

Multitemporal glaciers inventory of the Italian Alps, a basic tool for reconstructing the ongoing climate change

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WP 1.6: Risorse criosferiche montane

- *Task 1*

Monitoring and quantitative inventory of Alpine glaciers
quantitative and geo-referenced data on glaciers' areal variation, mass balances, changes in the Equilibrium Line Altitude; collection of iconographic and photographic/ photogrammetric material.

The task is performed in collaboration with the Italian Glaciological Committee.



Glaciers della Lobbia (to the left) and Adamello/Mandrone (to the right)
Adamello Group



Foto: Archivio Storico - Biblioteca della Montagna SAT

1903

Glaciers della Lobbia (to the left) and' Adamello/Mandrone (to the right)
Adamello Group



Foto: G. Alberti CGT

2005

1925

"Porro" Inventory 1925-1927

774 glaciers
in 4 sheets at the scale of 1:500.000

773 Glaciers on the Alps
1 Glacier on the Apennines (Calderone)



1927



Atlas of the Italian Glaciers; Porro and Labus, 1927
<http://www.glaciologia.it/publicazioni/?lang=en>



On the occasion of the **International Geophysical Year in 1957-1958**, CGI surveyed a new inventory, published in four volumes (CGI-CNR, 1959; 1962).

The CGI-CNR inventory includes

- 837 (822) glaciers, which existed at the end of the 1950s;
- >190 glaciers that disappeared from the previous inventory are also reported.

- In total 1027 entries were documented (<http://www.glaciologia.it/ghiacciai.html>).

CGI-CNR 1959-1962, *Catasto dei Ghiacciai Italiani*. Comitato Glaciologico Italiano, Torino, v. 1-4



805/822 (837) Glacial bodies
at the end of the '50s of the 19th Century

+ > **190** extinct glaciers (in the previous 50 yrs)

1959-1962



CGI-CNR 1959-1962, *Catasto dei Ghiacciai Italiani*. Comitato Glaciologico Italiano, Torino, v. 1-4



837 (805-822) Glacial bodies
at the end of the '50s of the 19° Century

+ > **190** extinct glaciers (in the previous 50 yrs)

(for a total of 1028 entries)

covering a total extension of **ca 527 km²**

1959-1962

In the volumes, glaciers of the Italian Alps are grouped in three main sectors:

- 322 glaciers are hosted in the Western Alps (Piemonte)
- 185 glaciers in Central Alps (Lombardia)
- 330 glaciers in the Eastern Alps (Tre Venezie)
- 1 glacier in the Apennines (Calderone, Gran Sasso Massif)



Comitato
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Italiano



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Italiano

Mappa Satellite

Ubicazione dei ghiacciai italiani

dati tratti dal Catasto dei ghiacciai italiani
CGI-CNR, 1959-1962

Location map of the italian glaciers

data from the Inventory of
Italian Glaciers, CGI-CNR, 1959-1962



<http://www.glaciologia.it/ghiacciai.html>

Google

SISC NextData - Venezia, 17-18 ottobre 2018

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World Glacier Inventory (WGI 1981 (1975) - 1984)

Data collected by the CGI also contributed to the World Glacier Inventory (WGI 1981-84), in which are reported:

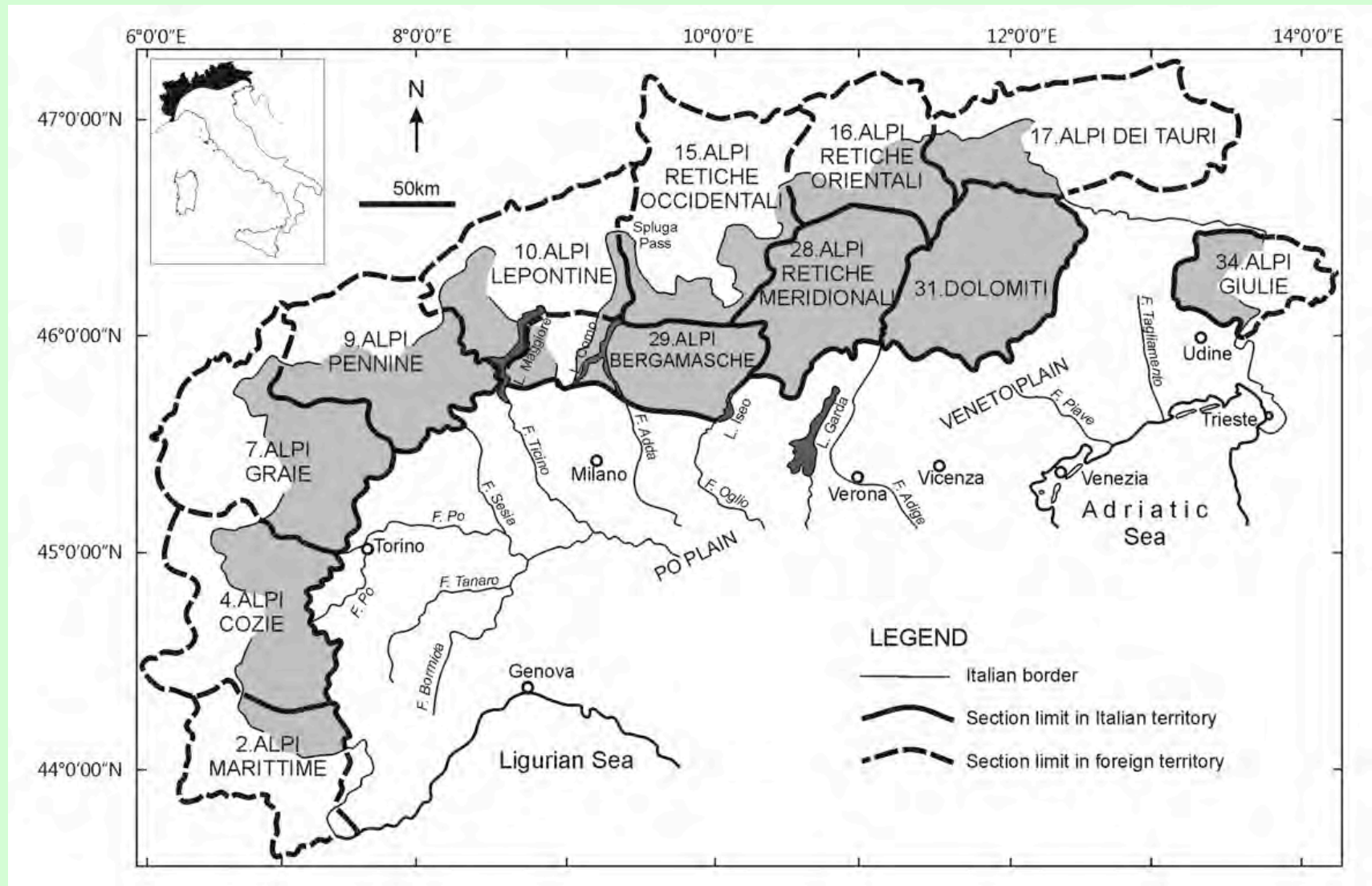
1397 glaciers of the Italian Alps, covering a total extension of **608 km²**

