

Inventorying rock glaciers in the Central and Eastern Italian Alps

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BiGeA - University of Bologna



Buco del Cacciatore rock glacier – Italian Alps, Lombardy region

Preparatory workshop IPA Action group “Rock glaciers inventory and kinematics”

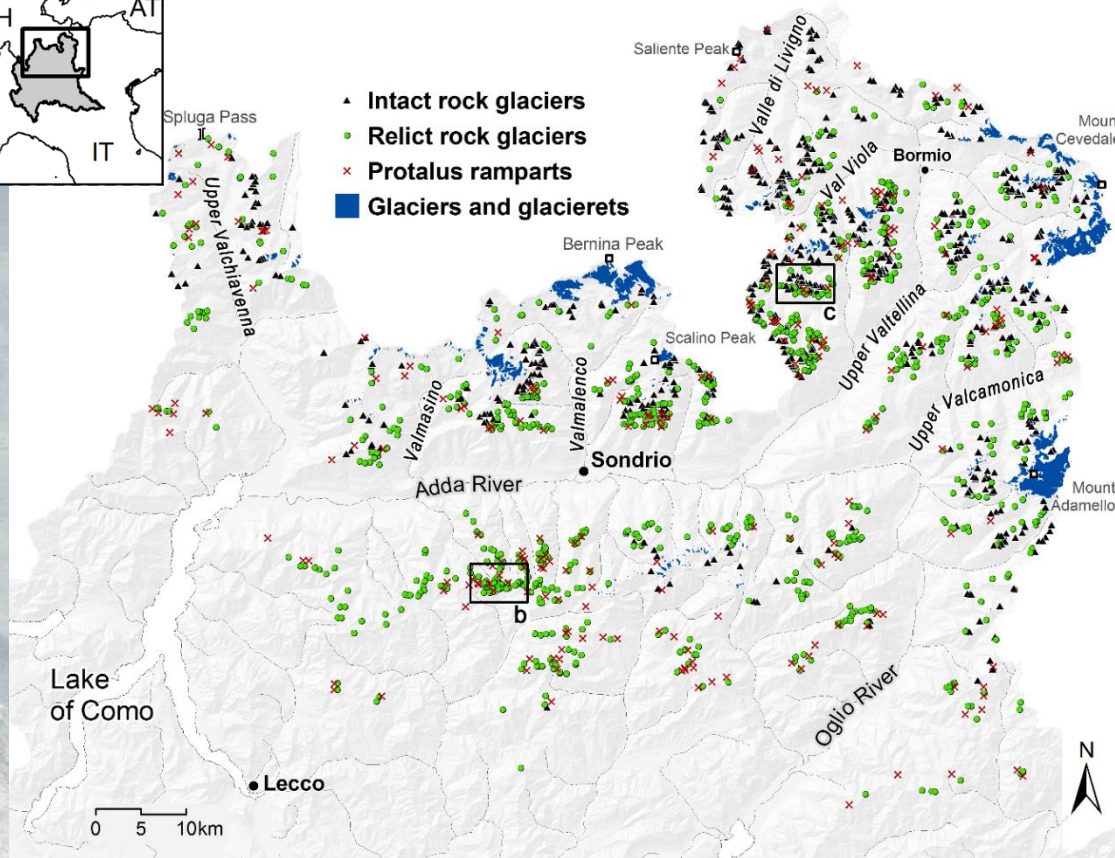
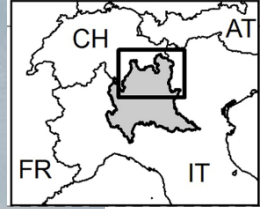
Laboratoire EDYTEM, Le Bourget-du-Lac, France, 20 March 2019

Rock glacier inventory of Lombardy region - Italy

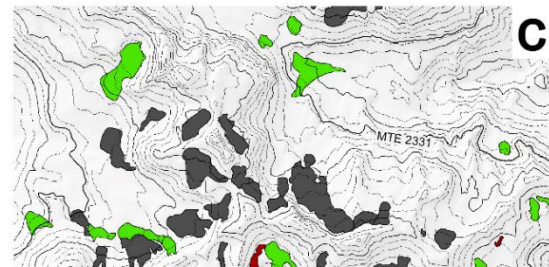
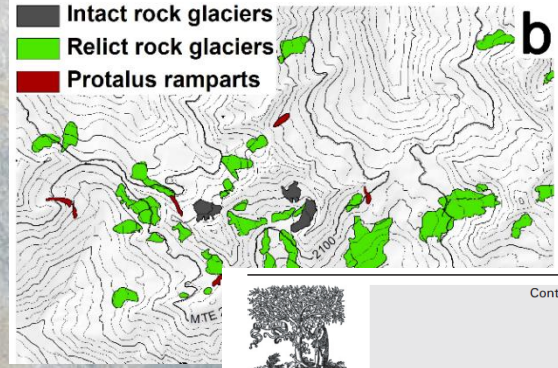
Year 2012

(inventory revised in 2018)

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Plator rock glacier, 2015



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Geomorphology

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A regional inventory of rock glaciers and protalus ramparts in the central Italian Alps
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Rock glacier inventory of Lombardy region - Italy

