Environmental Conservation and Debris Flow in the Dolomites, Northern Italy

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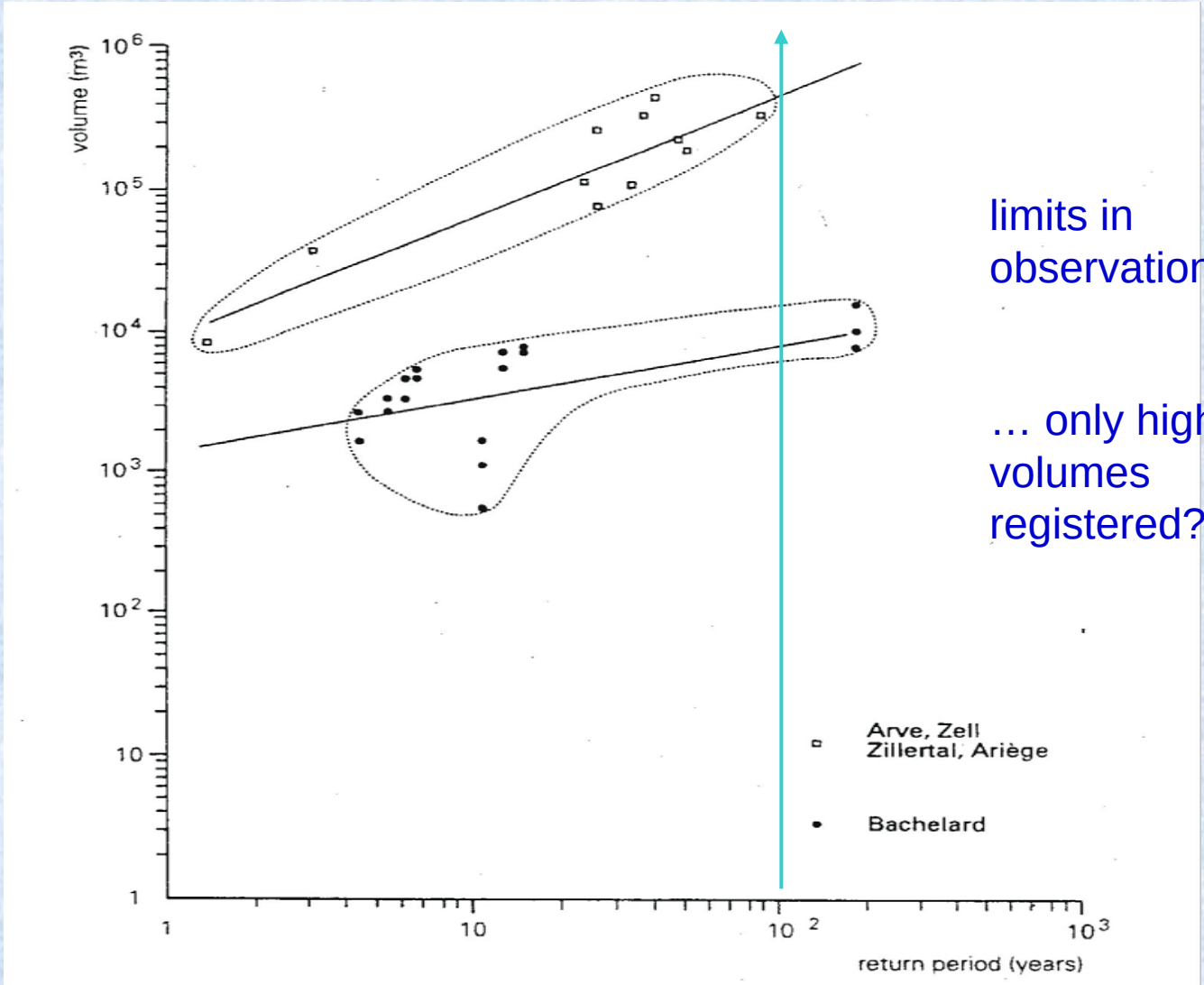
Historical Data

	19th century DF		20th century DF	
Location	**year**	**volume $10^3 m^3$**	**year**	**volume $10^3 m^3$**
Gallrutbach	1890	50		
Lichtenberg	1890	340		
Greifenberg	1851	210		
Schlinigbach	1855	68		
Ganderbach	1891	475		
Fendelfer	1874	330		
Ecklbach			1908	200
Haselbach			1908	200
Niederharterbach			1908	300
Nehäuselgraben			1908	15
Riederbach			1908	20
Gmünderbach			1908	15
Widerbach			1908	25
Sautenser			1905	15
Marchbach			1908	5
Mühlbach			1906	?
			1990	0,4
Rio Badin			1990	5
Campiolo			1990	3,7
Rudavoi			1992	5
Rio Bianco			1986	6,5
Fossa di Tovaccio			1986	9
Rio di Sacco			1986	35
Rio Dona			1989	15

where is the reason for such a difference?