- 531 in Western Alps (322 in 1959-62)
- 305 in Central Alps (185 in 1959-62)
- 560 in Eastern Alps (330 in 1959-62)

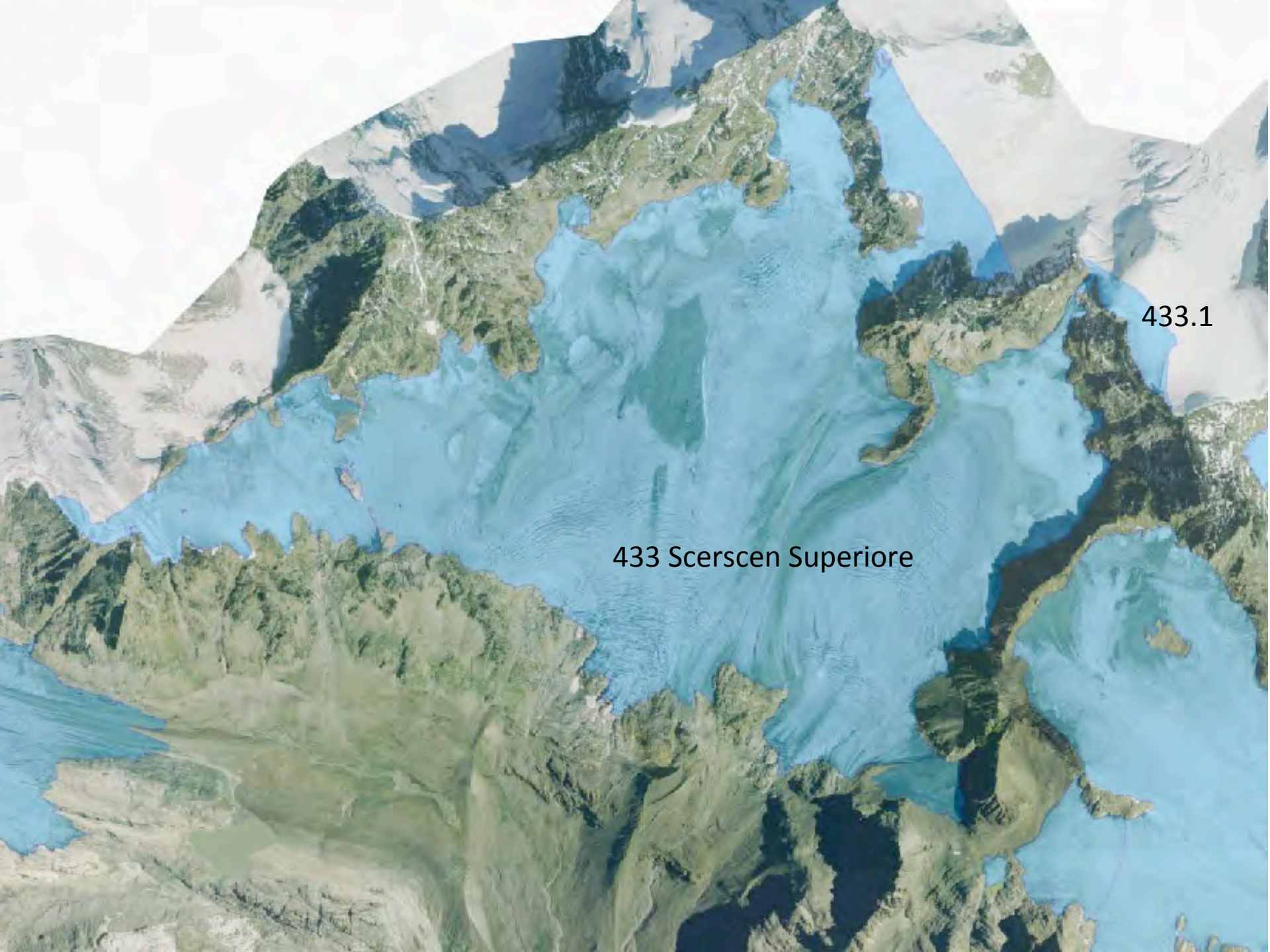
world glacier monitoring service