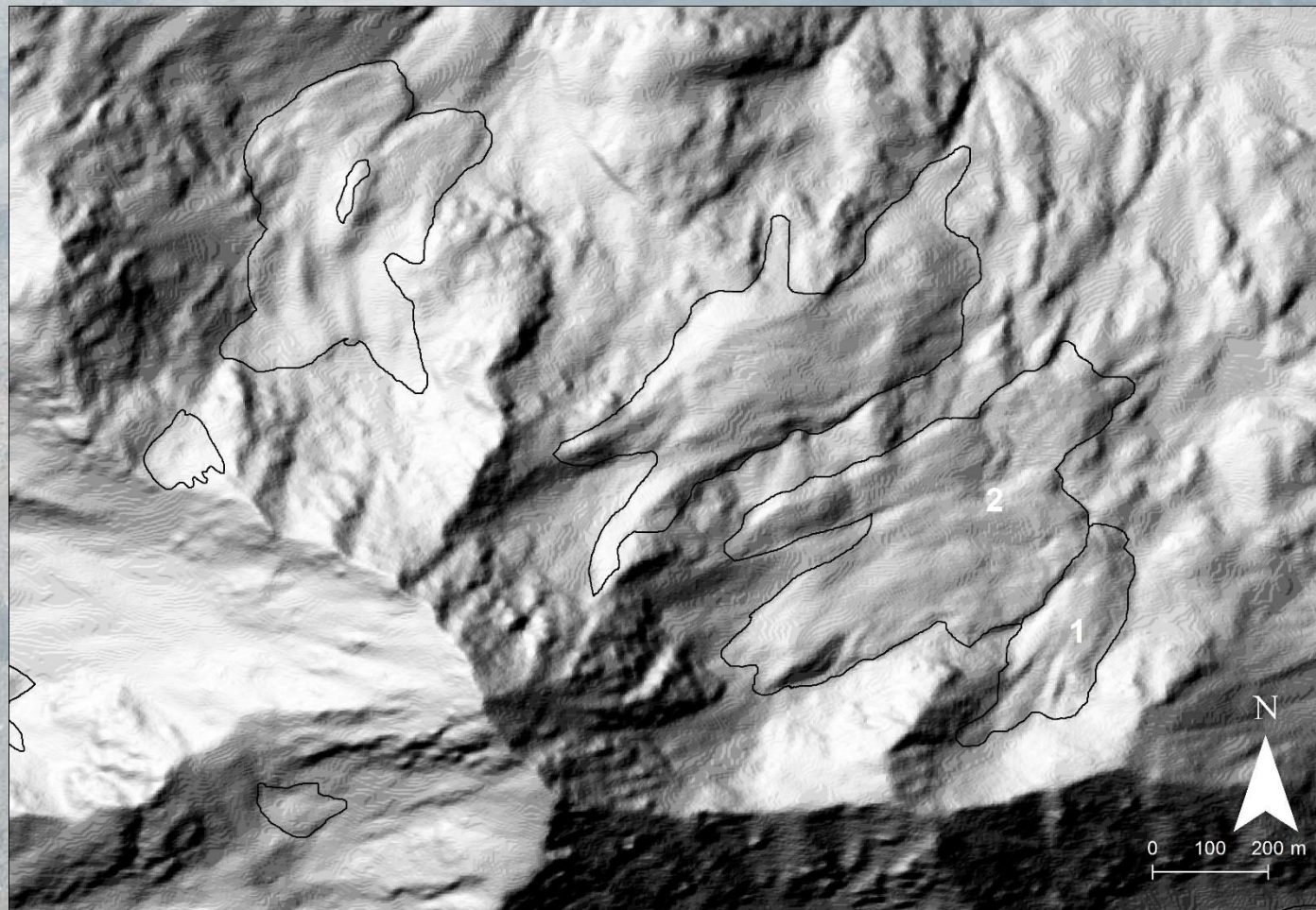
DATA COLLECTION

- 1/0.2-m pixel digital aerial photos (orthophotos) (1988, 1997, 2000, 2003, 2007, 2012 and 2015)
- 2-m DSM (Digital Surface Model)
- Confirmatory field surveys

Pizzo Filone (Livigno)
rock glaciers



DSM hillshade



Rock glacier inventory of Lombardy region - Italy

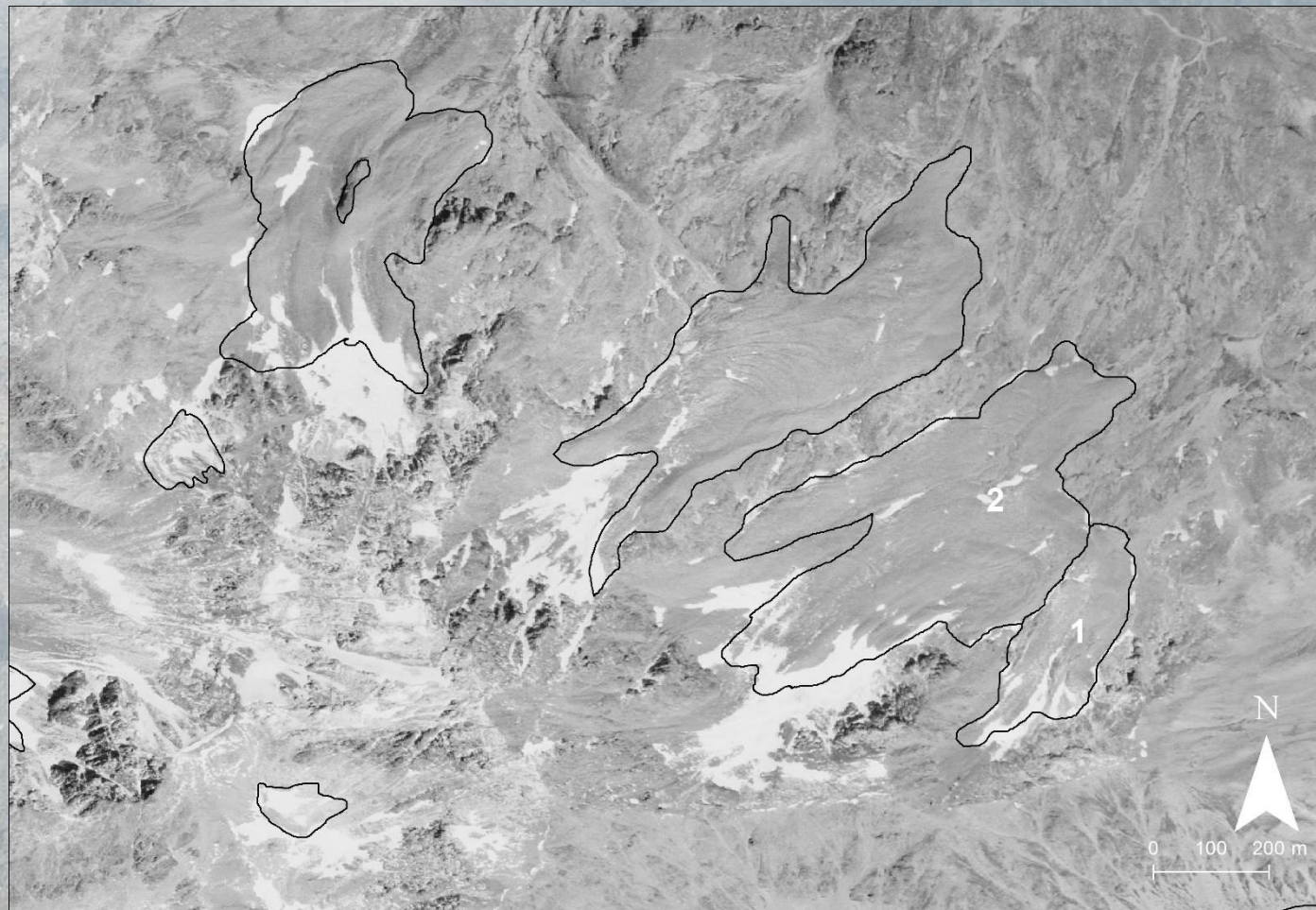
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Pizzo Filone (Livigno)
rock glaciers