- climate
- precipitation
- run-off genesis
- deposits
- inhabitants
- field observations

Periodicity of Debris Flow

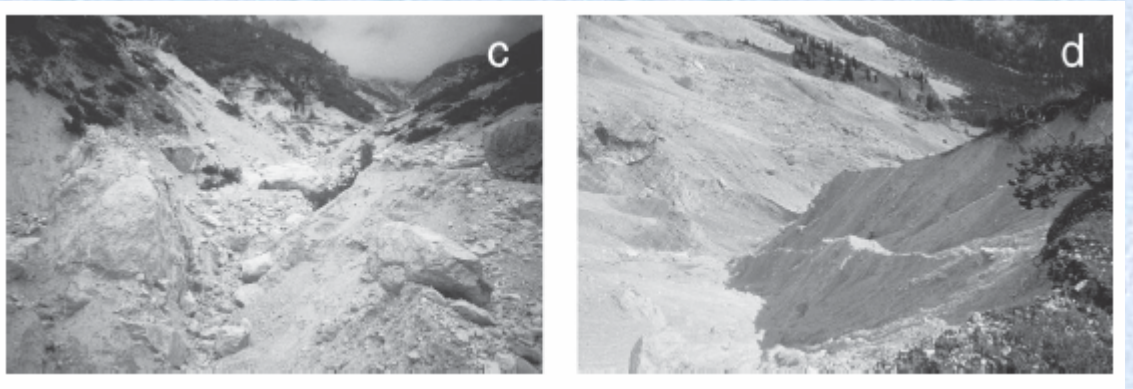


limits in observation?

… only higher volumes registered?

Dolomites – how and when

Generally, the attention has been paid to the Debris Flow regime only after a significant event