World Glacier Inventory (WGI 1981-84) –

<http://map.ngdc.noaa.gov/website/nsidc/glacier/viewer.htm>



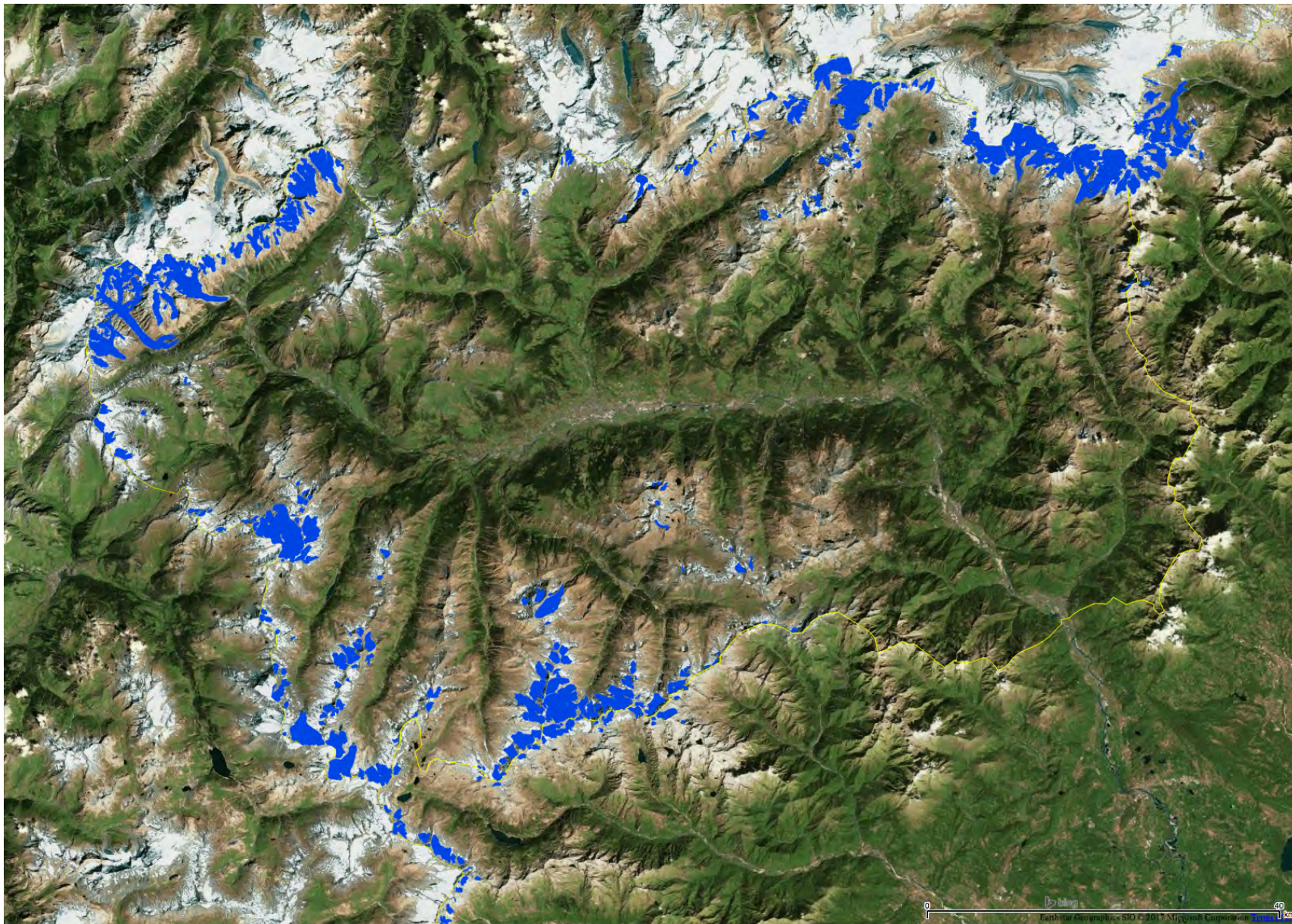
International Standardized Mountain Subdivision of the Alps (ISMSA) - section level.