1988



Rock glacier inventory of Lombardy region - Italy

DATA COLLECTION

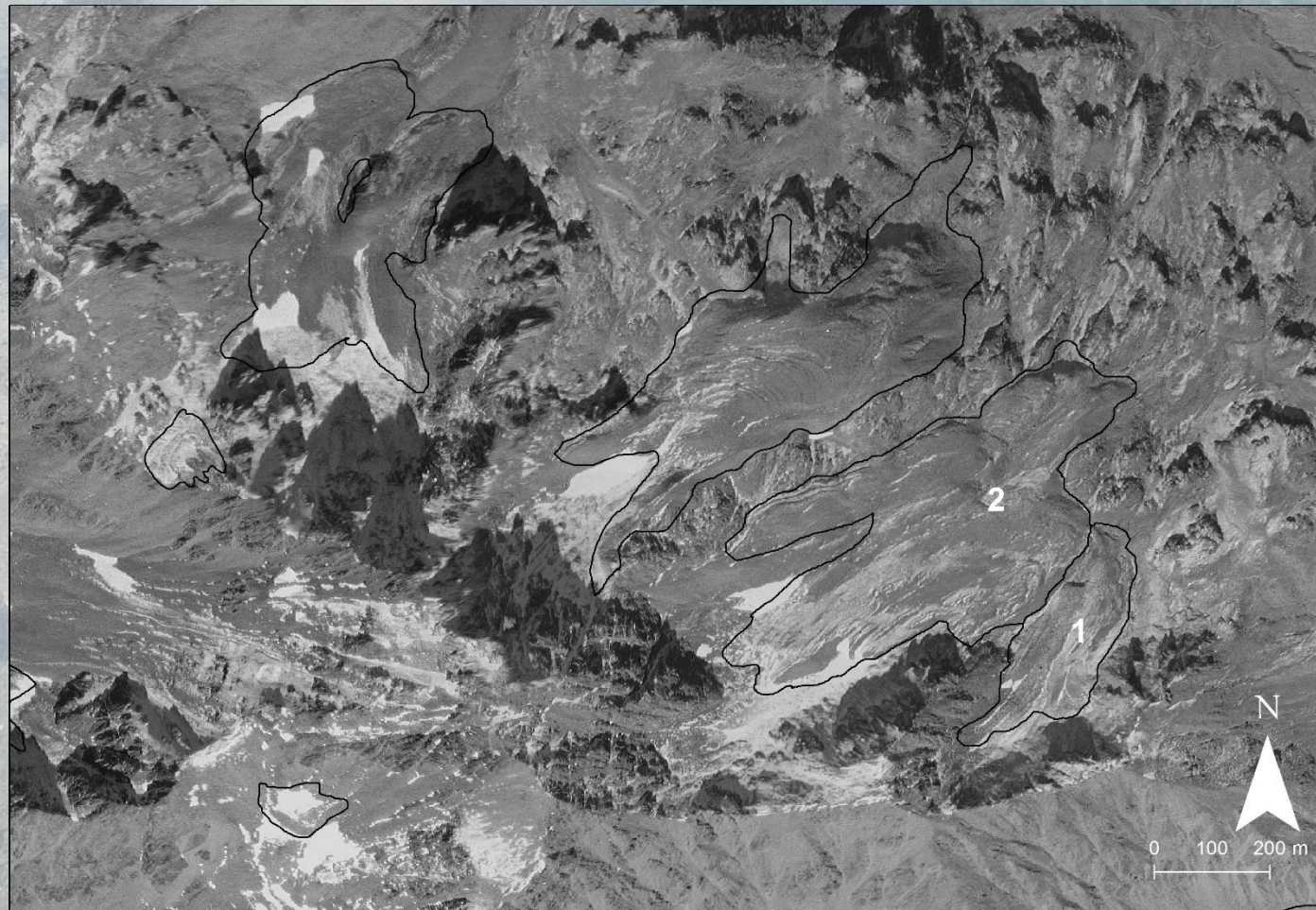
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Pizzo Filone (Livigno)
rock glaciers



