Moutain Risks
Stakeholder Workshop
Dortmund 24-25/09/2007

Study area southern Alps (France)

Jean-Marc Vengeon
Pôle Grenoblois Risques Naturels

- Risk management in France / french partners
- Hydrogeological hazards affecting southern alps
- Landslide risk management in Trieves
- Landslide risk management in Barcelonette basin

Risk management in France

- **RM circle** : cf Climchalp project (www.climchalp.org)

- **Role of the institutions**
  - State : reglementation, information , financial support
  - Regional councils : incentive financial support
  - Departmental councils : road and rescue service management, financial support
  - Communes : first responsibility level, land use planning
  - Citizens : right to be informed, civil protection partners (?)

- **Public / private engineering**
  - RTM, BRGM, CETE… : strong field / technical capacities, various status and dynamics
  - Engineering companies
  - Universities / research centers

French MR partners / PGRN

French partners Mountain risks

- University Caen
- Univ Joseph Fourier Grenoble
- Cemagref Grenoble

Pôle Grenoblois Risques Naturels : NGO

www.risknat.org

- Members : research and technical institutes of R-Alpes
- Interface Research / public authorities and institutions
- Impulse and coordinate applied research / natural hazards
- Supported by Conseil Général Isère / Région R-Alpes

Eathquakes

Torrents floods and debris flows

River floods

Rockfall, rock avalanches

Landslides and deep slope movements

(Avalanches)