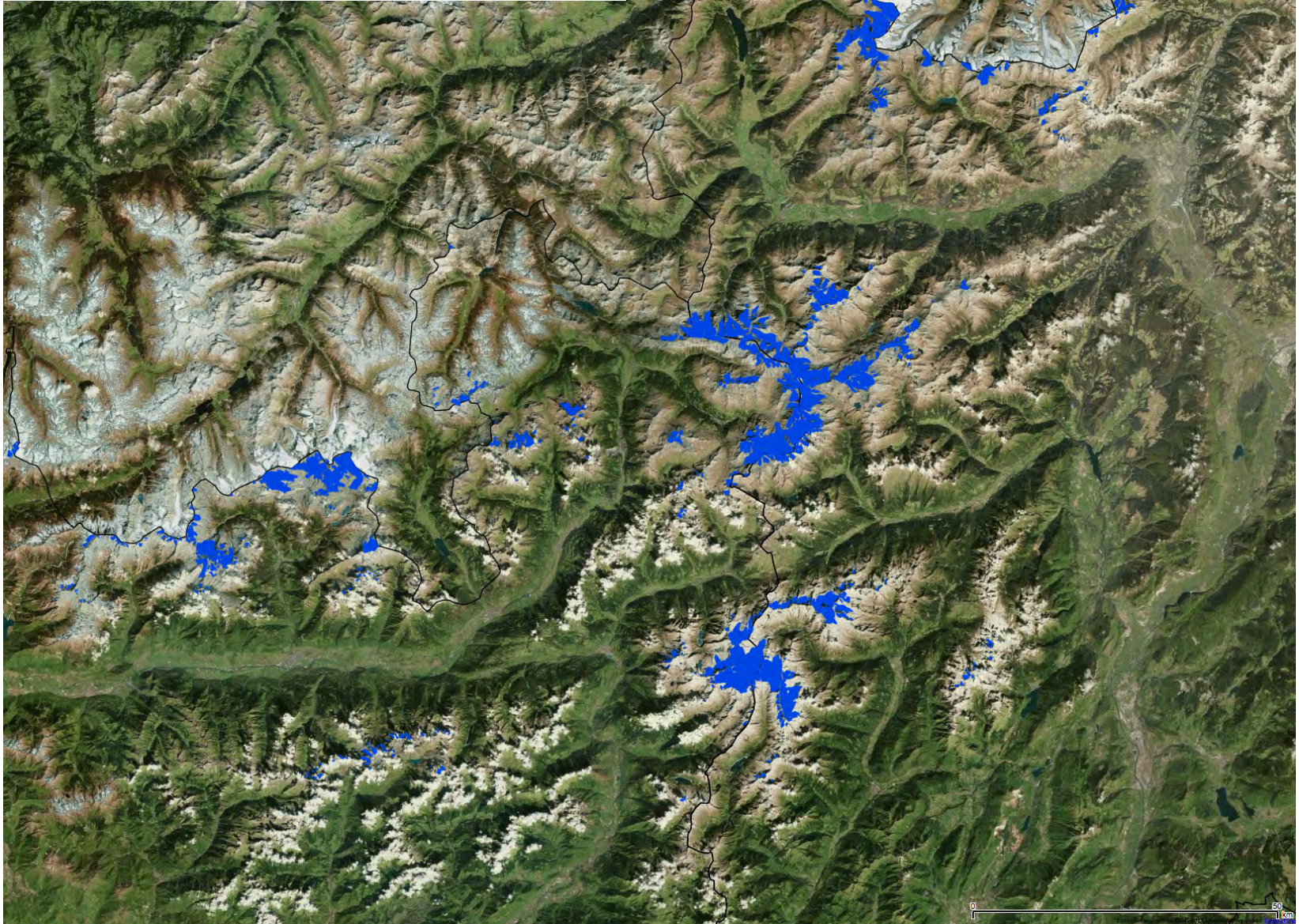
433 Scerscen Superiore

433.1

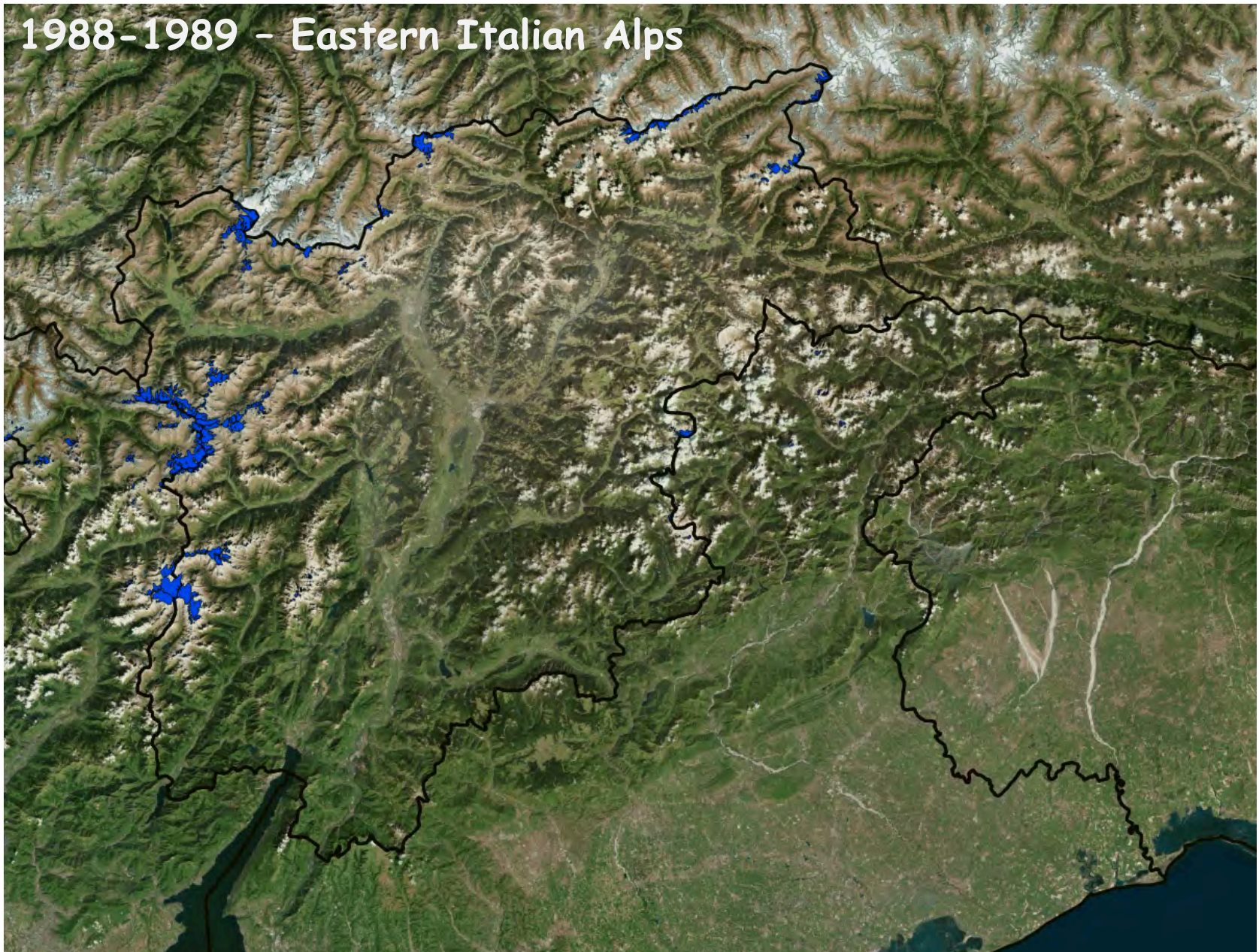