1988

1997



Rock glacier inventory of Lombardy region - Italy

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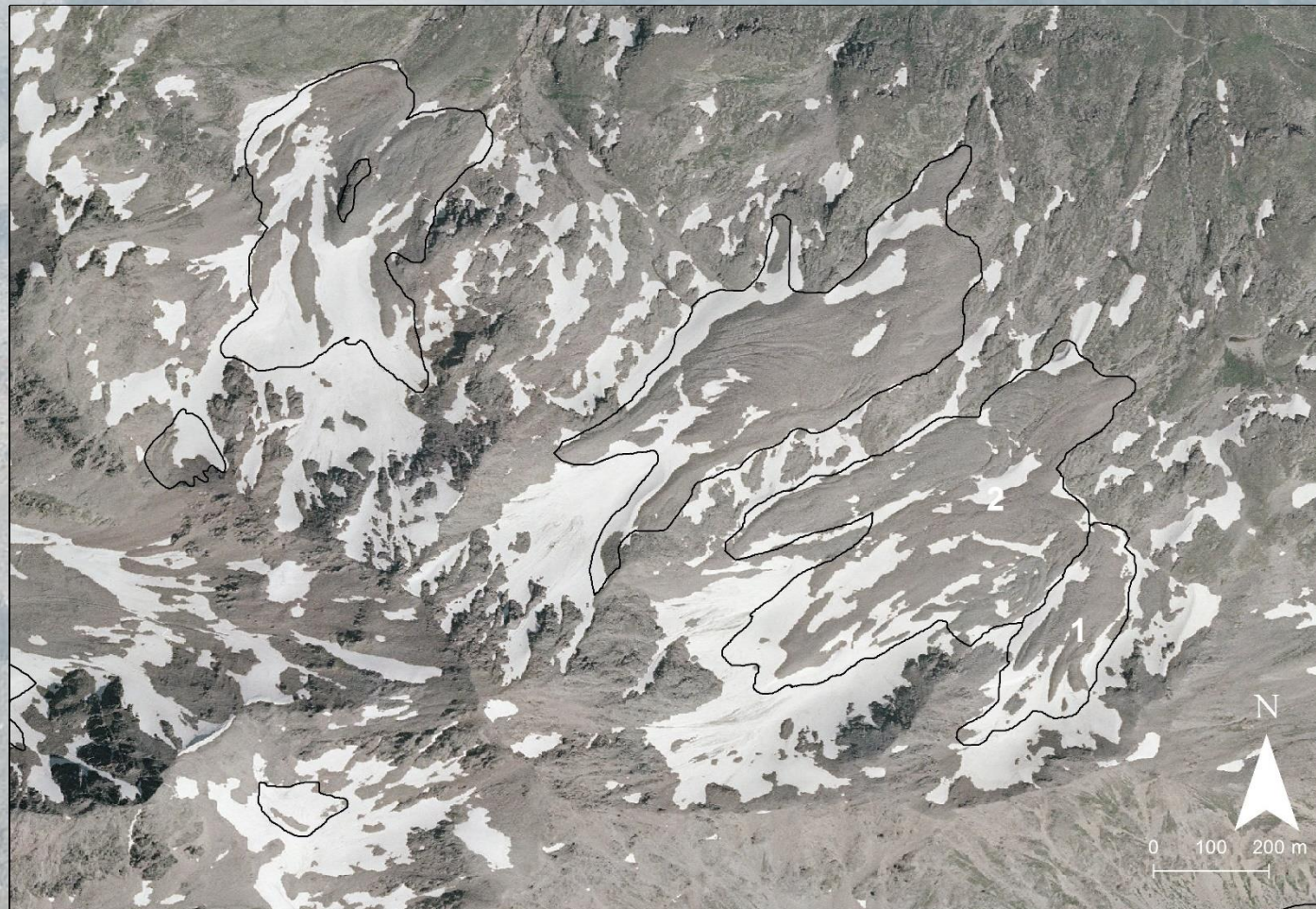
Pizzo Filone (Livigno)
rock glaciers



1988

1997

2000



Rock glacier inventory of Lombardy region - Italy

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Pizzo Filone (Livigno)
rock glaciers

