regularly update the database.