1988-1989 - Western Italian Alps



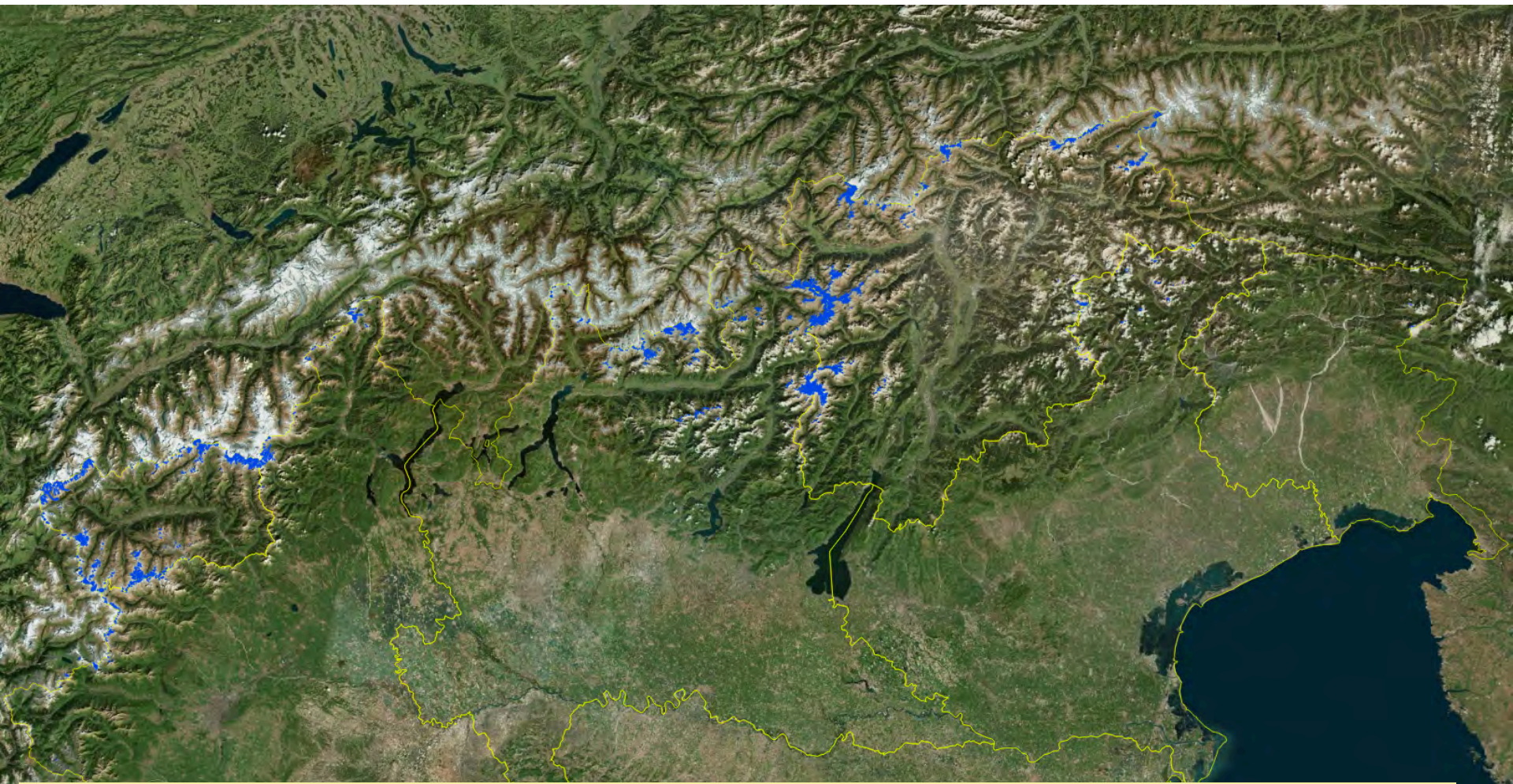
1988-1989 - Central Italian Alps