Southern Alps : moderate sismicity but high vulnerabilites

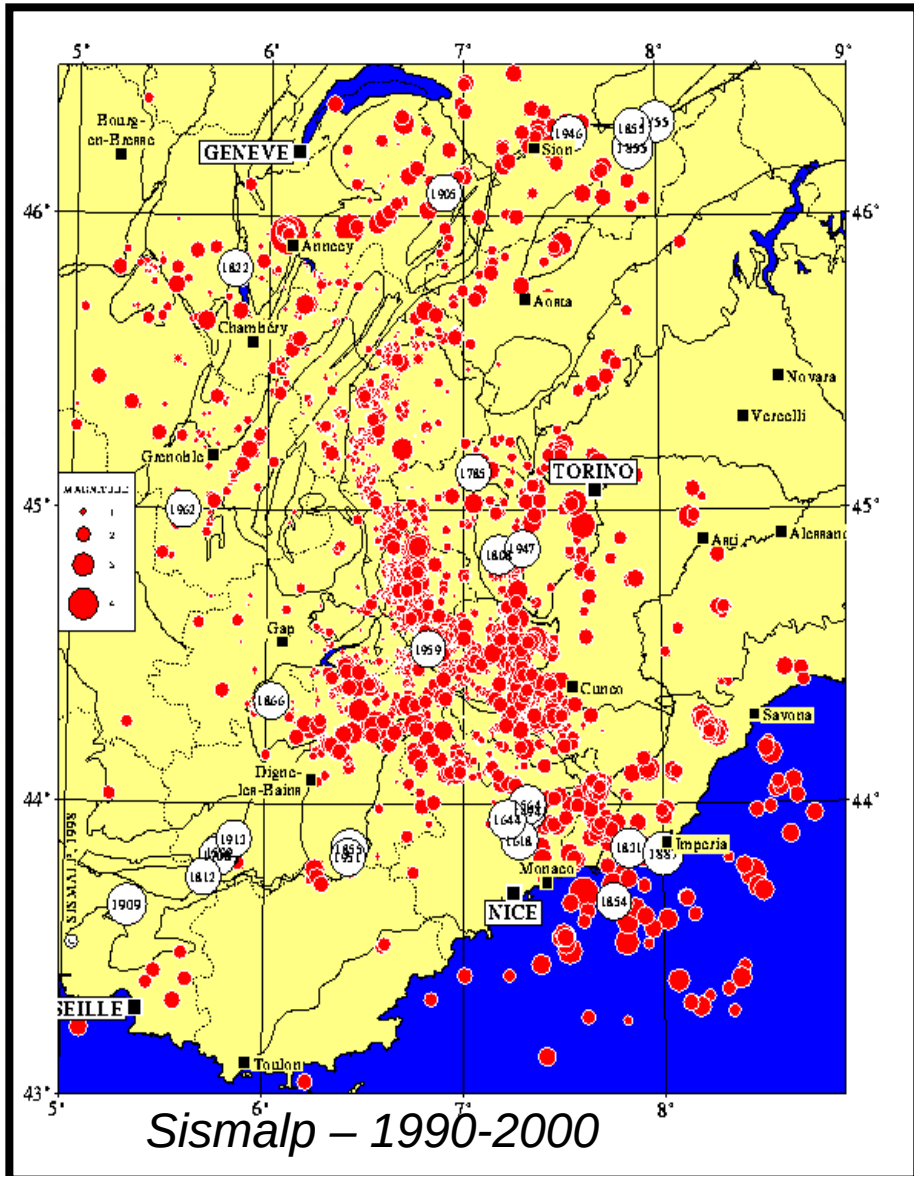
Moderate sismicity

Intensity VIII-IX

High vulnerability

Hi-Tech Industries

Chemical and nuclear plants



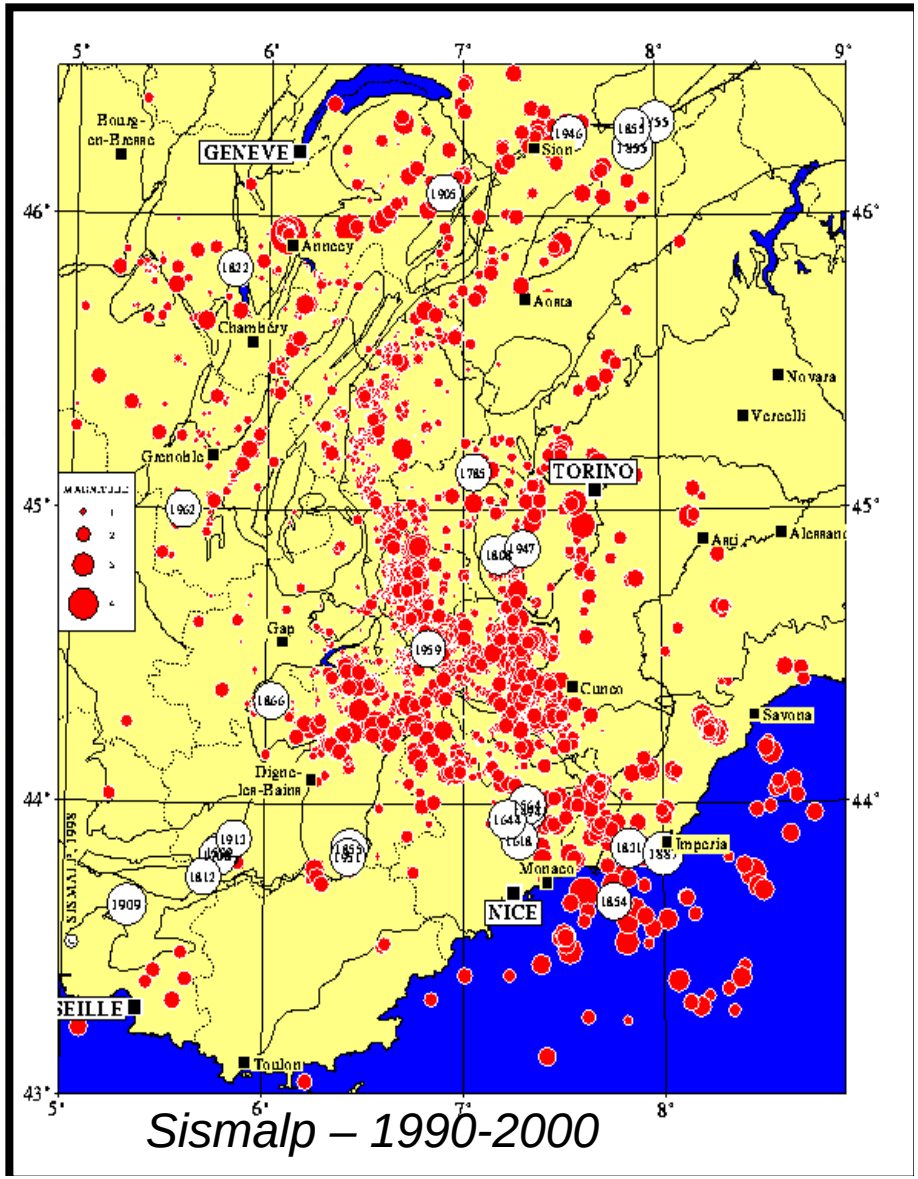
Sismalp – 1990-2000

Southern Alps : moderate sismicity but high vulnerabilites

Annecy 1996
Intensity VII

Corrençon 1962
Intensity VI - VII

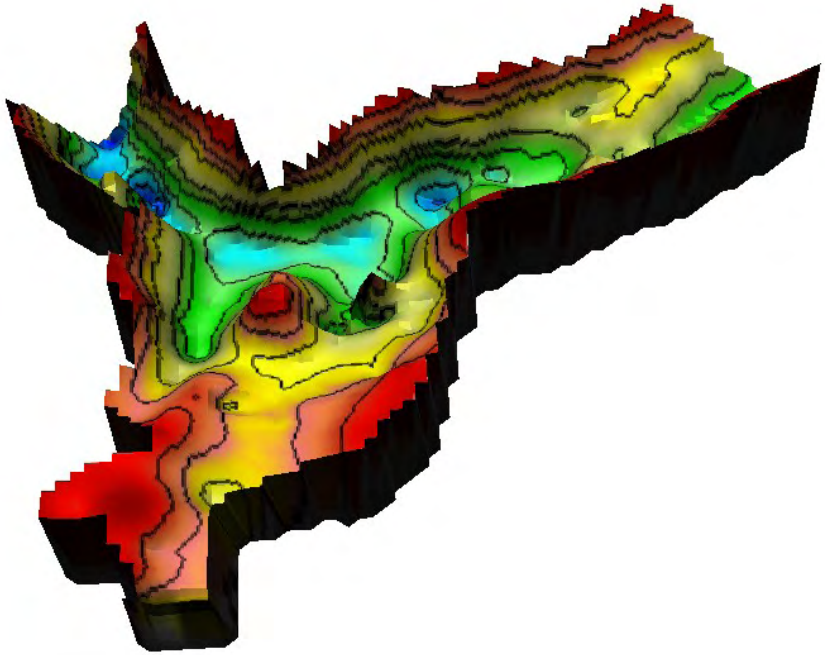
Lambesc 1909
Intensité VIII à IX



Sismalp – 1990-2000

GRENOBLE : alpine glacial valley filled with clay sediments

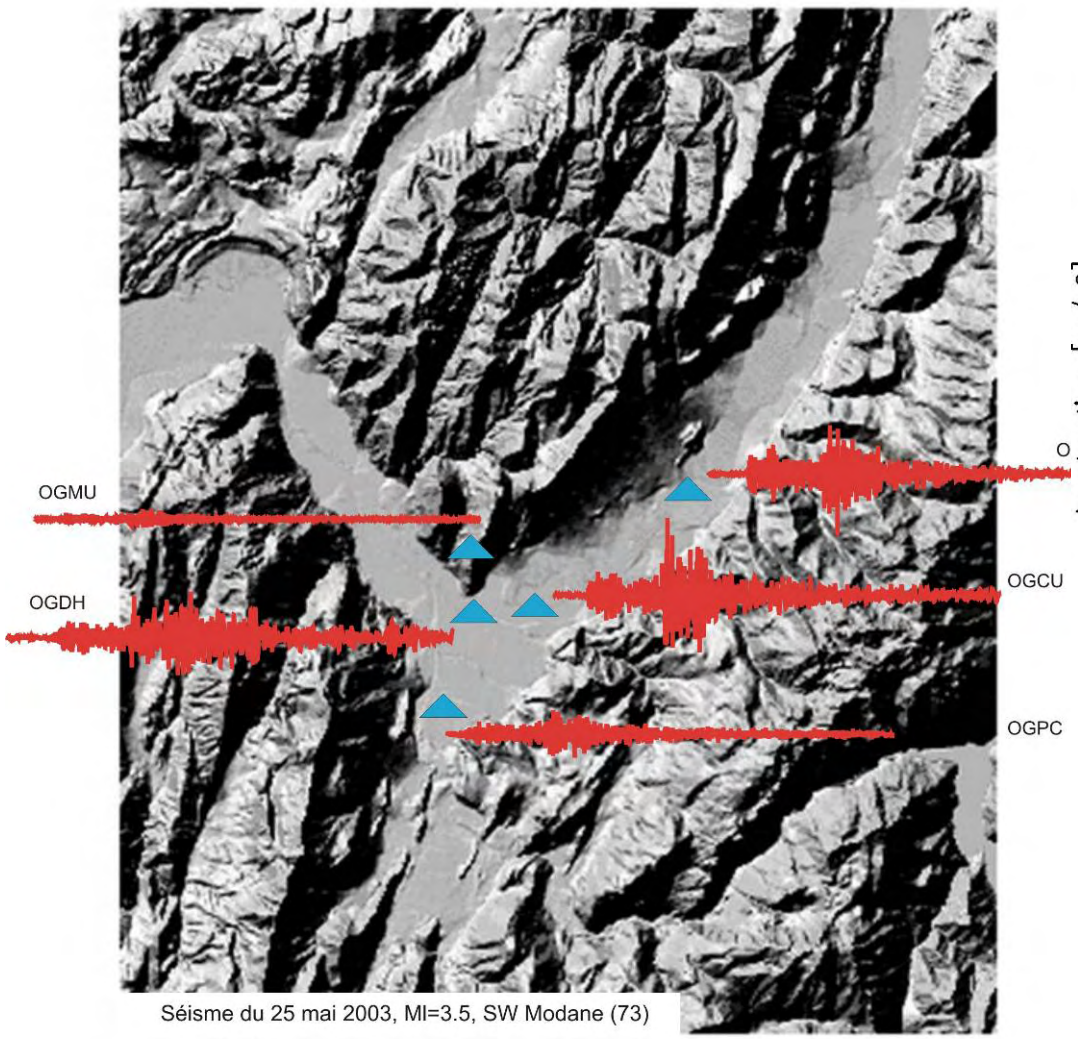
Bedrock depth :
up to 800 m



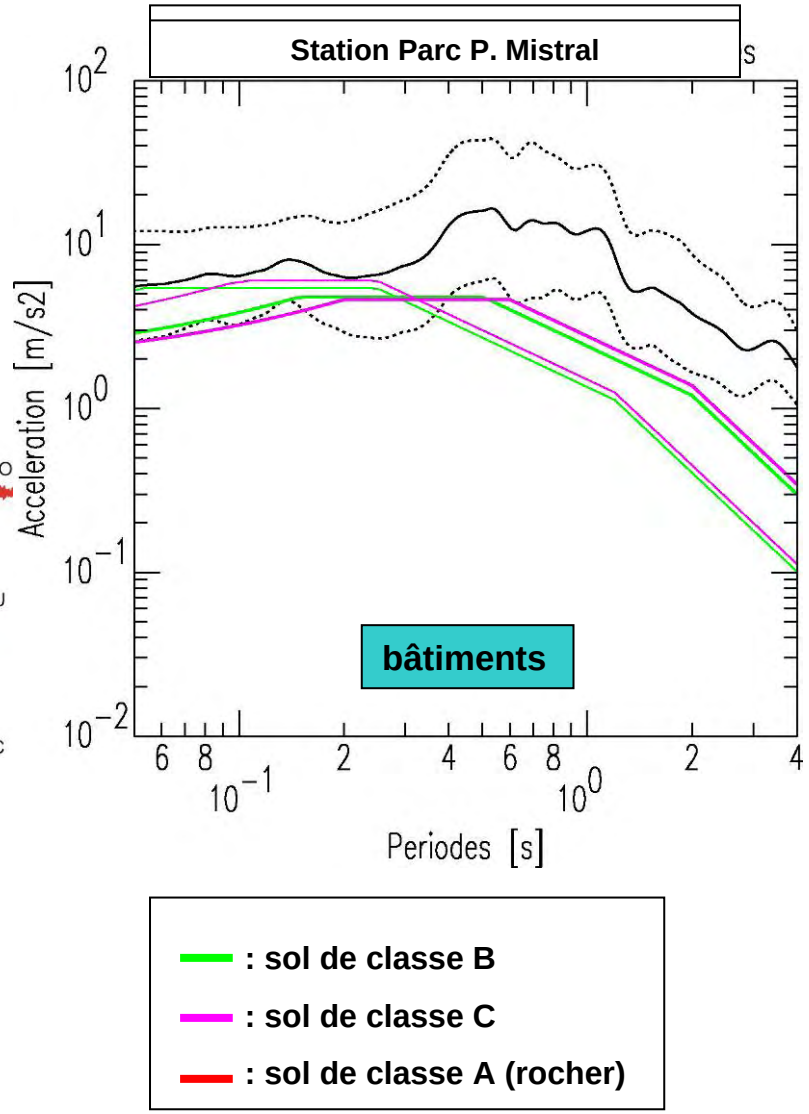
Vallon, 1999

SITE EFFECT : SEISMIC AMPLIFICATION

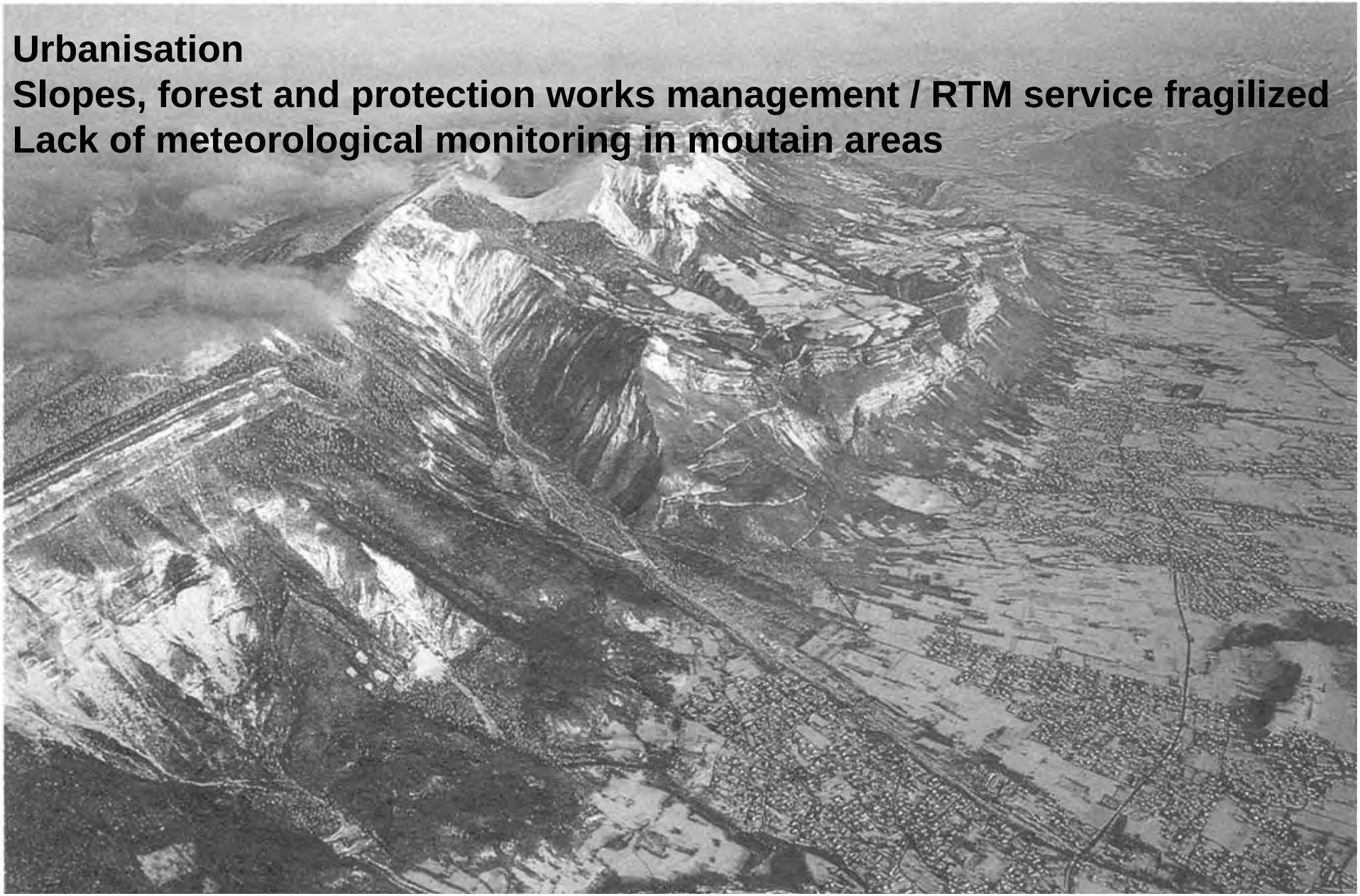
Observations Ml=3.5 – SO de Modane (73)