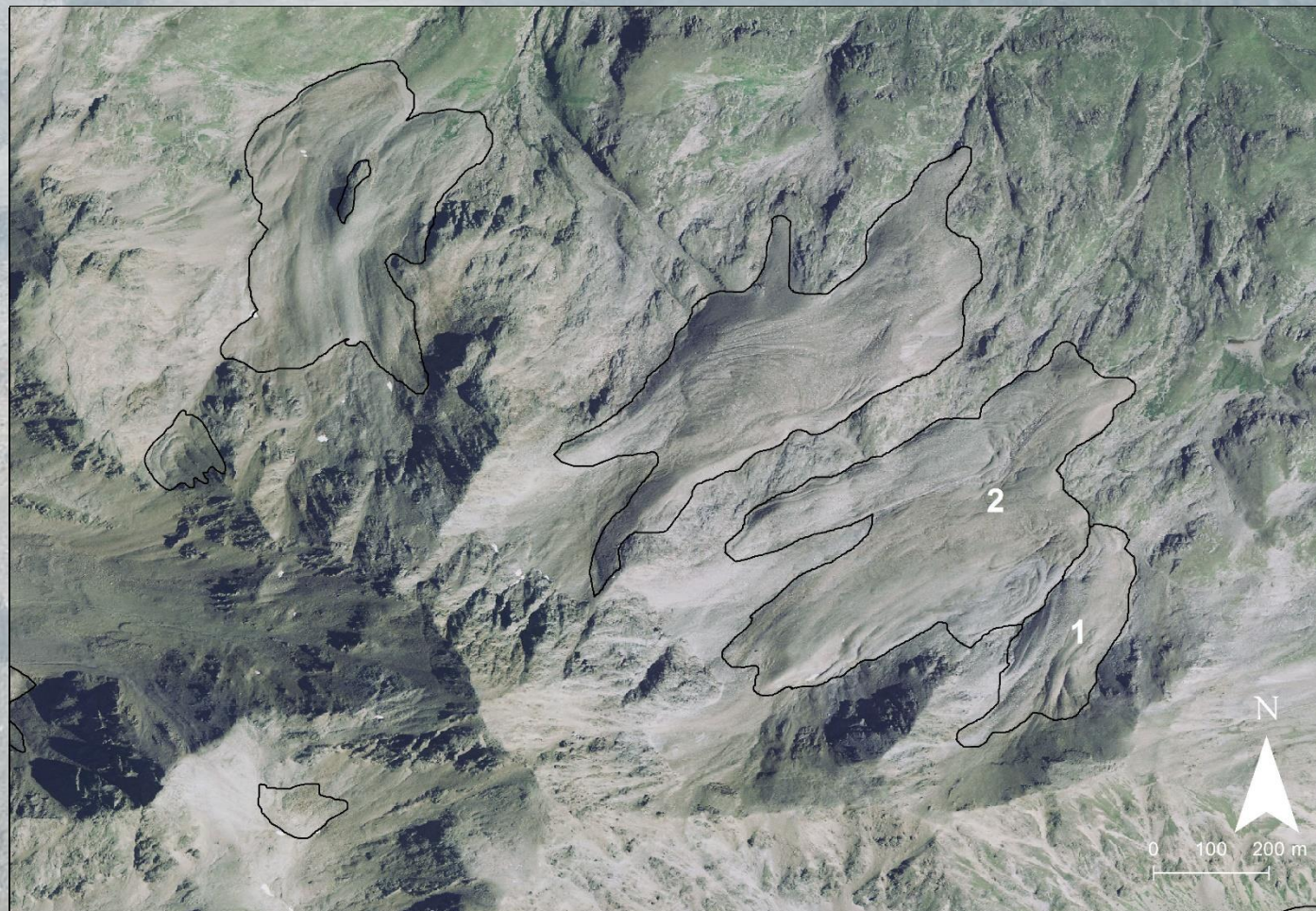


1988

1997

2000

2007



Rock glacier inventory of Lombardy region - Italy

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Pizzo Filone (Livigno)
rock glaciers



1988

1997

2000

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Rock glacier inventory of Lombardy region - Italy

DATA COLLECTION

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- Confirmatory field surveys