1988-1989 - Eastern Italian Alps



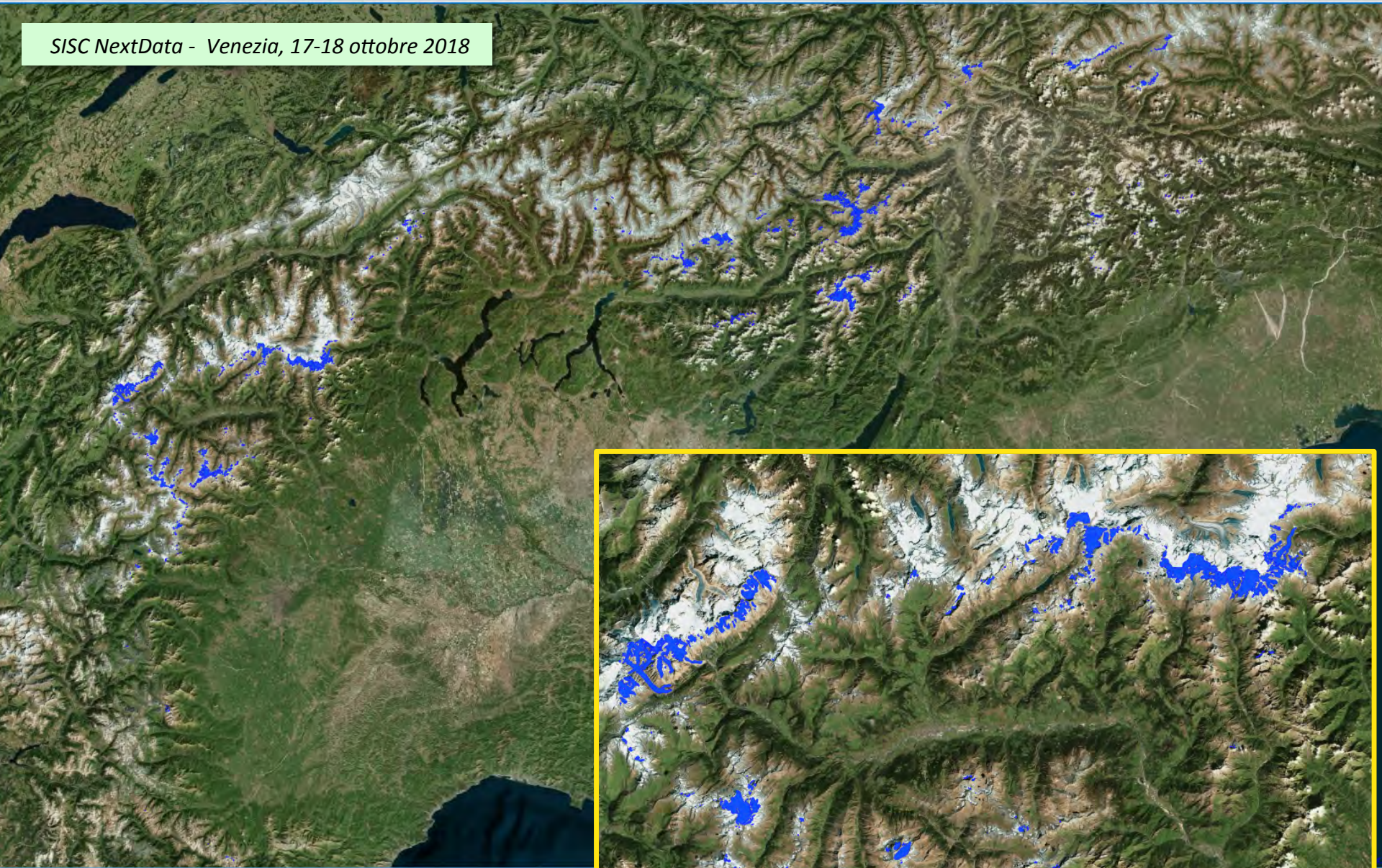
MOUNTAIN GLACIERS DATABASE: 2006-07.