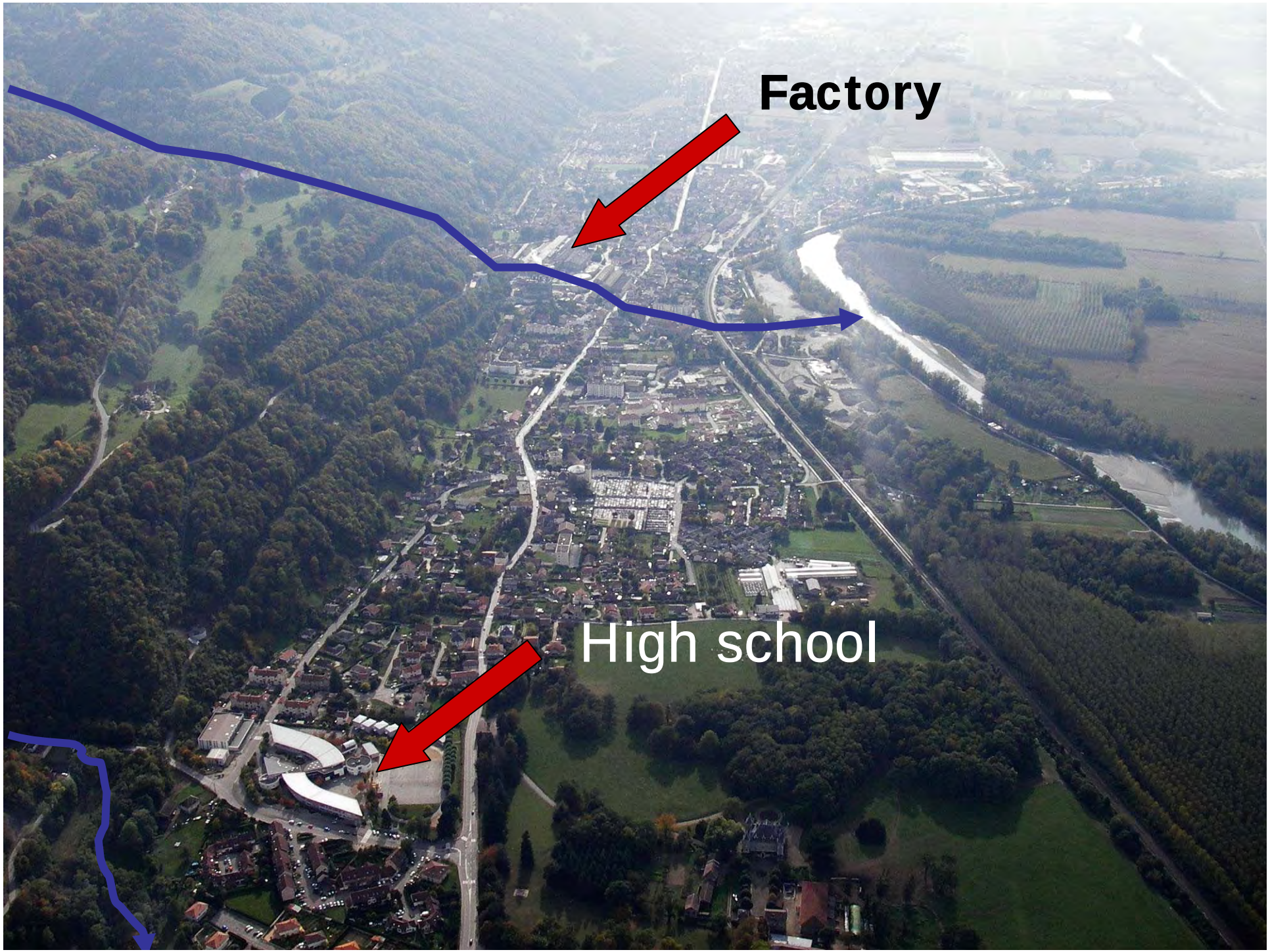


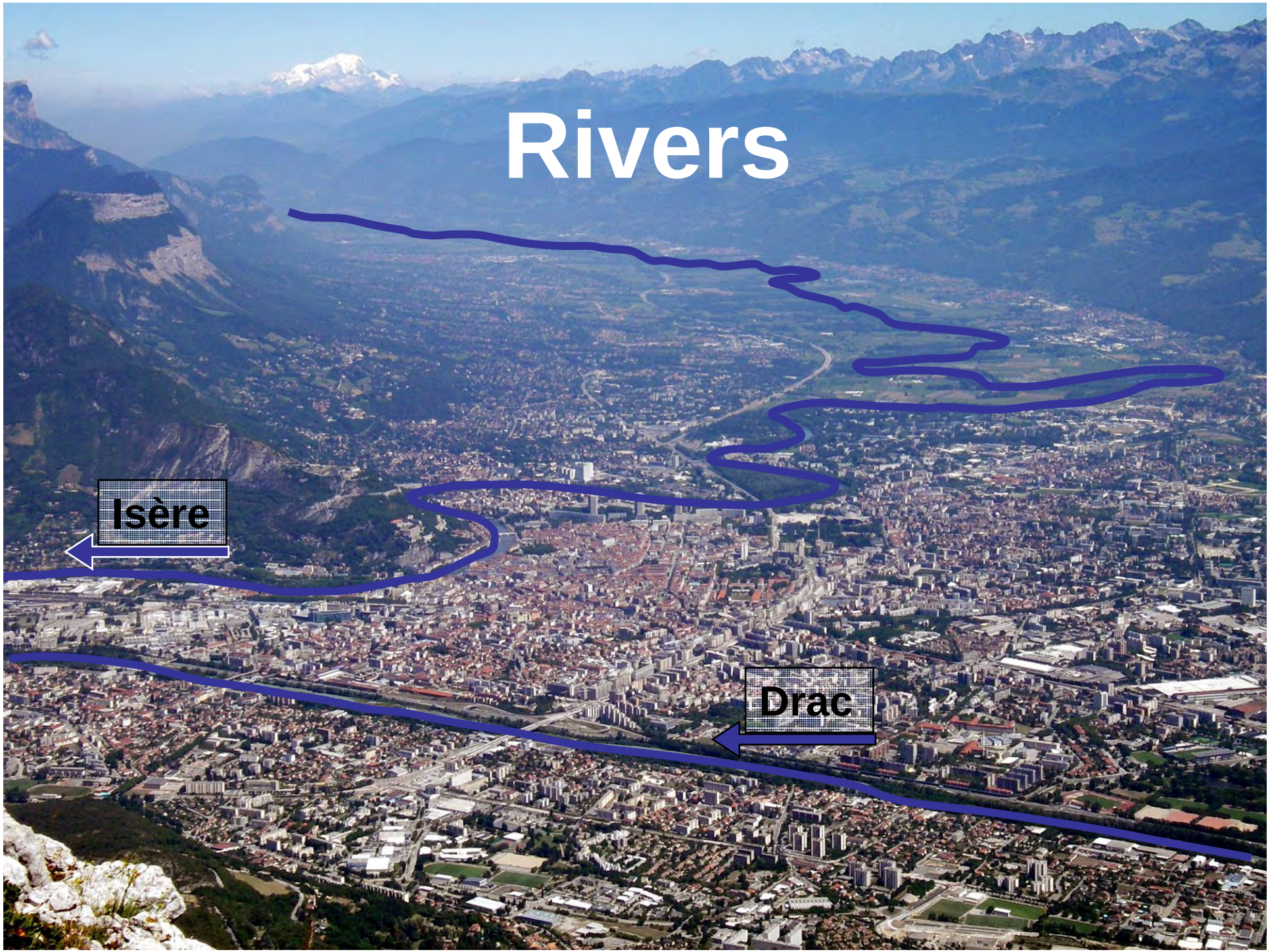
Simulation M=5.5 Laffrey



Torrents


Urbanisation
Slopes, forest and protection works management / RTM service fragilized
Lack of meteorological monitoring in moutain areas


Factory
High school


Rivers
Isère
Drac

Rivers : enough space ?

Embankment / flooding areas

Social acceptation / risk dialog ?

Isère :

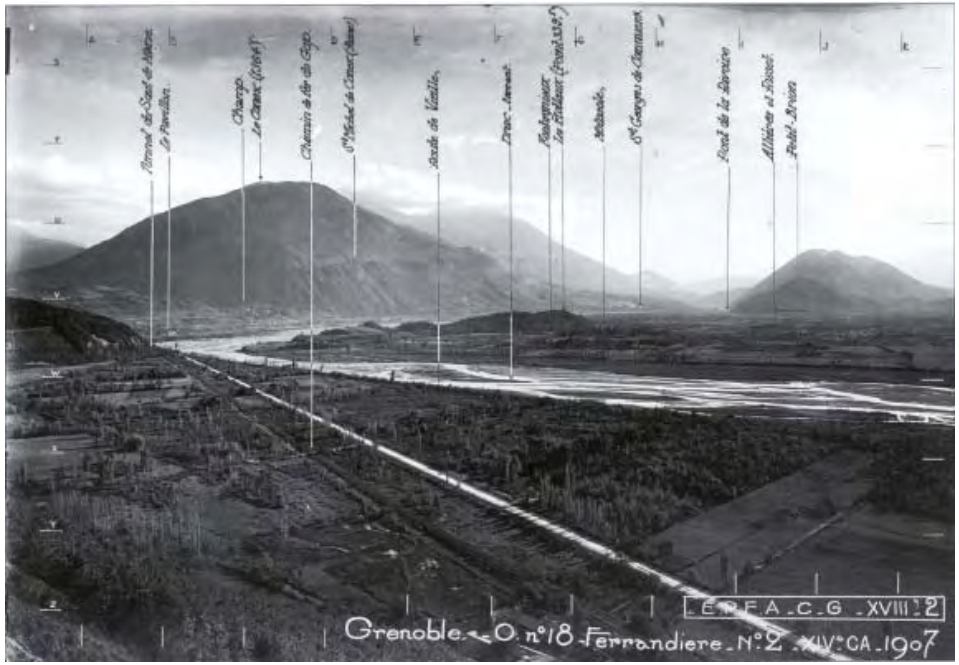
- Flood Prevention Plans
- Project upstream Grenoble

Saint-Hélène/Isère - doc. JM Sanchez/ISAIR

Rivers : transit capacity ?

Biological management of river beds
Upstream / downstream sediments management
(+ / - : Drôme river lack of sediments / reforestation)

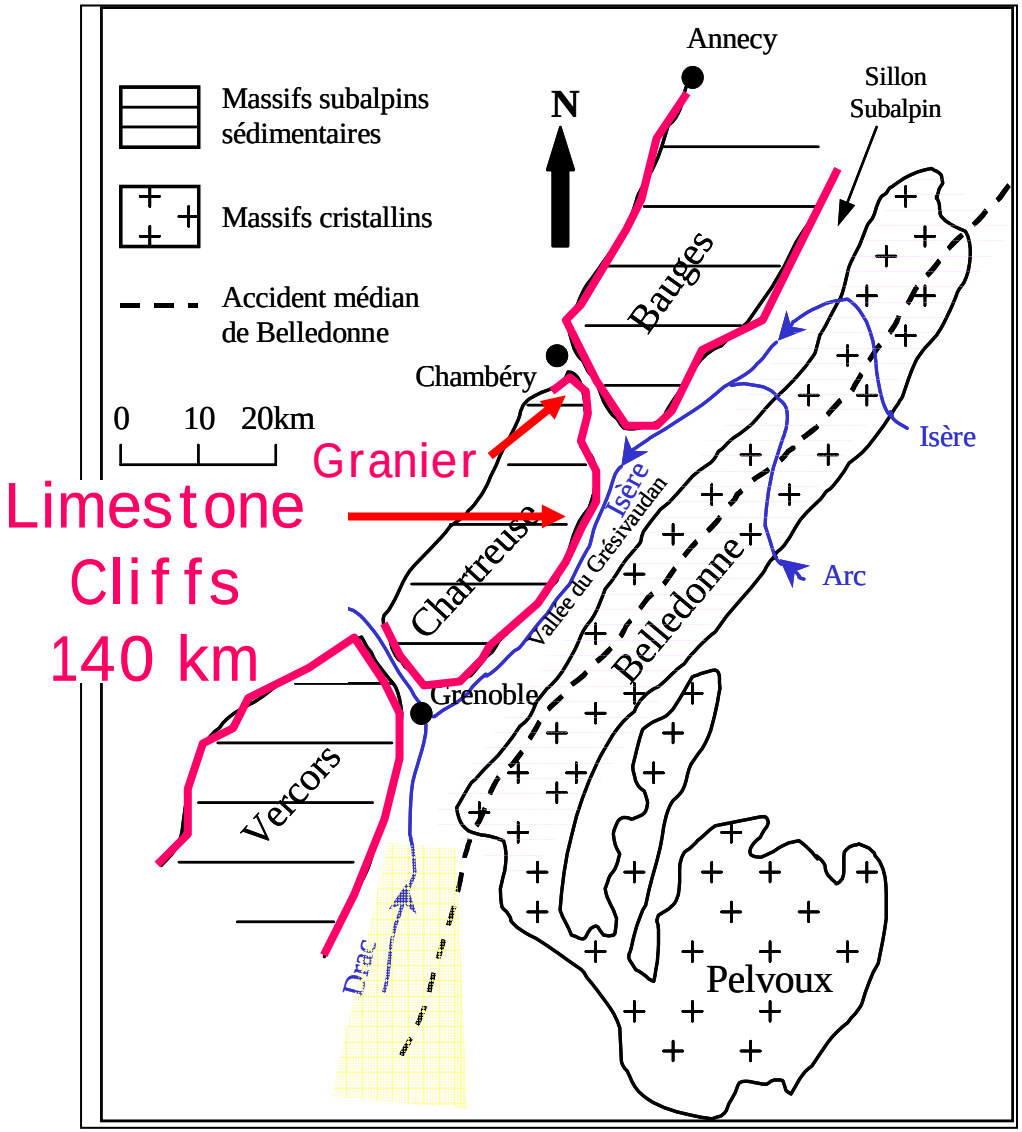
Drac à Jarie 1907

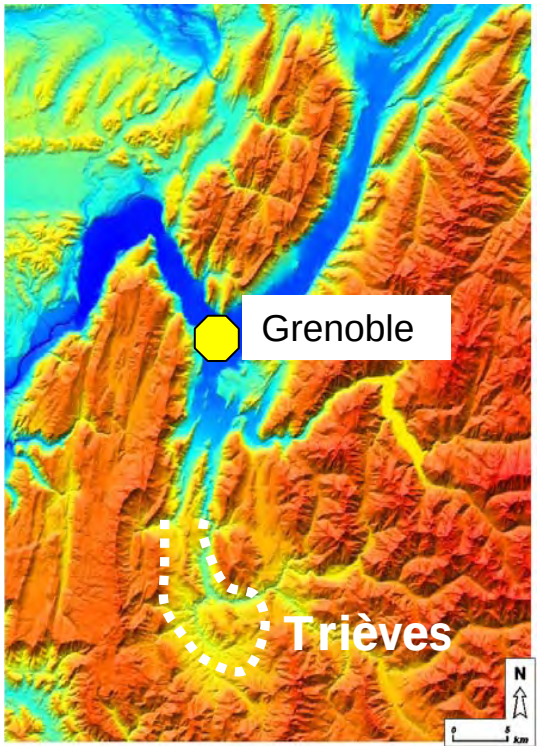


Drac à Jarie 1997

doc : Patrick Blanc, Sylvie Perrard, "Grenoble;, un siècle de photographies", Didier-Richard, 1998

Rockfall – rockavalanche risks near Grenoble





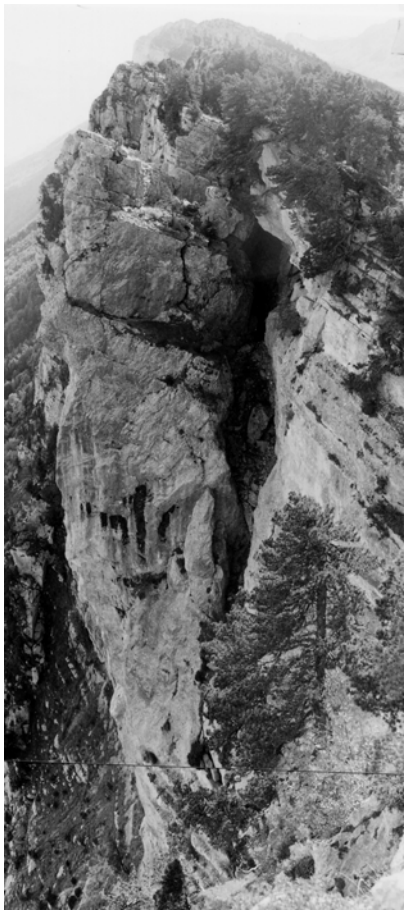
Calcaire

Micaschistes

Argile

Rockavalanche risks in alpine valleys near Grenoble

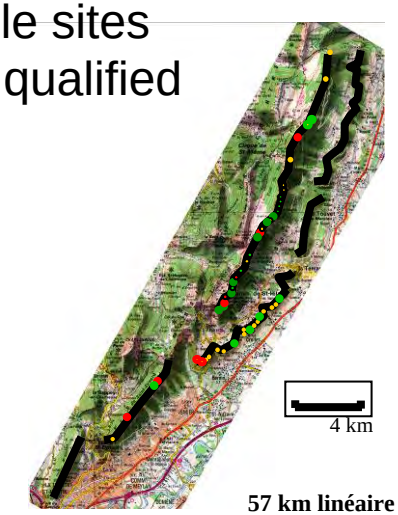
Rockfall : every day management
Rockavalanches : out of scope of Prevention Plans