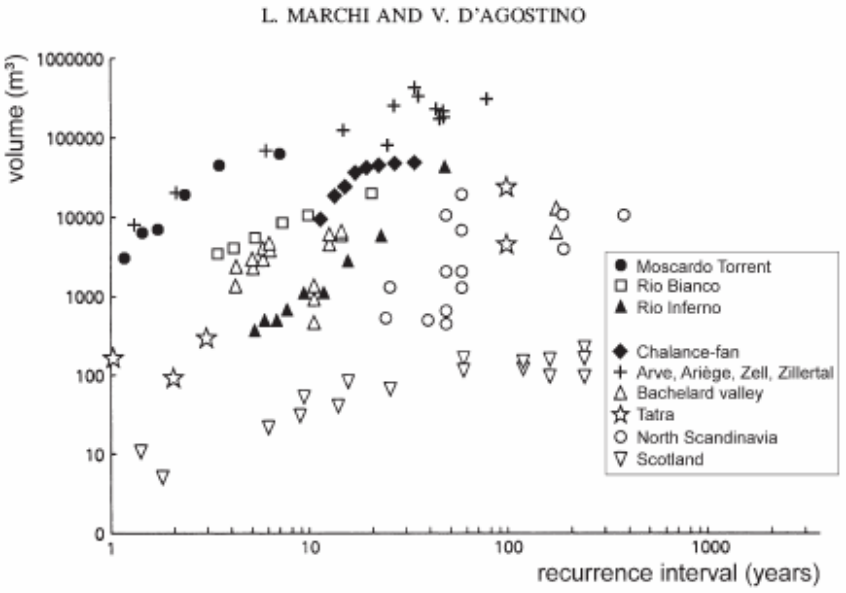


Damage on buildings

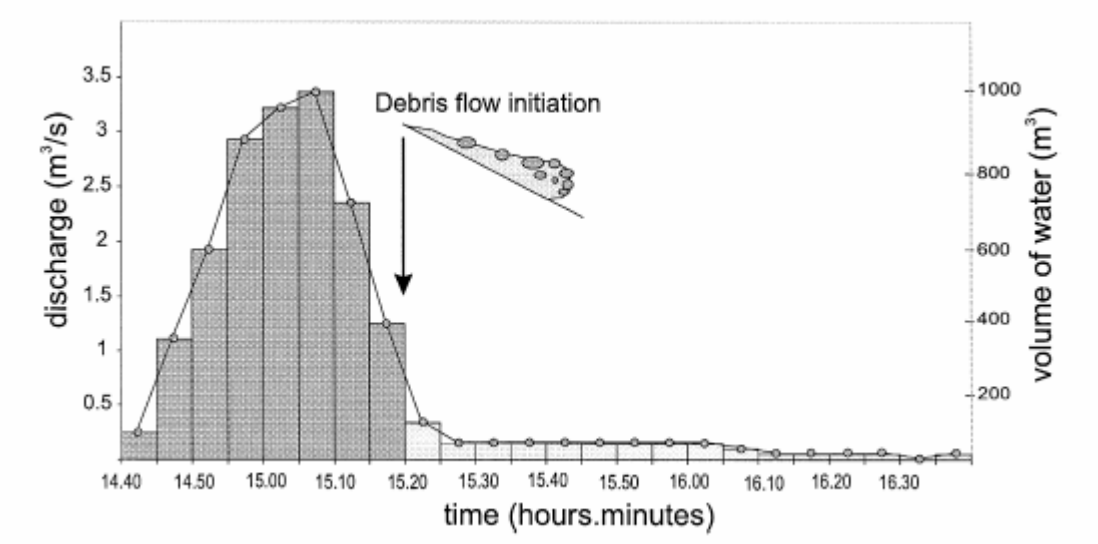
Direct impact zone

Indirect impact zone

Limited respect to the research results?



Warning System ?



- A continuous observation of meteorological and hydrological data is urgently needed
- There is also water level recorder handy to instal
- Simple PC operations could be activated only during extraordinary events

From the past and recent observations

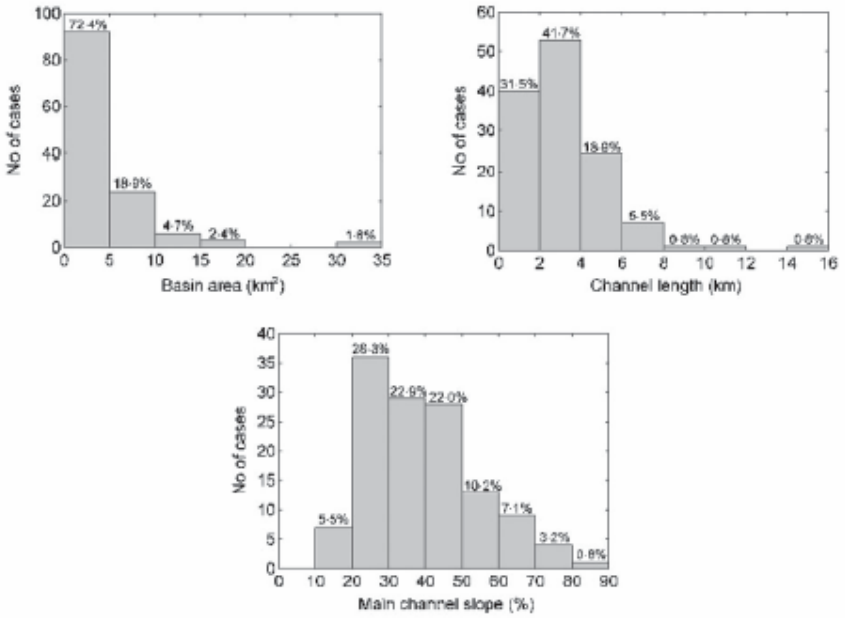


Figure 2. Frequency distributions of drainage basin area, main channel length and main channel gradient for the studied basins