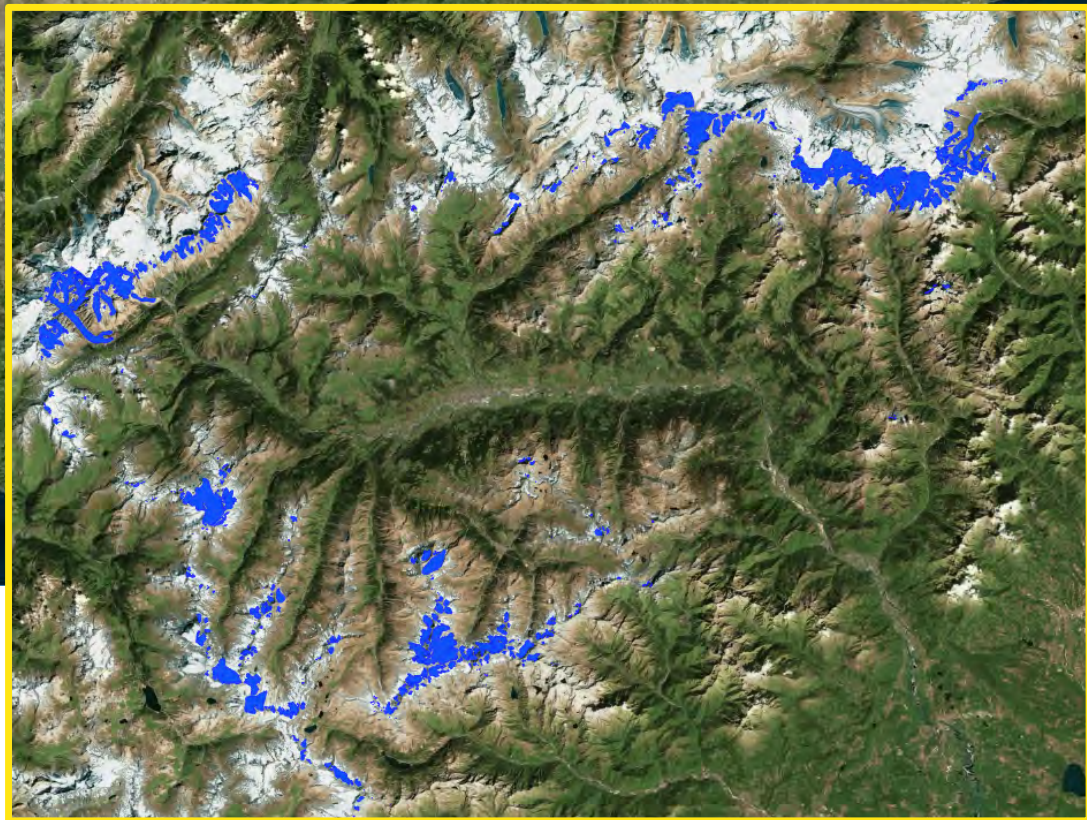
Salvatore M.C., Zanoner T., Baroni C., Carton A., Banchieri F.A., Viani C., Giardino M. & Perotti I., 2015
- *The state of Italian glaciers: a snapshot of the 2006-2007 hydrological period*. *Geografia Fisica e Dinamica Quaternaria*, 38(2), 175-198 https://gfdq.glaciologia.it/038_2_07_2015

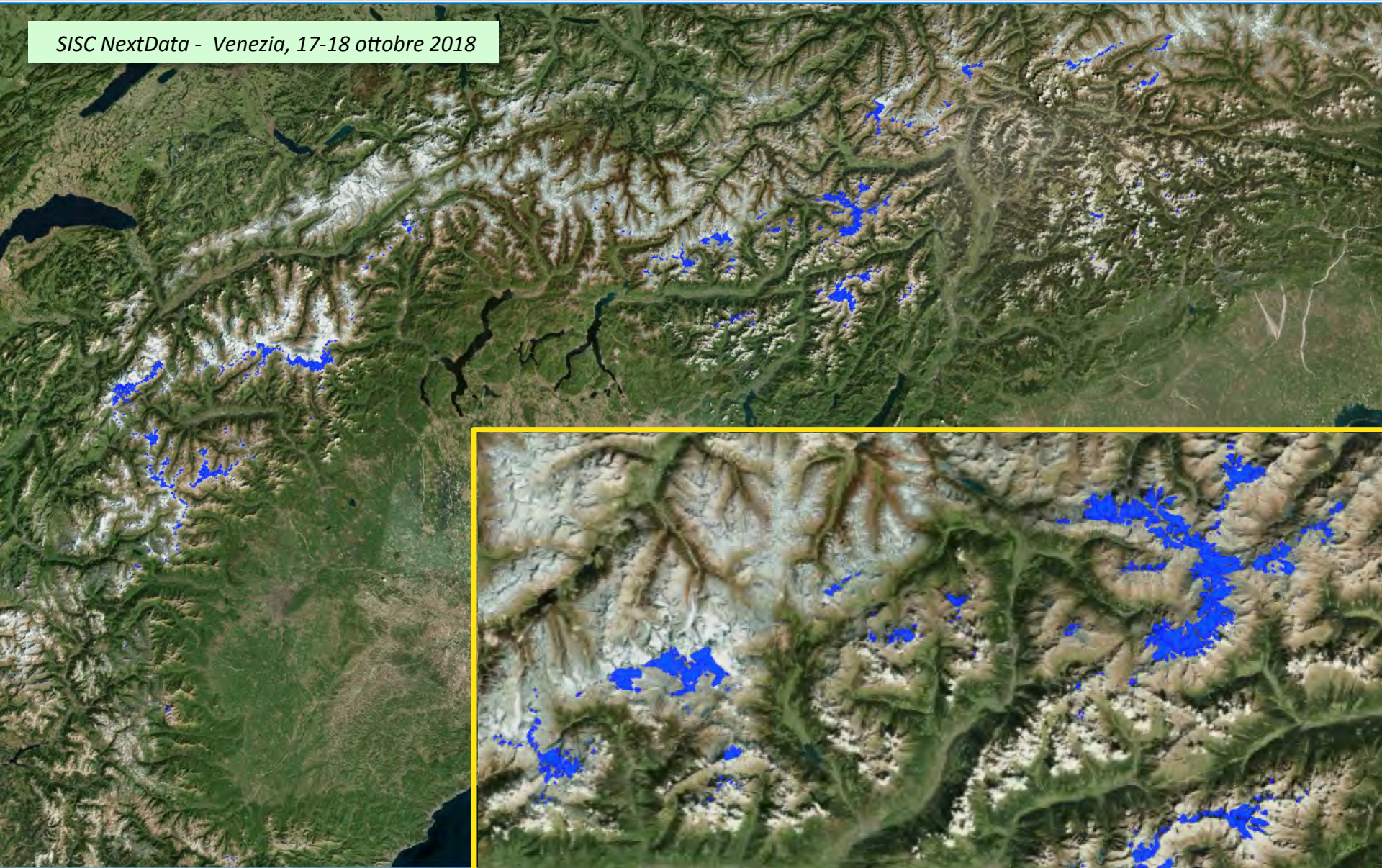
<http://www.glaciologia.it/i-ghiacciai-italiani/>