Strategical study /
landuse planification

Chartreuse east : 57 km cliff

- 9 unstable sites
- 19 to be qualified

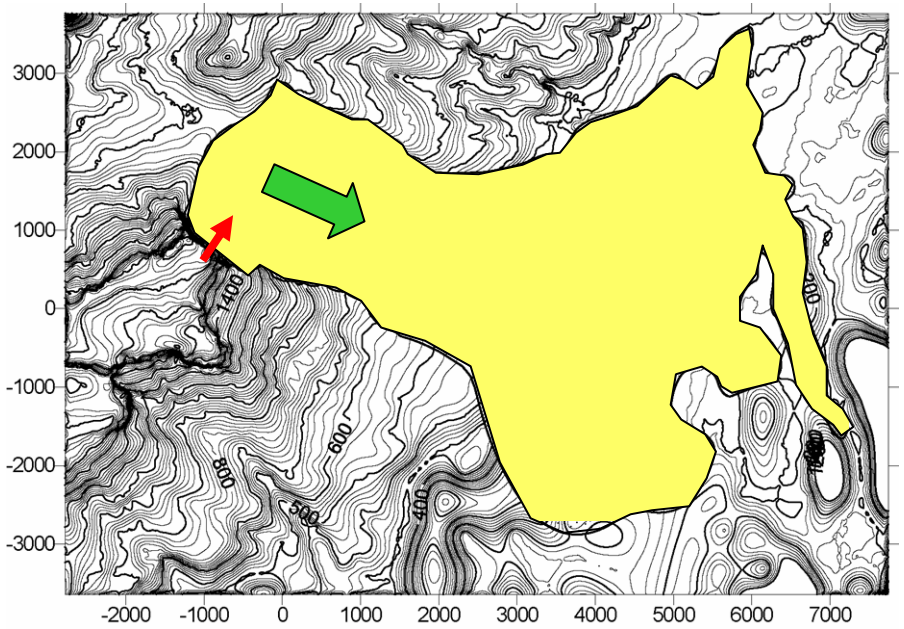


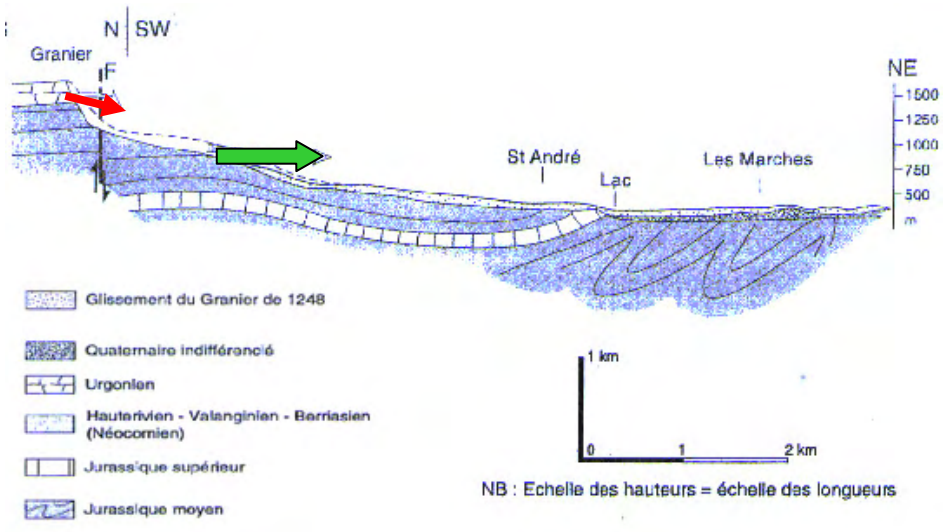
57 km linéaire de falaise

Historical catastrophe : Mont Granier

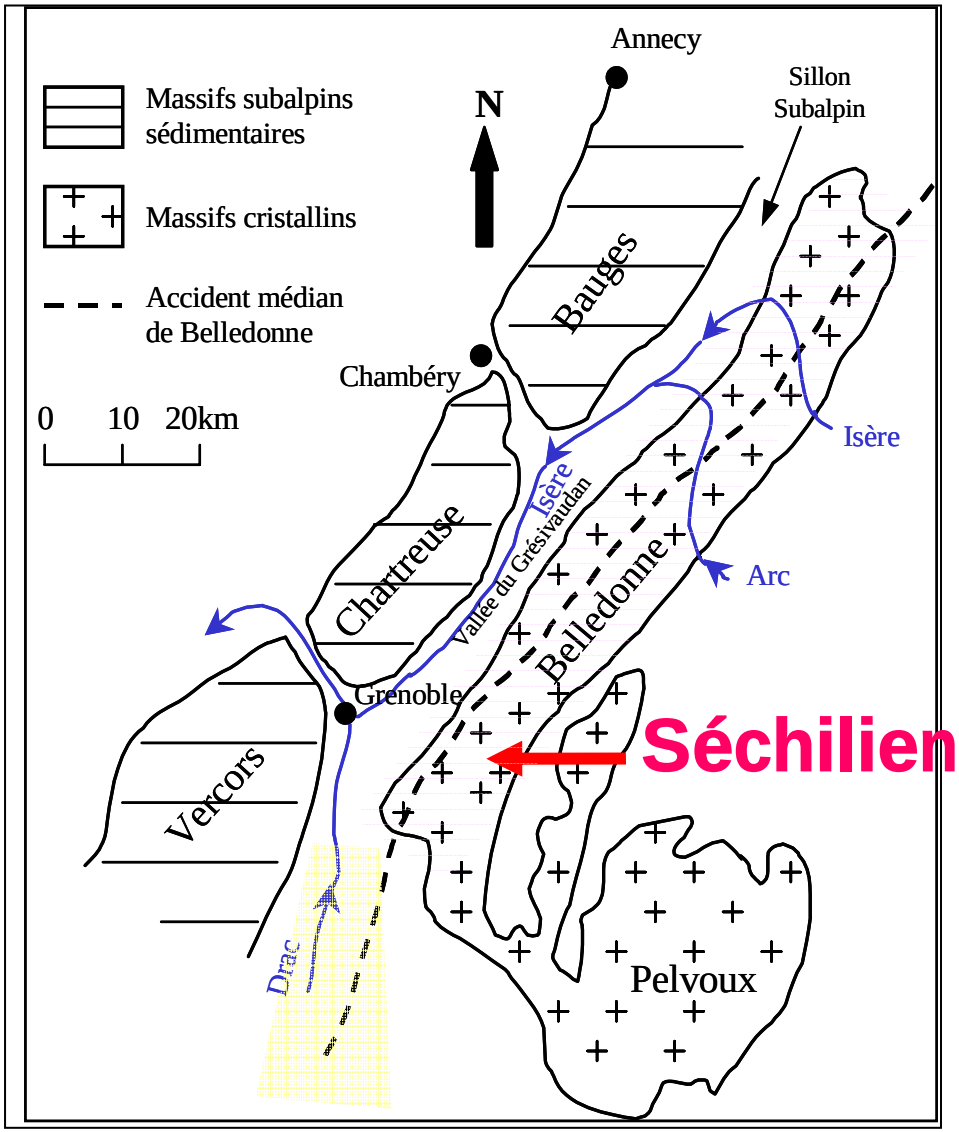
1248 : huge mudflow (300-500 Mm^3) triggerred by rockavalanche (10-50 Mm^3)