Pizzo Filone (Livigno)
rock glaciers



1988

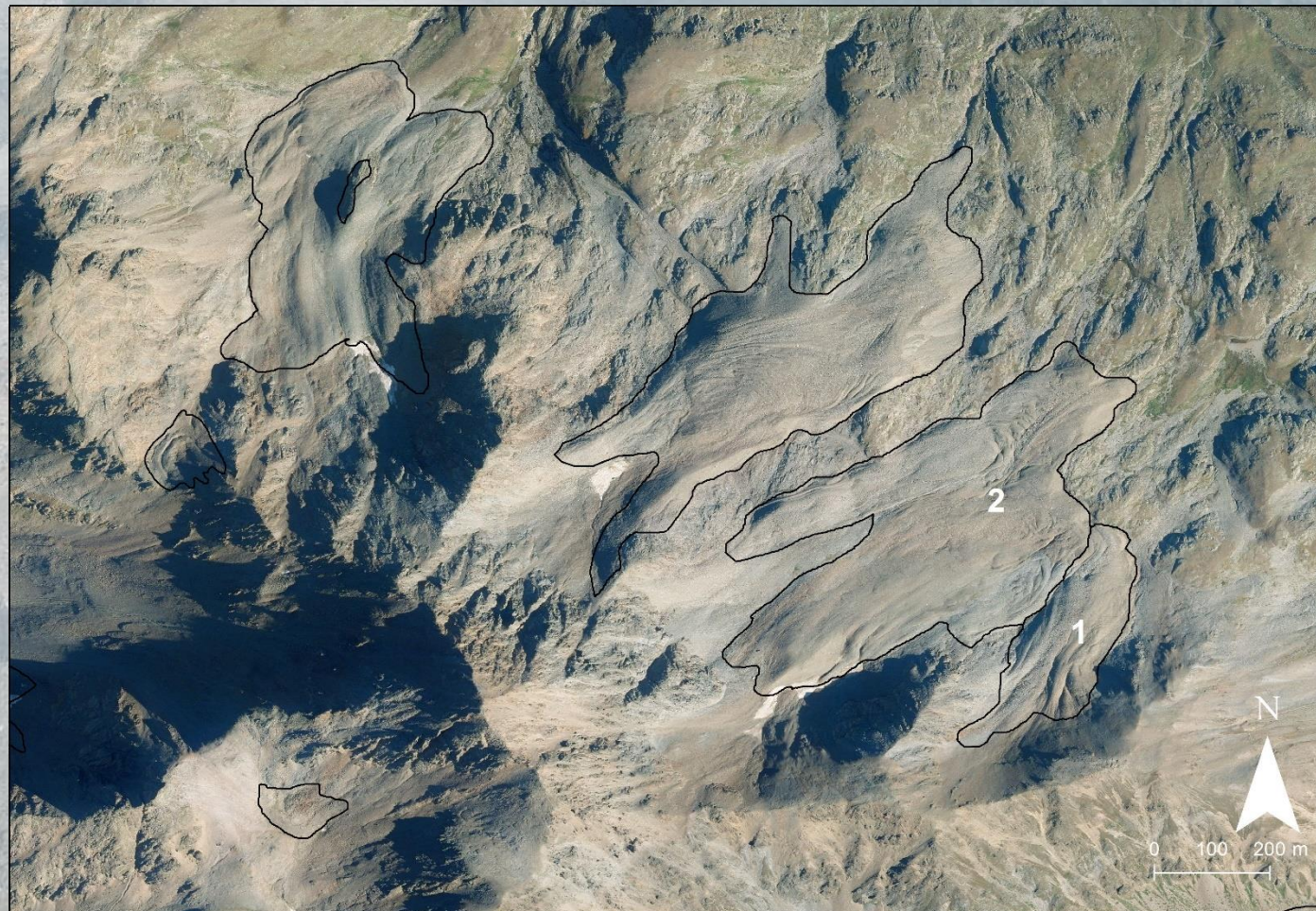
1997

2000

2007

2012

2015



Rock glacier inventory of Lombardy region - Italy

DATA COLLECTION

visual evidence of rock glacier movement
from multitemporal orthophotos analysis

Pizzo Filone (Livigno)
rock glaciers



1988

1997

2000

2007



Rock glacier inventory of Lombardy region - Italy

DATA COLLECTION

visual evidence of rock glacier movement
from multitemporal orthophotos analysis

Pizzo Filone (Livigno)
rock glaciers



1988

1997

2000

2007

2012

2015



Rock glacier inventory of Lombardy region - Italy

MAIN ATTRIBUTES

Landform attributes

- Surface area
- Elevation
- Slope aspect
- Slope gradient
- Vegetation at the front
- Upstream presence of glaciers
- Dominant litology
- Degree of uncertainty*

Genetic and geometric classification

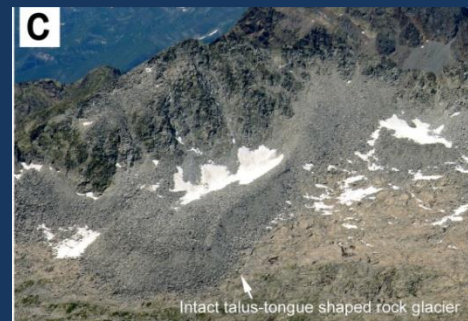
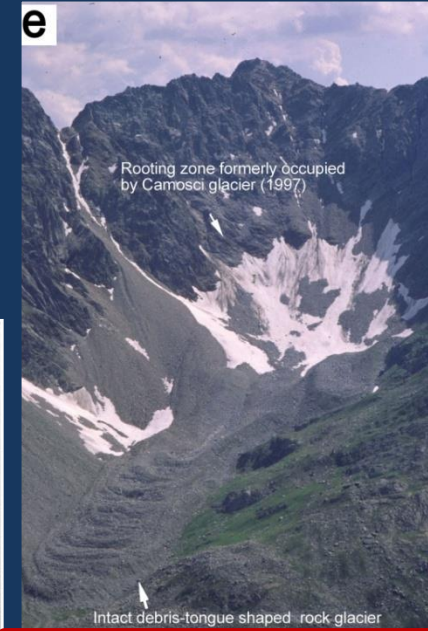
- talus-lobate
- talus-tongue shaped
- debris-lobate
- debris-tongue shaped
- protalus rampart*

Dynamic classification

Active/inactive (intact)

Relict

- Degree of uncertainty*



Rock glacier inventory of Lombardy region – Italy (revised 2018)

Landform type	Intact	Relict	Total	
Talus	509	685	1194	86%
Debris	134	61	195	14%
Total rock glaciers	643	746	1389	
	46%	54%		
Protalus Ramparts			228	