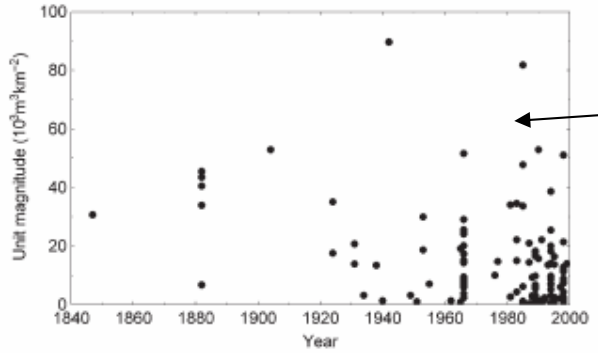
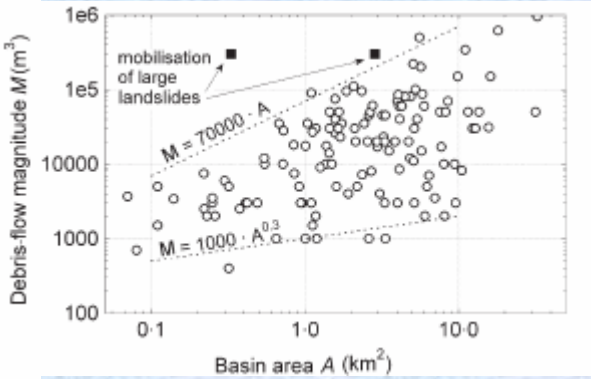


Figure 3. Historical distribution of maximum unit magnitude of debris flows



Global Climate change, human interventions, progress in the field observation

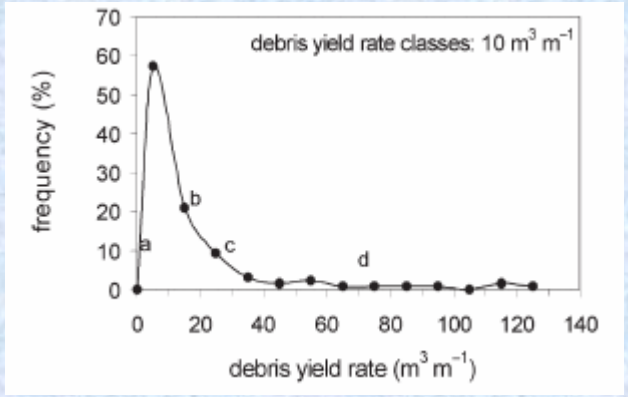
Conclusions

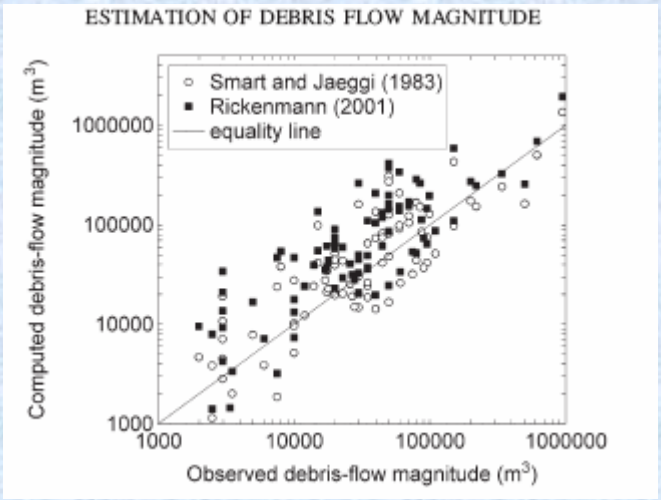
Table I. Lithological classes and geological index (*GI*) values (modified from D'Agostino and Marchi, 2001)

	GI value
Quaternary deposits	5
Schists and phyllites	4
Marls, marly limestone, siltstones, etc.	3
Volcaniclastic rocks	2
Dolomite and limestone rocks	1
Massive igneous and metamorphic rocks*	0
In $M = 45\,000A^{0.9}S^{1.5}GI$ athered rocks for all lithologies	3–5

* For basins entirely or almost entirely consisting of this lithology, a cautionary value of 0·5 is advised.

$$M = 18\,000A^{1.16}S^{1.30}GI$$





Can we predict the Debris Flow ?