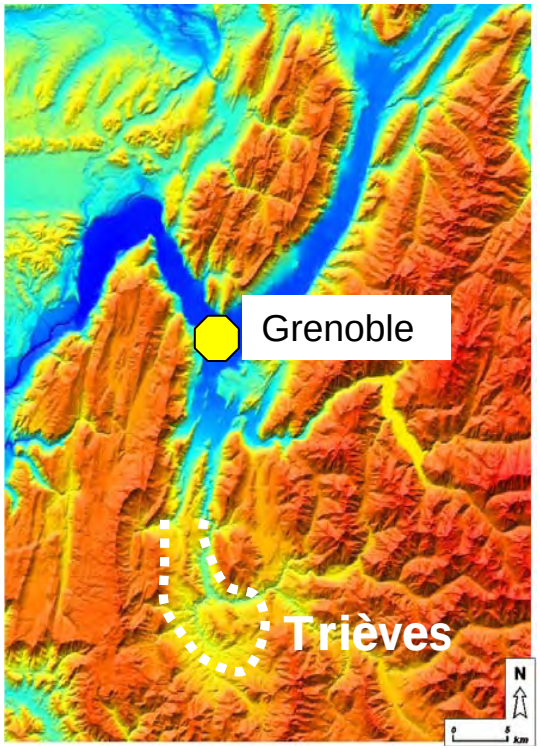
XX° : several rockfall 10^4 – 10^5 m^3





Sechilienne : major slope unstability

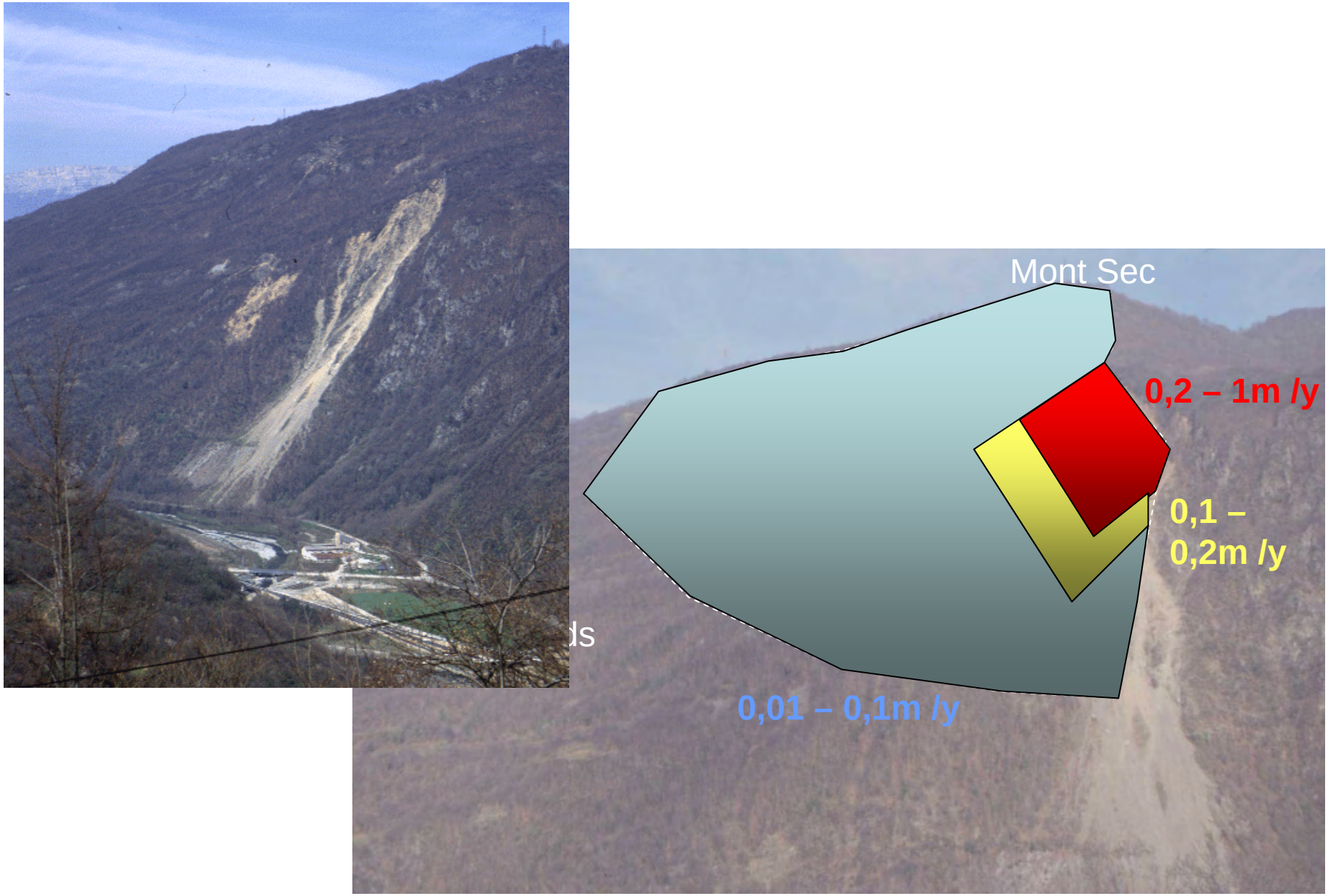




Limestone

Micaschists

Clays

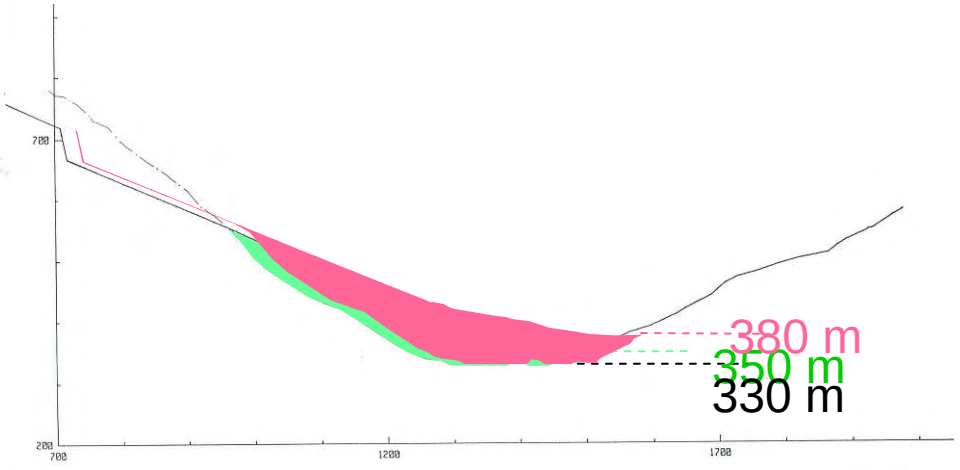

Mont Sec
0,2 – 1m /y
0,1 – 0,2m /y
0,01 – 0,1m /y

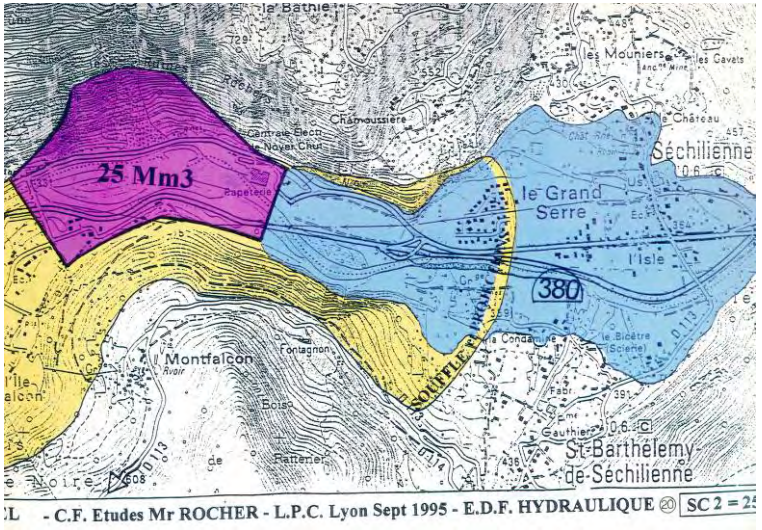
SECHILIENNE

Cross section

SECHILIENNE

Rockavalanche Hypothesis 7and 25 Mm3



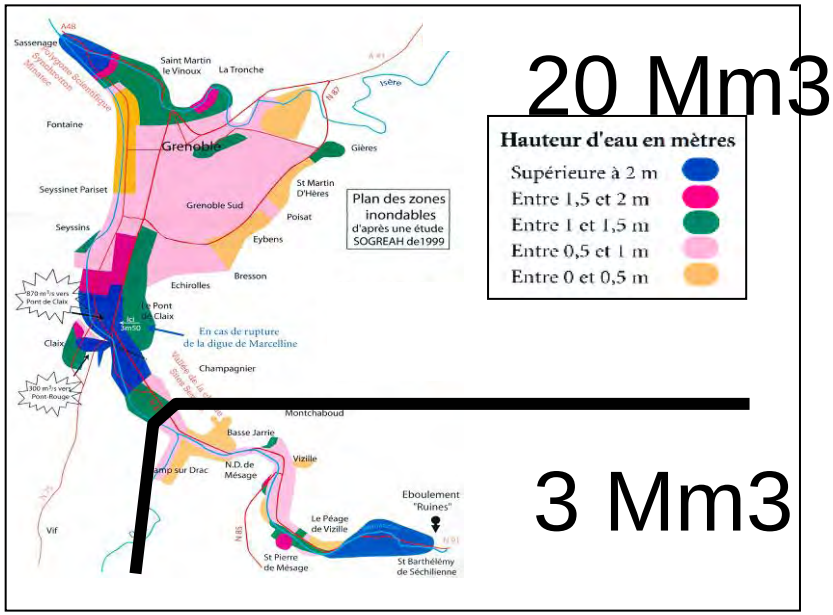


Narrow valley : risk of natural damming

Interuption of main road transit to southern Alps / Italy : 1-2 M€/day

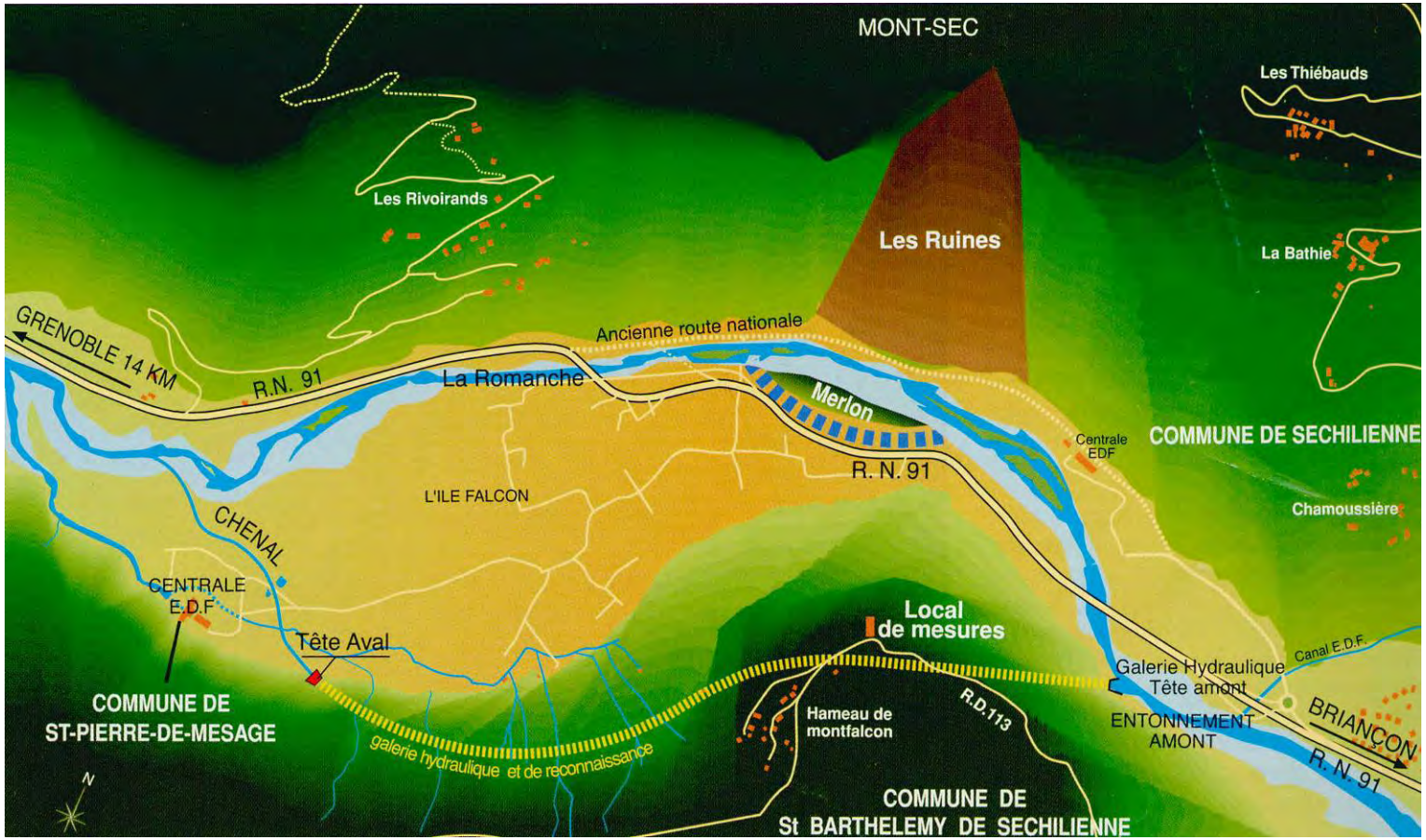
Upstream slow flooding risk : impact on local developement

Downstream wave flooding risk / urban zones and chemical plants

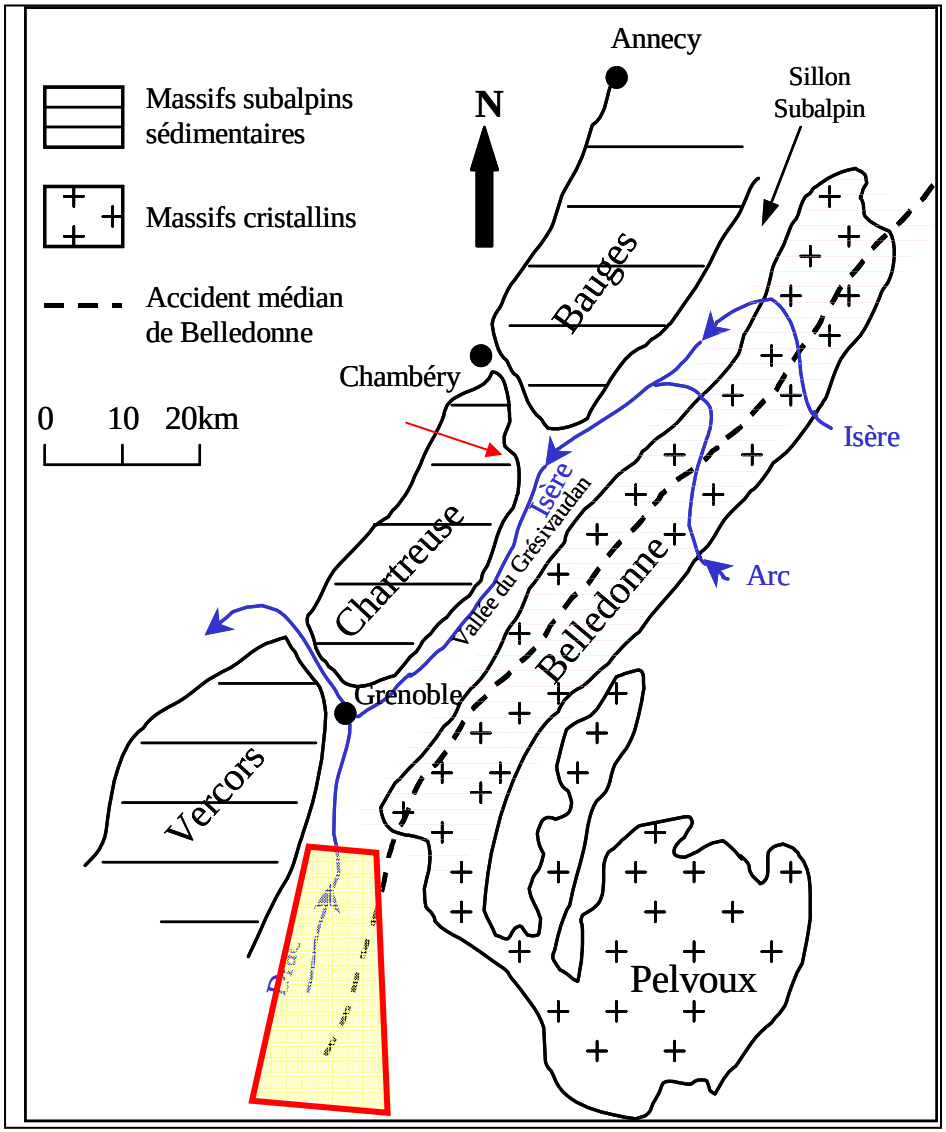


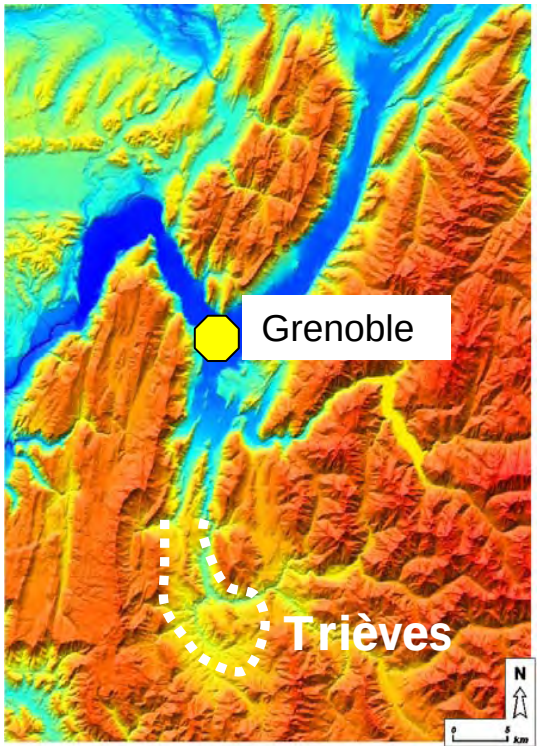
Decisions :

- Intense monitoring (State : CETE Lyon)
- Alert system / Civil Protection Plan downstream
- Paper factory and 50 houses preventive expropriation (Loi Barnier, 1°)
- Road uplift on opposite slope (project 2009)
- Hydraulic tunnel : investigation gallery done, studies going on… funding ?



Mouvements de terrain dans la région de Grenoble





Limestone

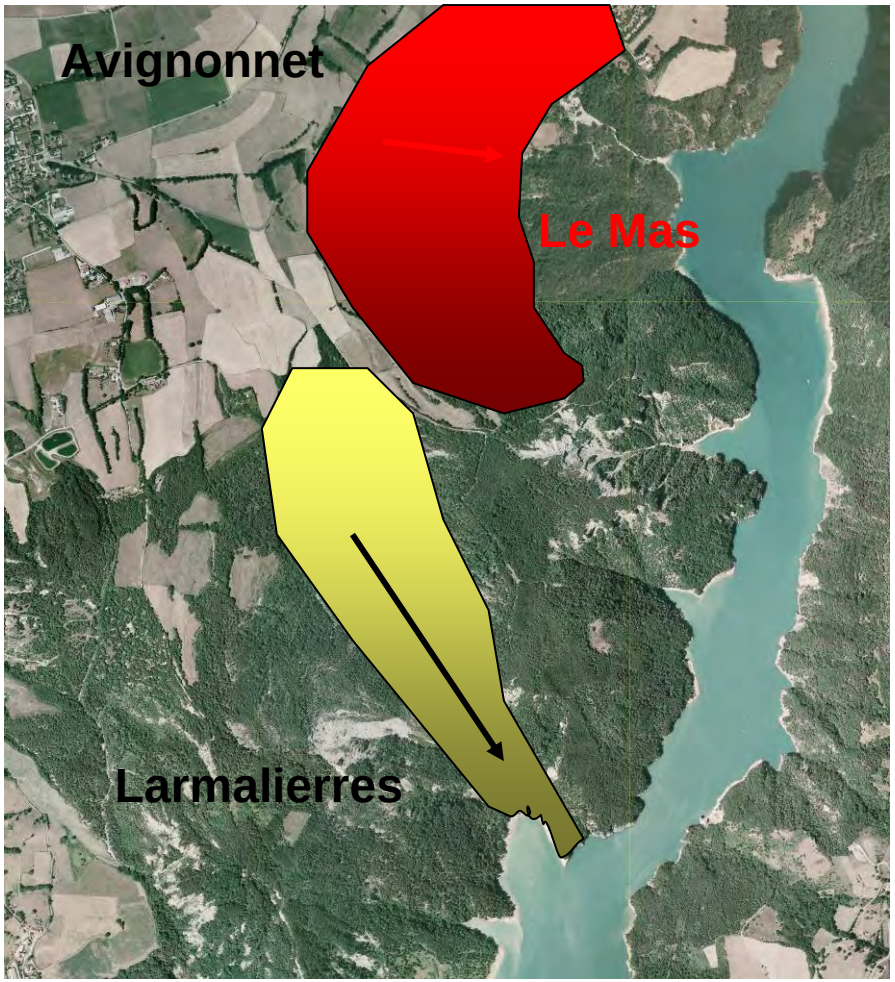
Micaschistes

Clay

Trièves landslides

Trieves landslides

MR partner : LGIT – Univ Joseph Fourier



Trieves landslides

Larmalierres

EDF
hydropower dam :
risk evaluated
as low,
no specific monitoring

Avignonnet landslide management

Avignonnet

Le Mas village :

- damages to houses, danger to habitants
- limited monitoring (RTM – CG 38)
- expropriation procedure going on
- Social risk dialog : …?