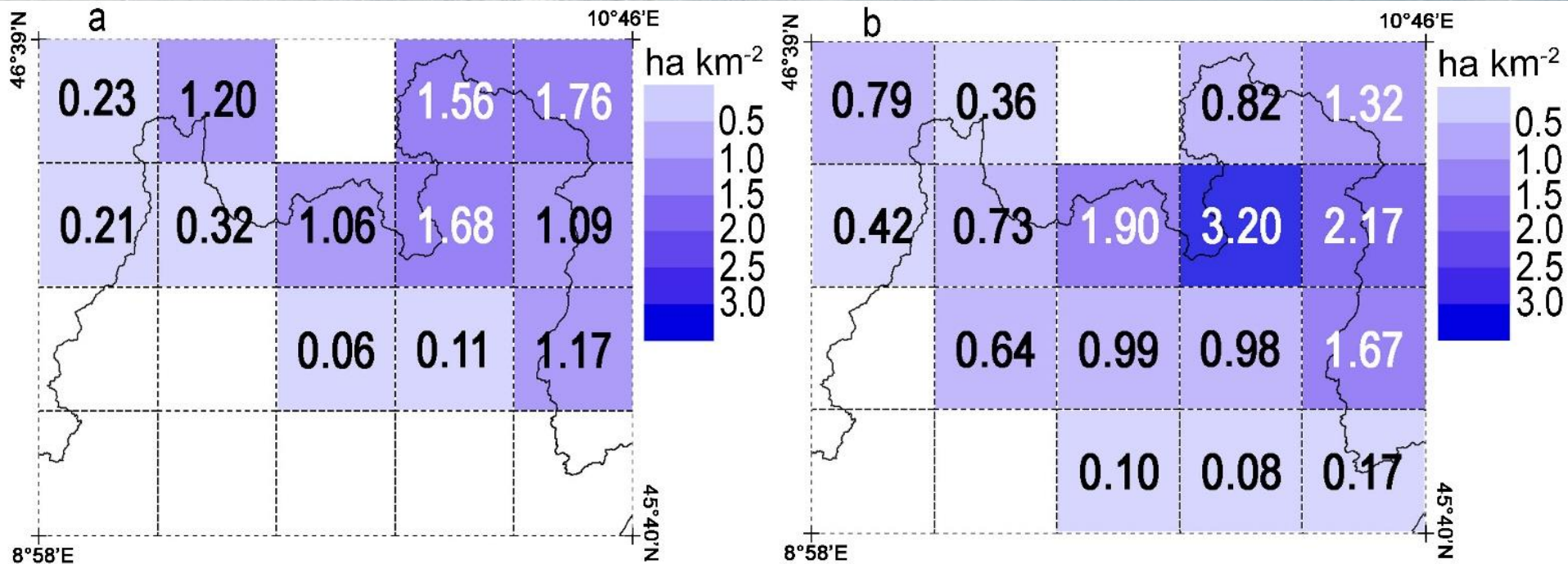
Total rock glacier area 68 km²

REGIONAL VARIABILITY: SPECIFIC ROCK GLACIER AREA

Intact

Relict

Scotti et al., 2013

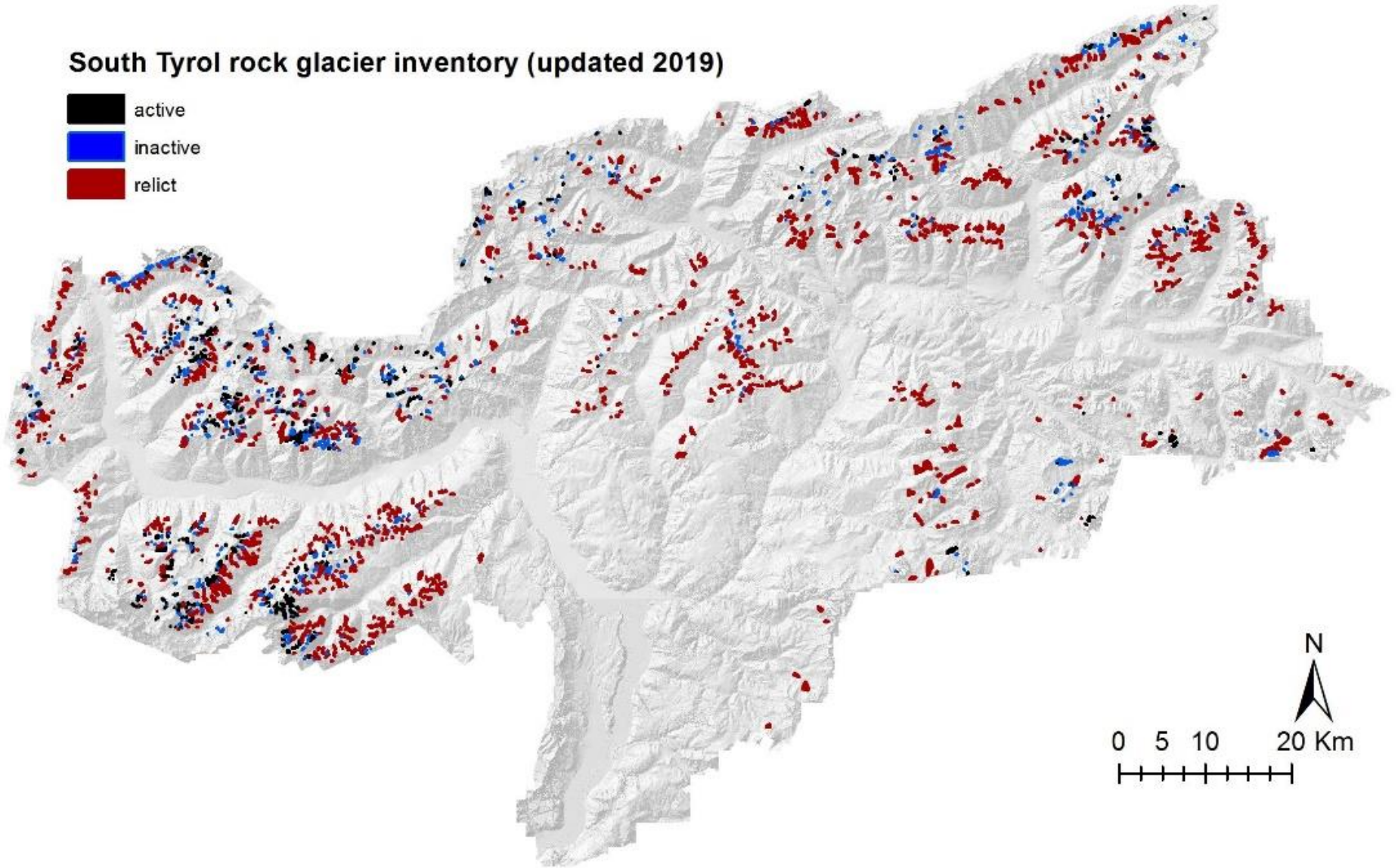
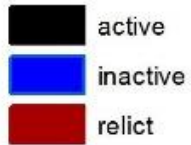