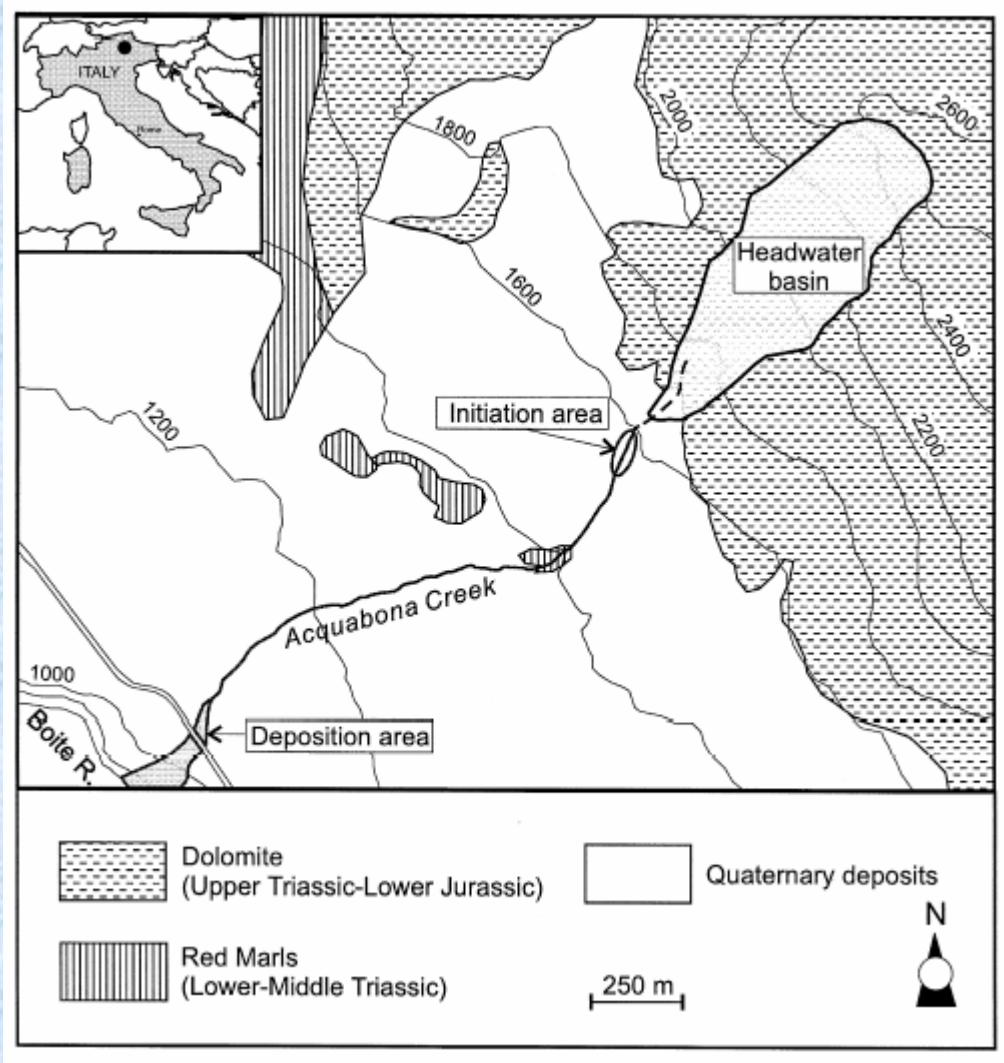
Do we have data enough?

Do we have time enough?