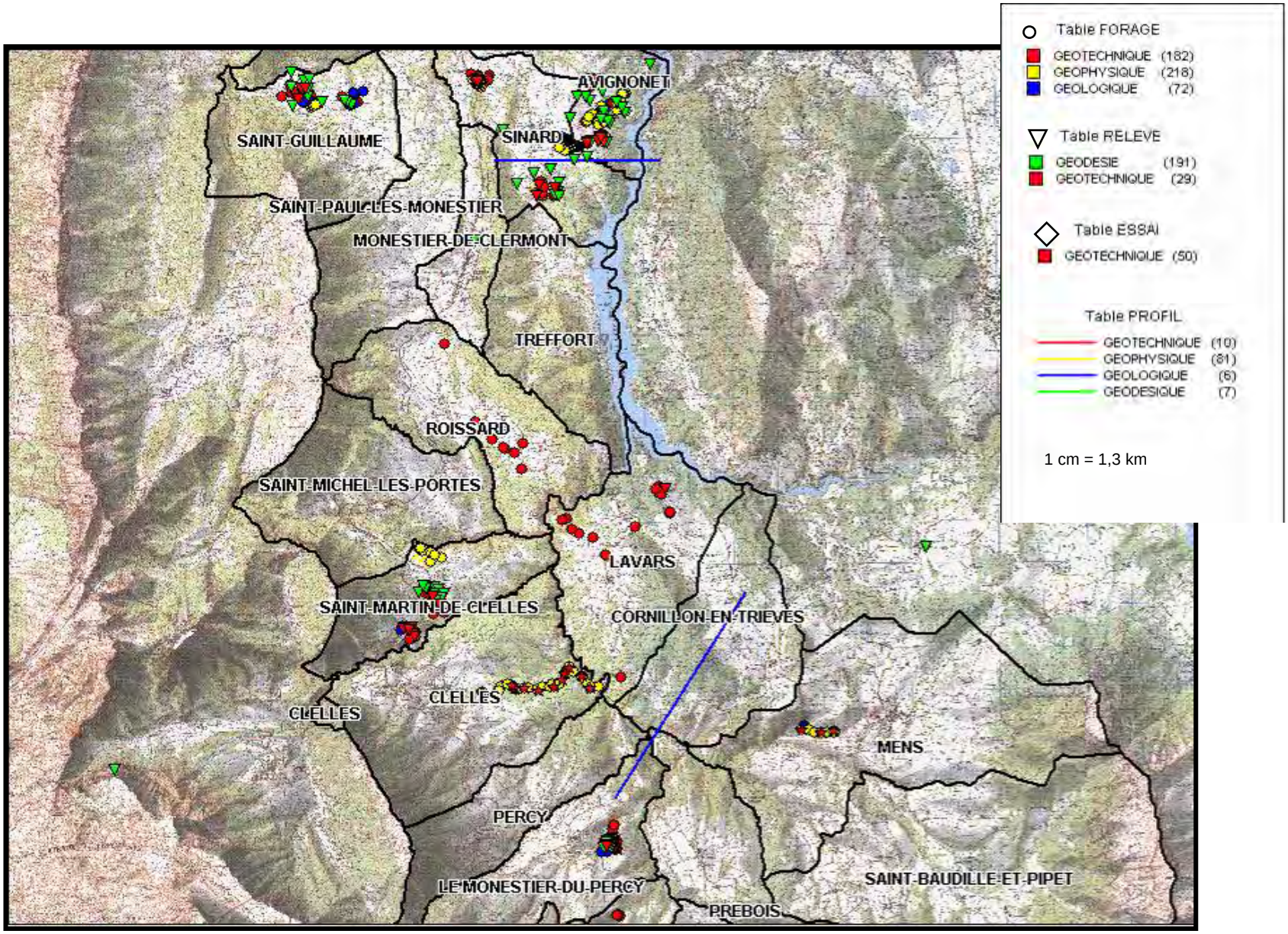
Set up of the MOUVARGI observatory

- Creation of a geotechnical database (2005-2006; funds Conseil Général Isère / State)
- Permanent geotechnical and geophysical measurements on Avignonnet landslide (funds Région Rhône-Alpes)
- Scientific projects, open data access

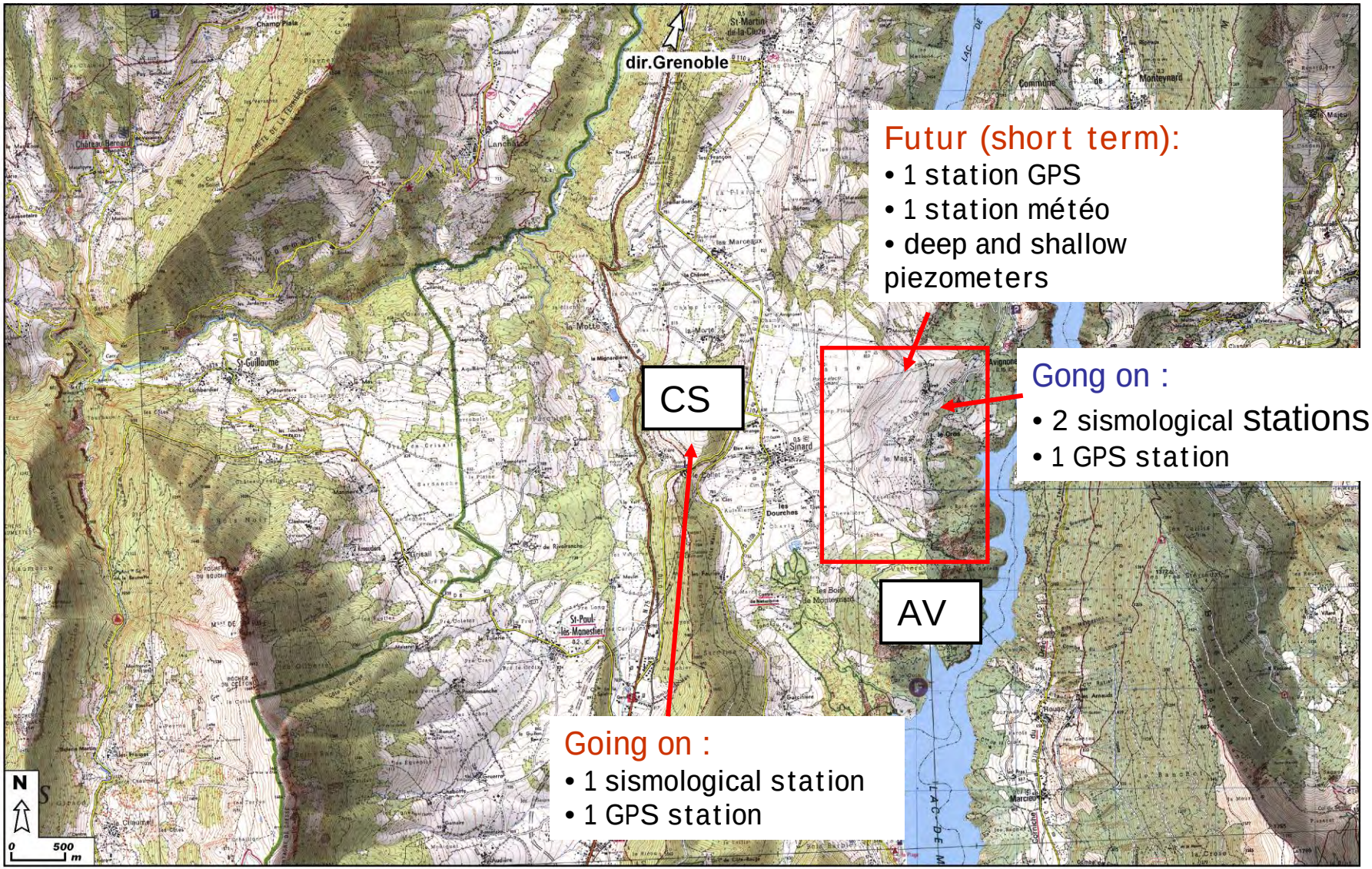
National label with 3 other sites

(Séchilienne, La Clapière, Super-Sauze)