South Tyrol rock glacier inventory (revised in 2019) *preliminary results*

R. Scotti; F. Brardinoni; V. Mair

BiGeA - University of Bologna & Autonomous Province of Bolzano

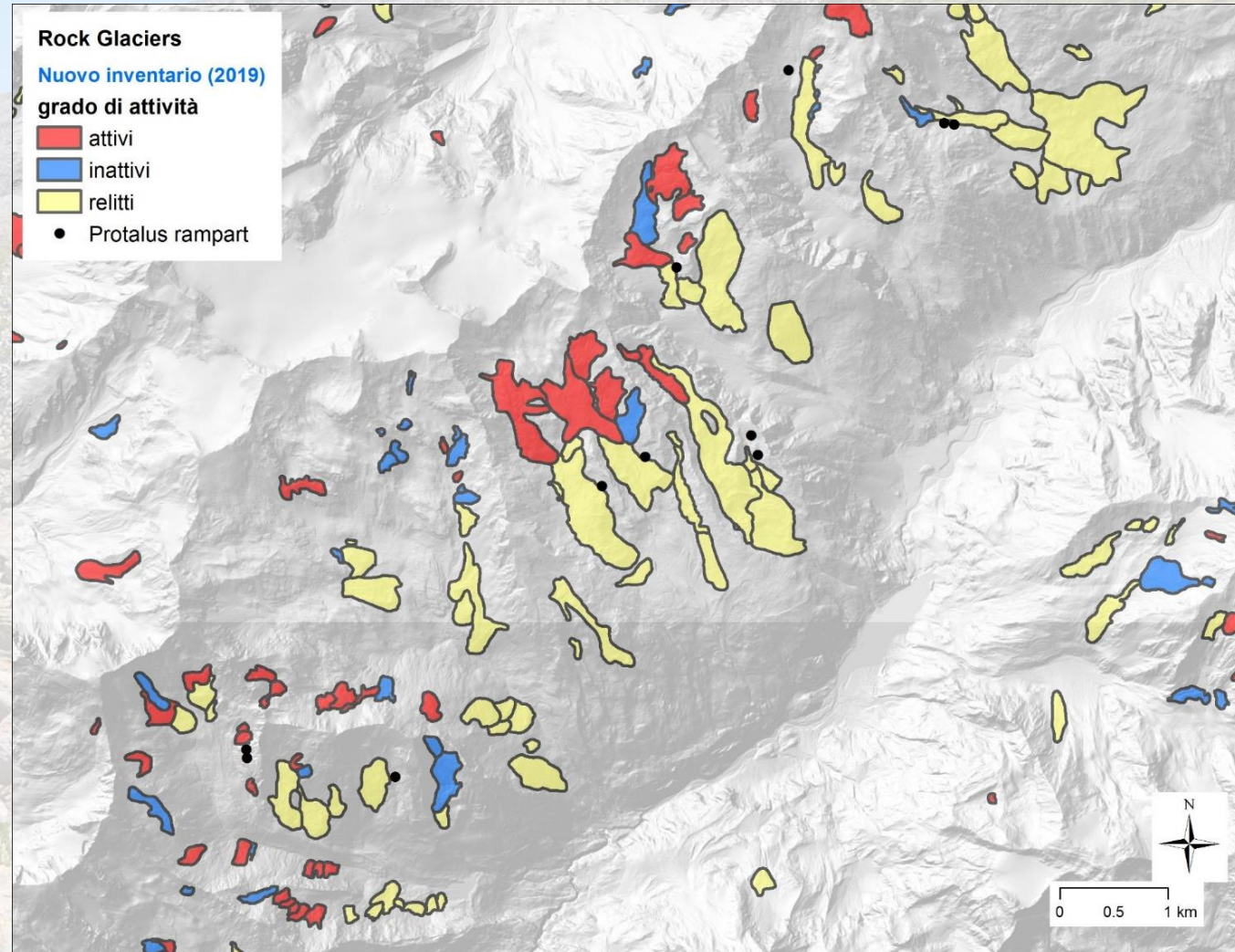
South Tyrol rock glacier inventory (updated 2019)



South Tyrol rock glacier inventory (revised in 2019)

DATA COLLECTION

- 0.5/0.2-m pixel digital aerial photos (orthophotos) (2008, 2014 and 2015)
- 2.5-m DEM (Digital Elevation Model)
- Confirmatory field surveys



South Tyrol rock glacier inventory (revised 2019)

MAIN ATTRIBUTES

Landform attributes

- Surface area
- Elevation
- Slope aspect
- Slope gradient
- Vegetation at the front
- Dominant litology

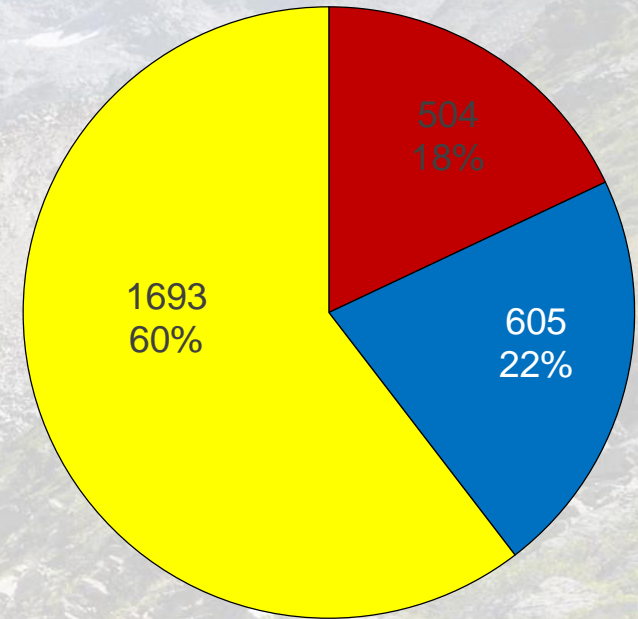
Genetic and geometric classification

- talus-lobate
- talus-tongue shaped
- debris-lobate
- debris-tongue shaped
- protalus rampart*

Dynamic classification

- Active
- Inactive
- Relict

Degree of uncertainty



■ Active ■ Inactive ■ Relict

Total rock glacier number
2802

Total rock glacier area
147 km²