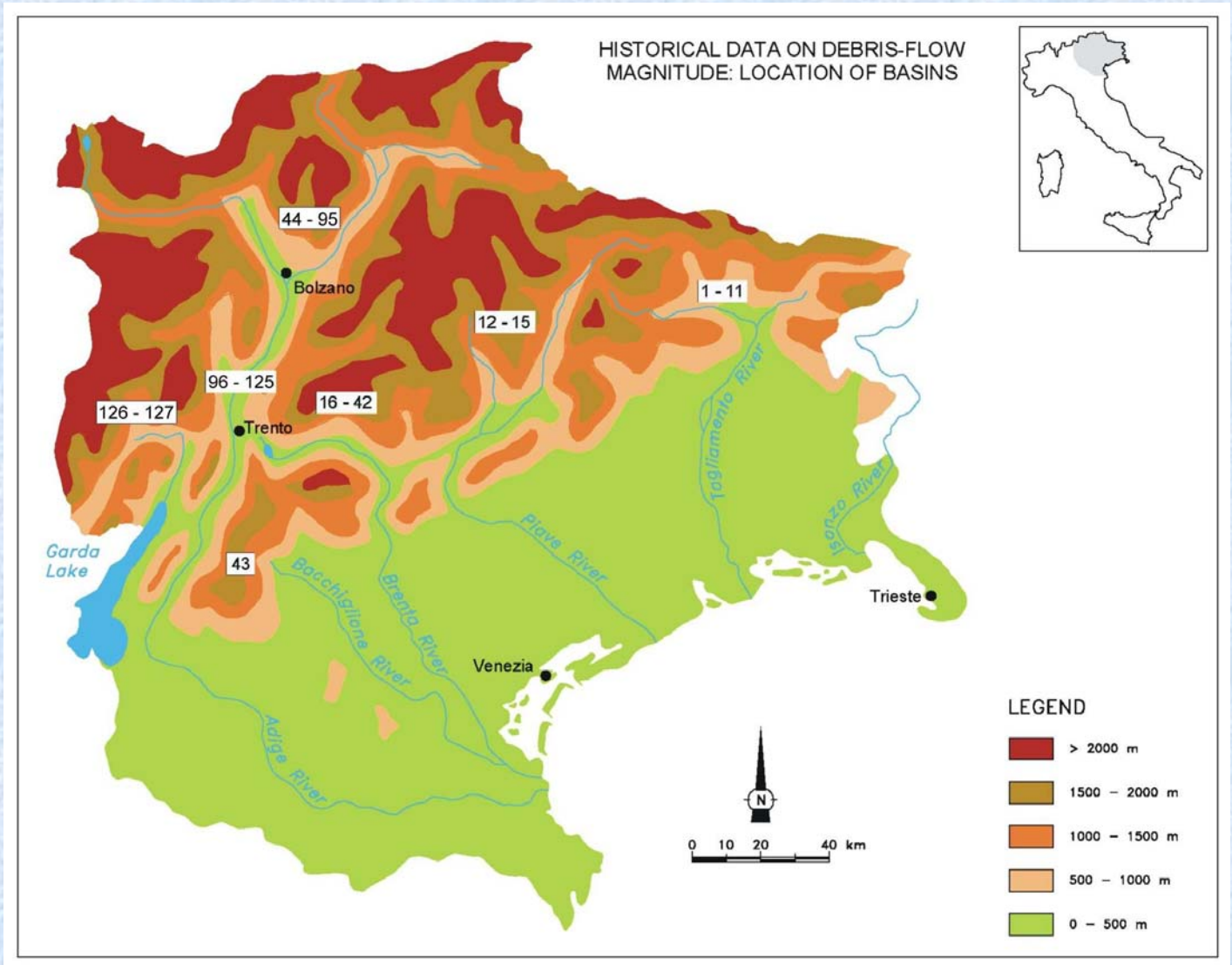
Reasons for future activities.

An example of debris flow

12.6.1997
Aquabona Creek
– Cortina d'Amepezzo
slope 10°to 30°
altitude 1000 – 3200
annual average precip. 1300 mm
basin cca 0.3 km^2
Dolomitic clifs
cca 1,5 km of transport
cca 6000 m^3 debris volume
max. stone diameter – 2 m