Trieves : geotechnical database



Avignonnet : permanent measurements

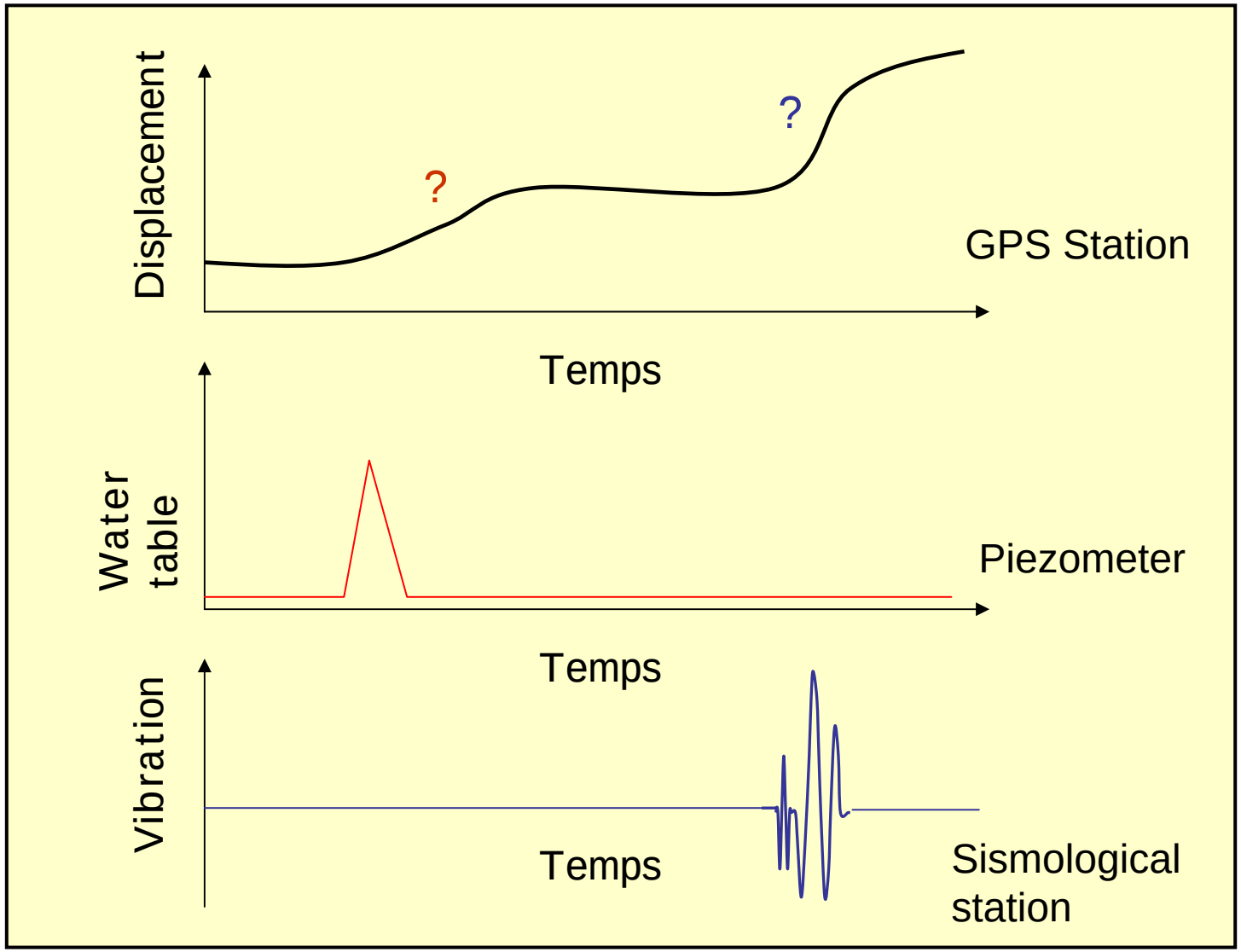


Avignonnet landslide

Permanent equipements

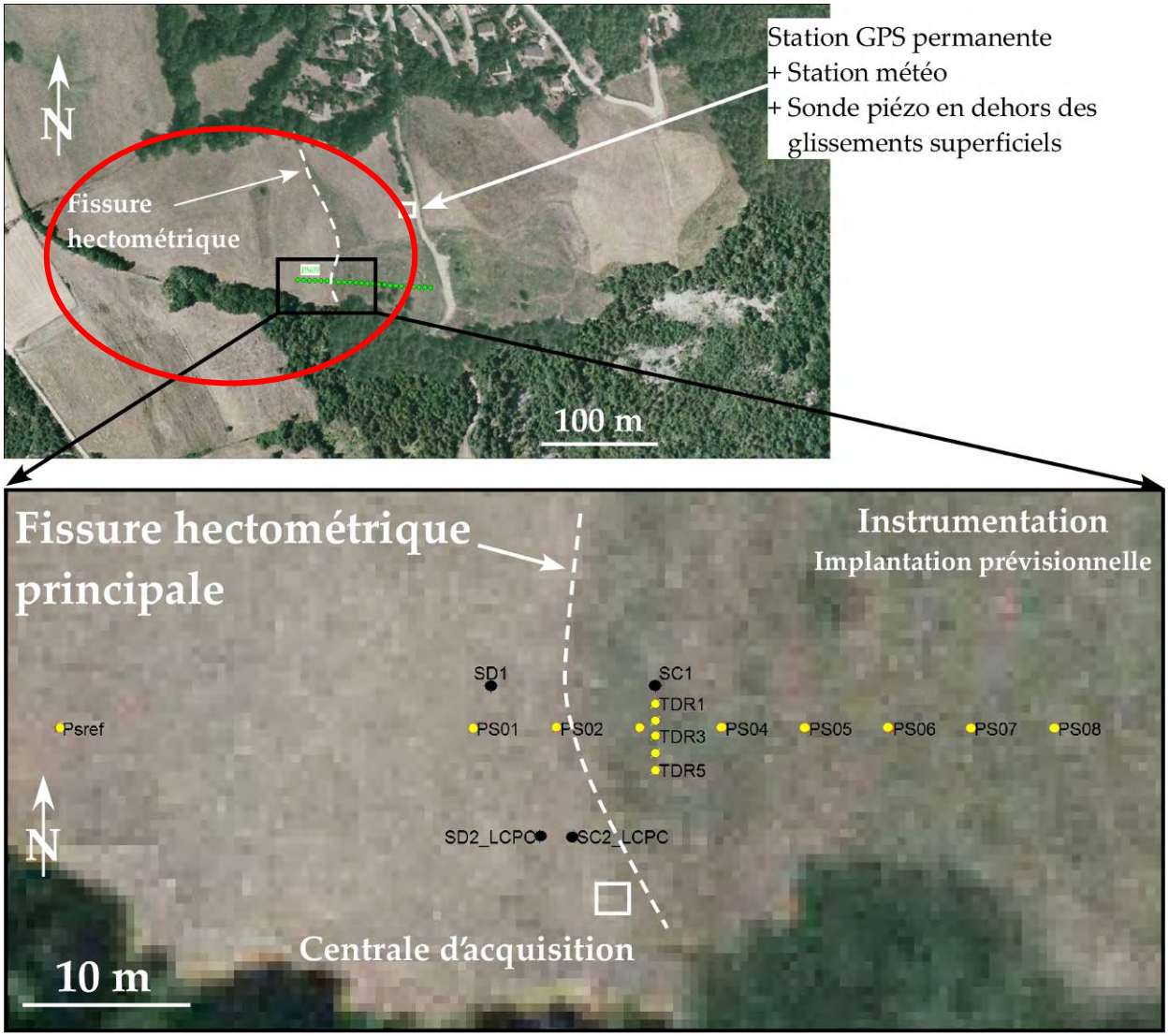
Station sismologique

Understanding Avignonnet landslide



Ex : These G. Bievre (UJF-LGIT)

Investigation of hectometrical extension cracks



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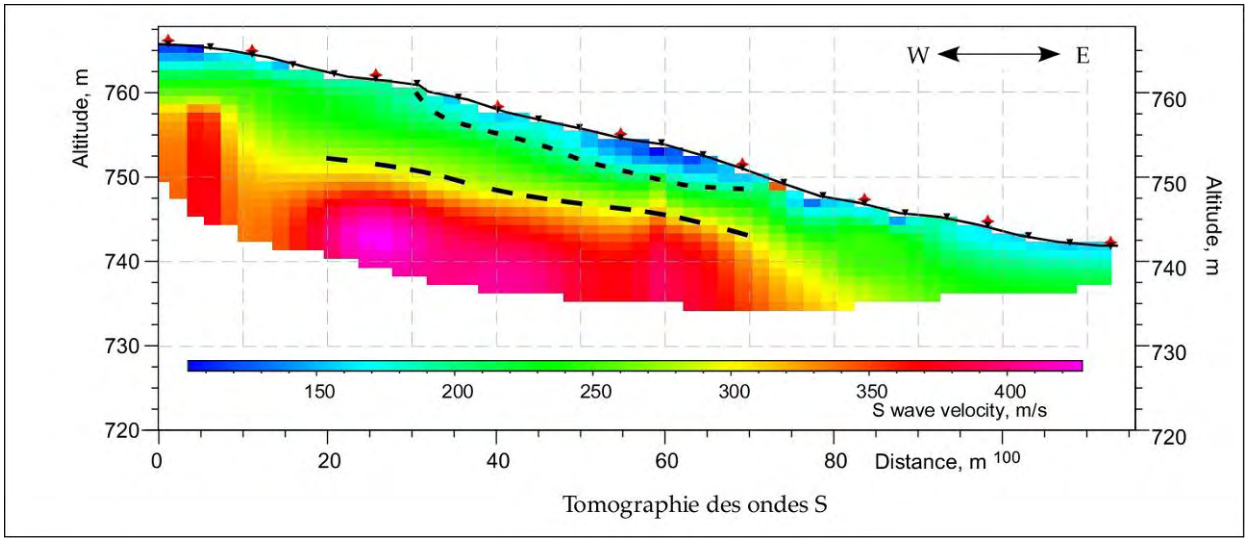
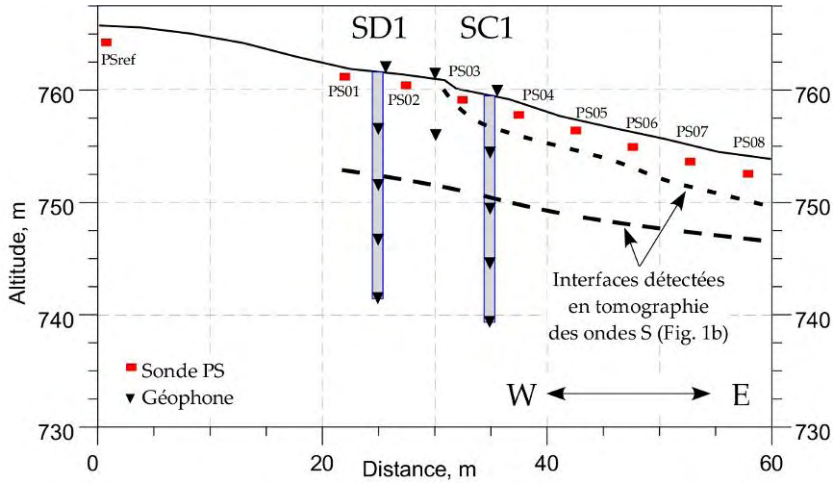
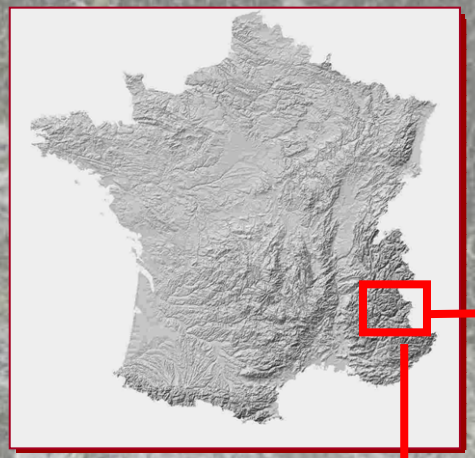
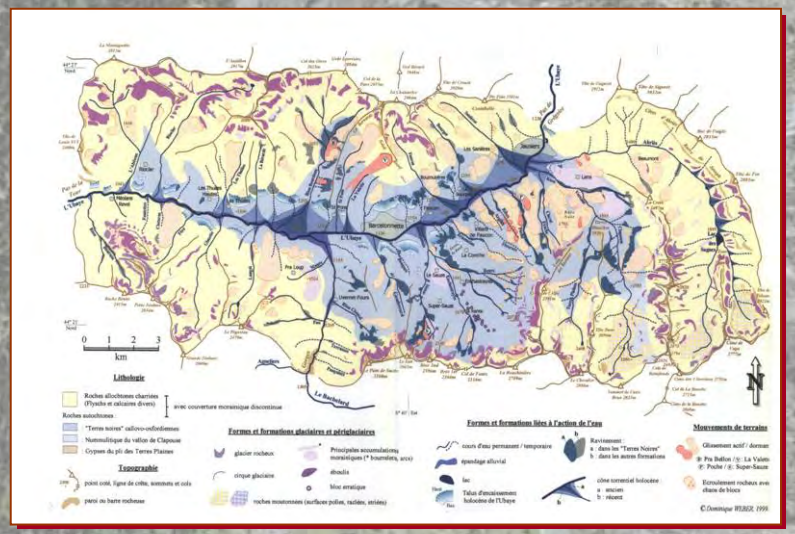




LANDSLIDE RISK MANAGEMENT IN THE BARCELONNETTE BASIN

J-P Mallet, O. Maquaire, University of Caen





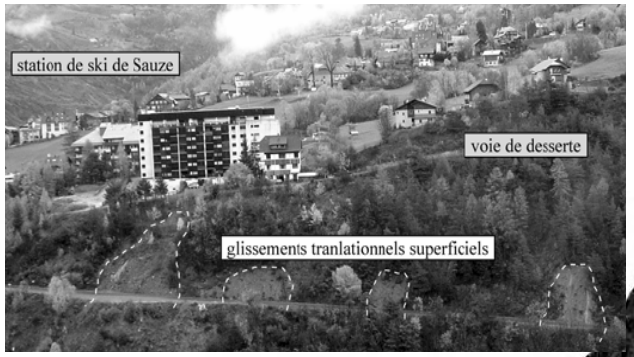
HAZARD TYPE: LARGE MUDSLIDES

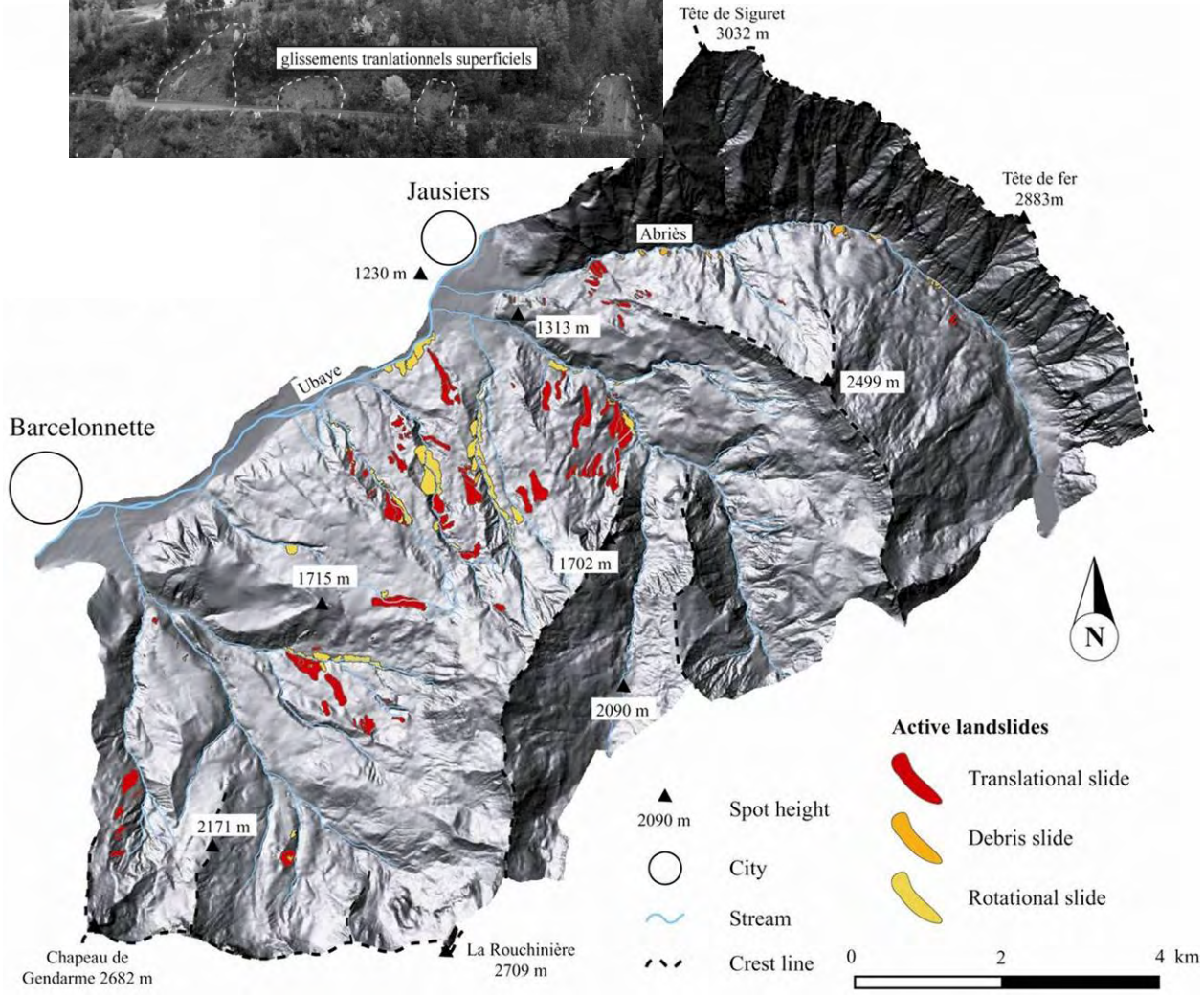
La Valette mudslide

Several ‘Slide2Flow’ risk catchments

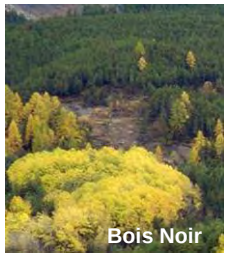
HAZARD TYPE: DEBRIS FLOWS – 26 active torrents

HAZARD TYPE: SHALLOW SLIDES





- **Translational slide**



Depth (m)	μ = 7	δ = 4.7
Length (m)	μ = 207	δ = 146.5
Width (m)	μ = 76	δ = 69
α (°)	μ = 20	δ = 7

- **Shallow translational slide**

Depth (m)	μ = 3.5	δ = 1.35
Length (m)	μ = 112	δ = 76
Width (m)	μ = 38	δ = 25
α (°)	μ = 25	δ = 8

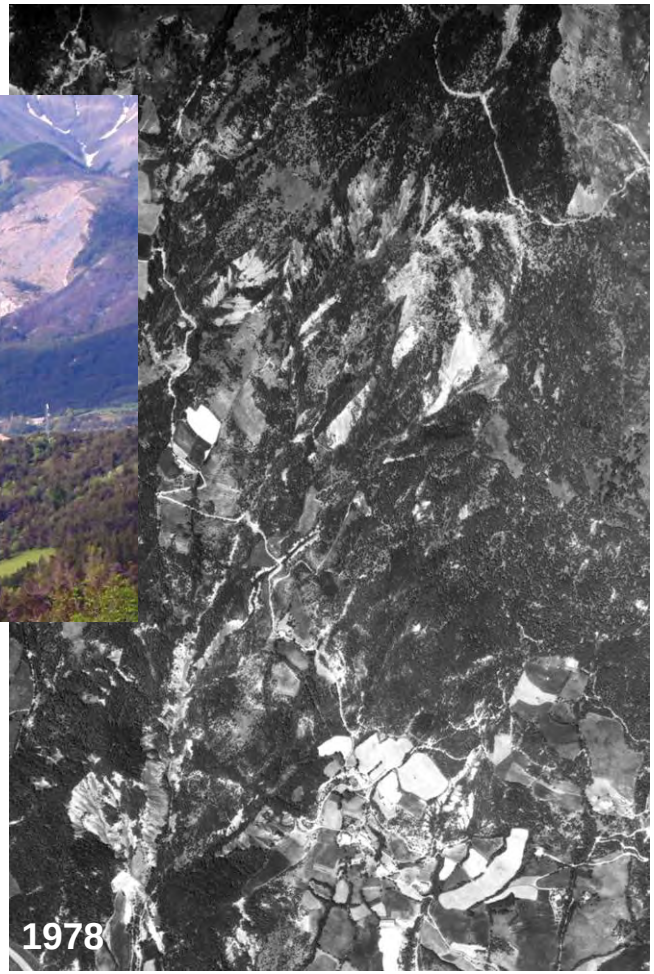
- **Rotational slide**

Depth (m)	μ = 6	δ = 2.9
Length (m)	μ = 128	δ = 116
Width (m)	μ = 146	δ = 138.5
α (°)	μ = 20.4	δ = 8.9

Tasks of RTM – ‘Restauration des Terrains en Montagne’

- **Large landslides:** setup of monitoring systems and mitigation works (drainage, etc)

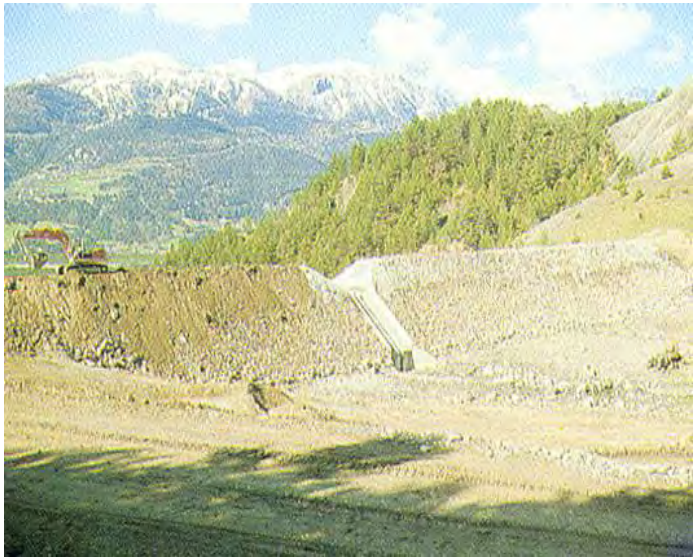
Monitoring of
La Valette mudslide



Tasks of RTM – ‘Restauration des Terrains en Montagne’

- **Large landslides:** setup of monitoring systems and mitigation works (drainage, etc)

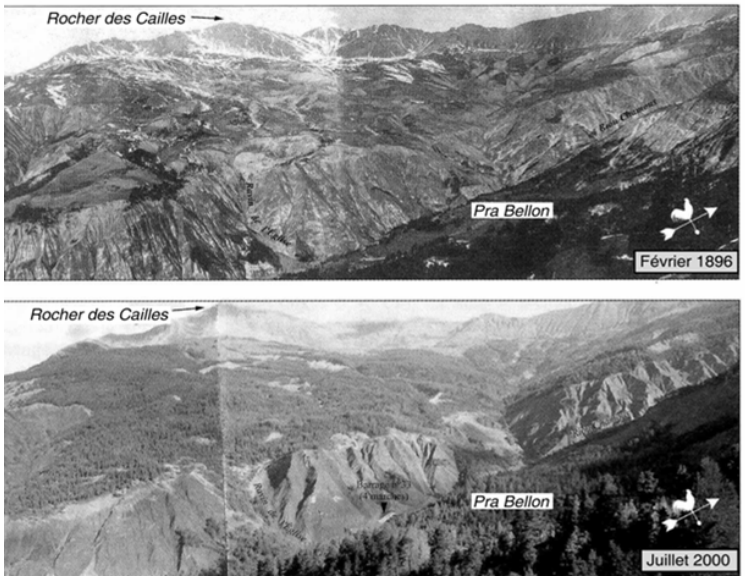
Debris flow alert system

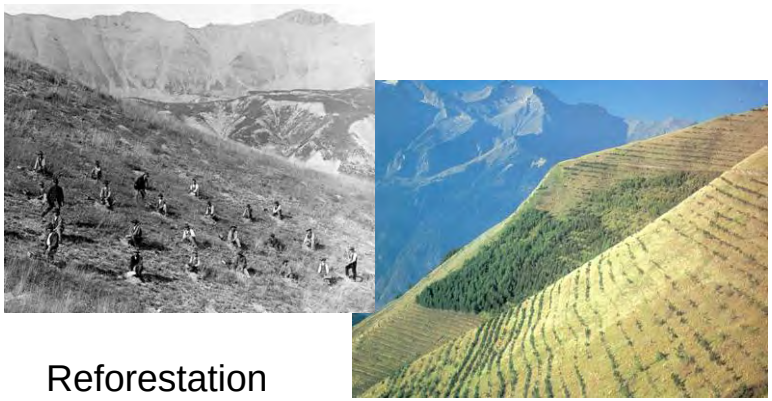


Sediment trap & storage dam

Tasks of RTM – ‘Restauration des Terrains en Montagne’

- **Debris flow activity:** Setup and maintenance of torrent check dams, eco-engineering, risk mapping





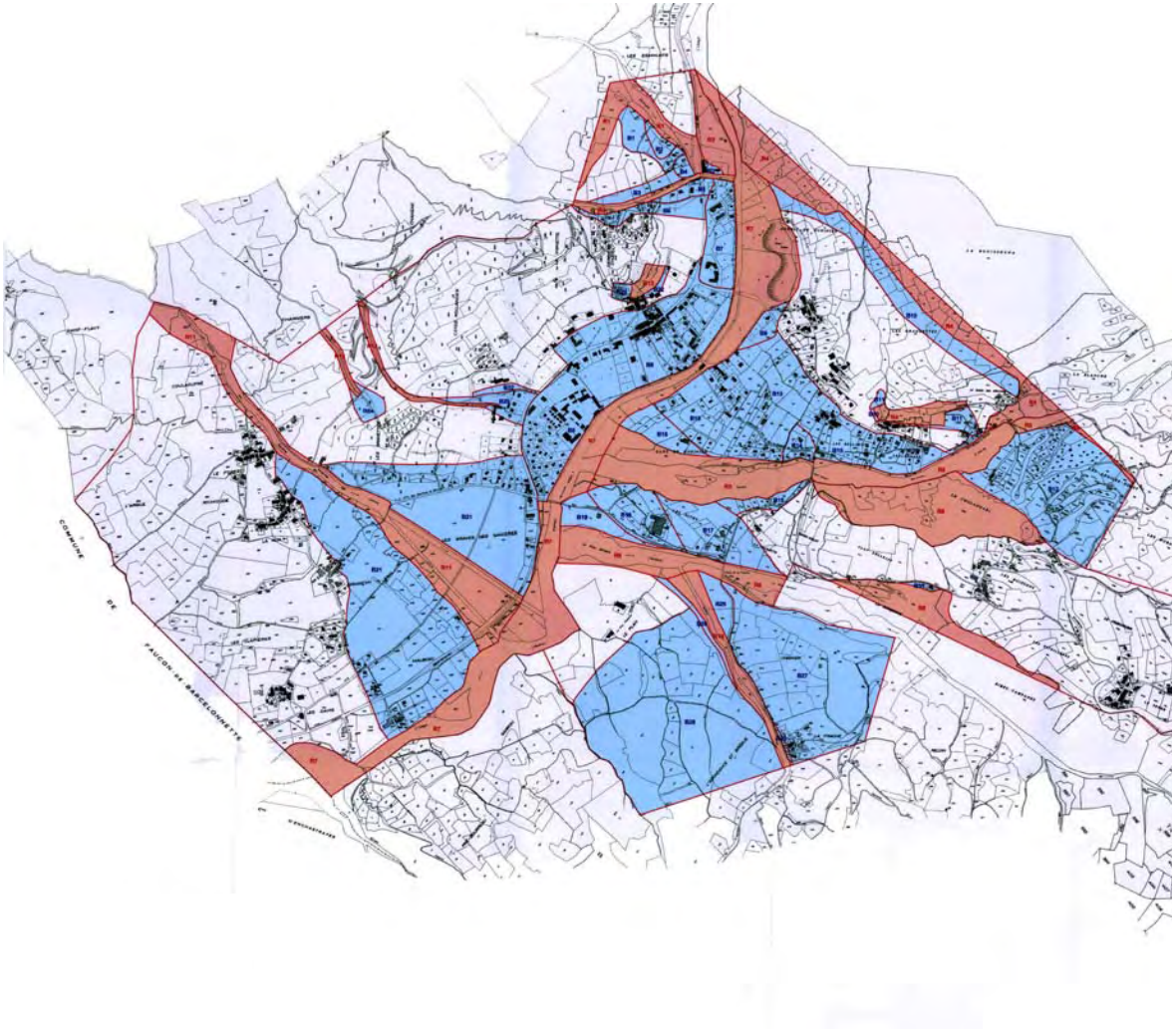
Reforestation

Torrent mitigation works

HAZARD & RISK MANAGEMENT

- **Hazard & risk mapping:** Plan de Prévention des Risques (PPR), Building authorization

Tasks of State (contracts with RTM, BRGM or private companies)



DEPARTEMENT DES ALPES DE HAUTE-PROVENCE

COMMUNE DE JAUSIERS

PLAN DE PREVENTION DES RISQUES NATURELS PREVISIBLES

	Approbation
Document initial	A.P. N° 95-449 du 17/3/95
Modification N°1	A.P. N° 97-584 du 10/3/97
Modification N°2	Présent document

CARTE DE ZONAGE

Contour de la zone faisant l'objet du P.P.R.

Zonage

zone bleue

zone rouge

NOVEMBRE 2000

Echelle 1/5000

SERVICE INSTRUCTEUR ET REALISATION DE L'ETUDE

MINISTERE DE L'AGRICULTURE
DIRECTION DEPARTEMENTALE DE L'AGRICULTURE ET DE LA FORET

OFFICE NATIONAL DES FORETS
DIRECTION REGIONALE PROVENCE ALPES-COTE D'AZUR

rtm

SERVICE DEPARTEMENTAL DE RESTAURATION DES TERRAINS EN MONTAGNE DES ALPES DE HAUTE-PROVENCE