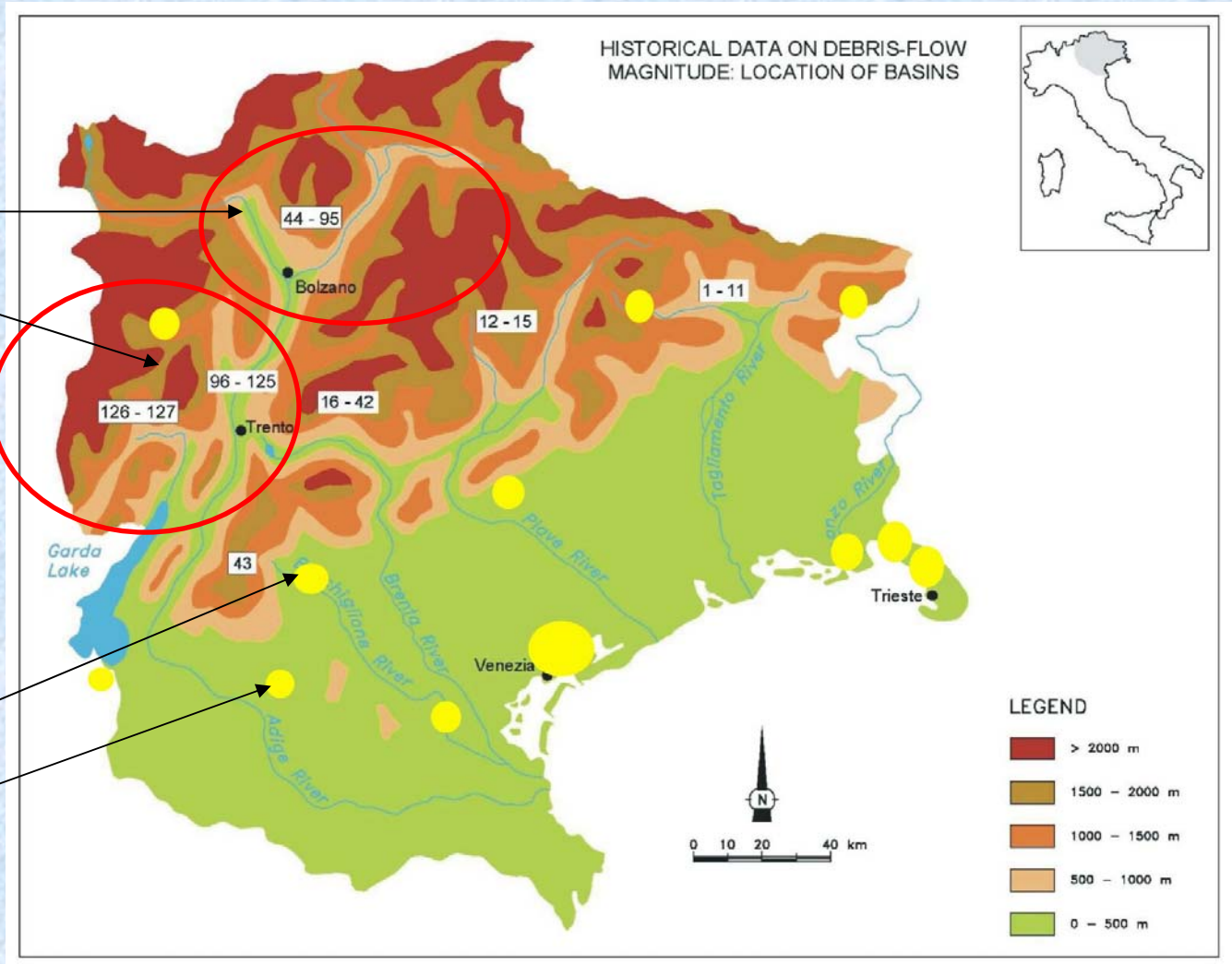
Erosion processes ...



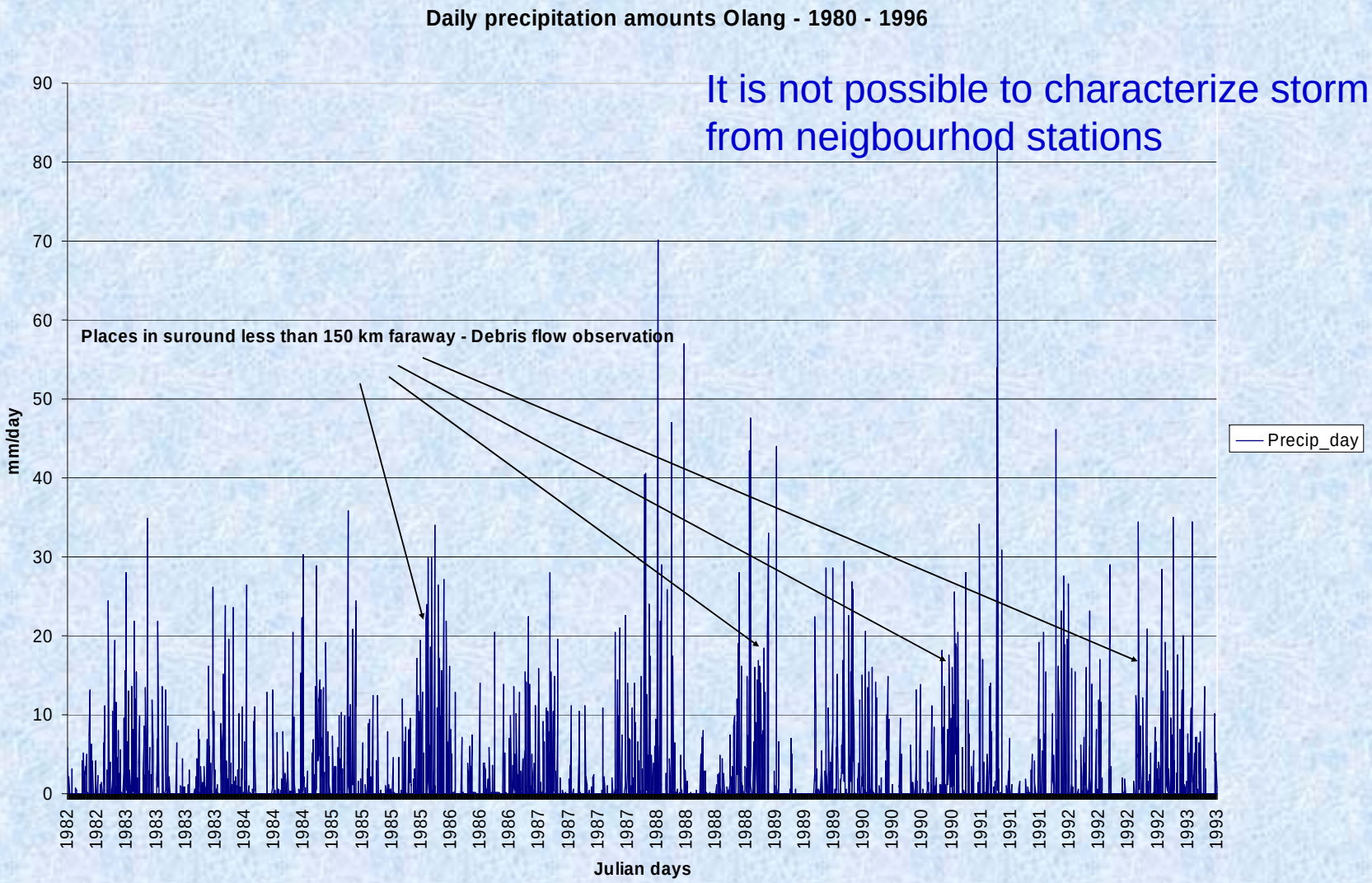
Aditional meteorological observations related to the areas of problem

Areas of possible problems

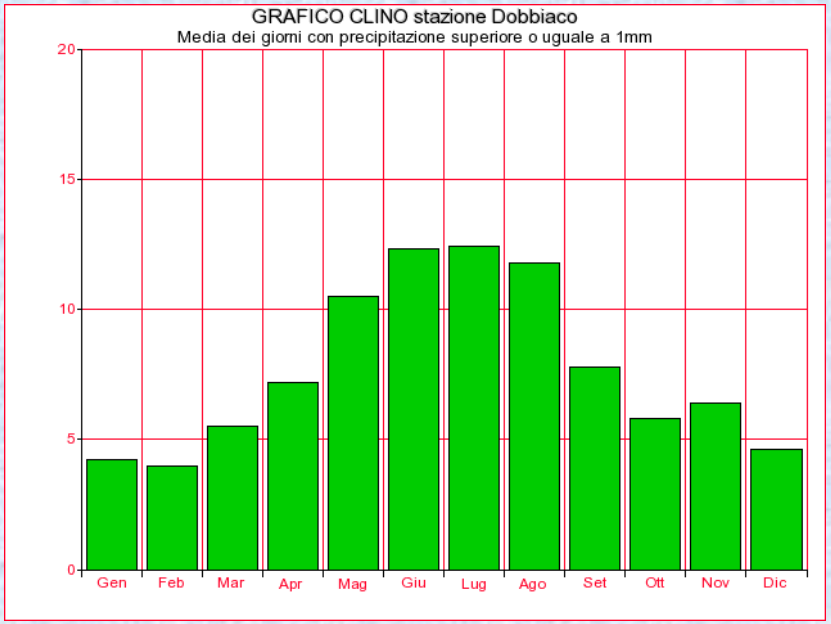
Meteoroligical stations



Variability in space



Problems to be solved



Typical weather situations

Critical seasons/periods

Building – structure‘s design and destination

Socio – eonomic aspects: safety

inhabitants

tourism

Cost/benefit analysis needed; decision making processes

Sources of data

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Thank You
Very Much
for Your
Attention