http://repo.igg.cnr.it/ghiacciaiCGI/ghiacciai_new.html

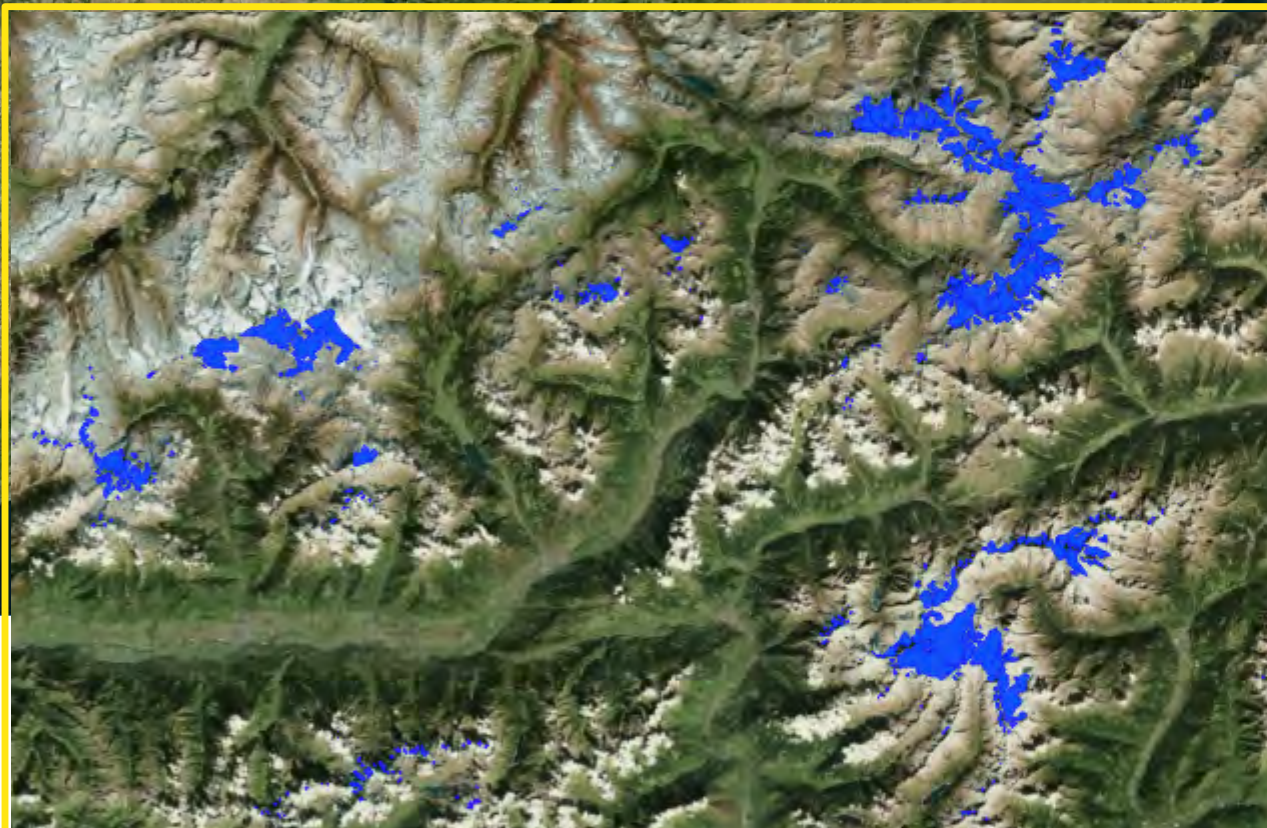


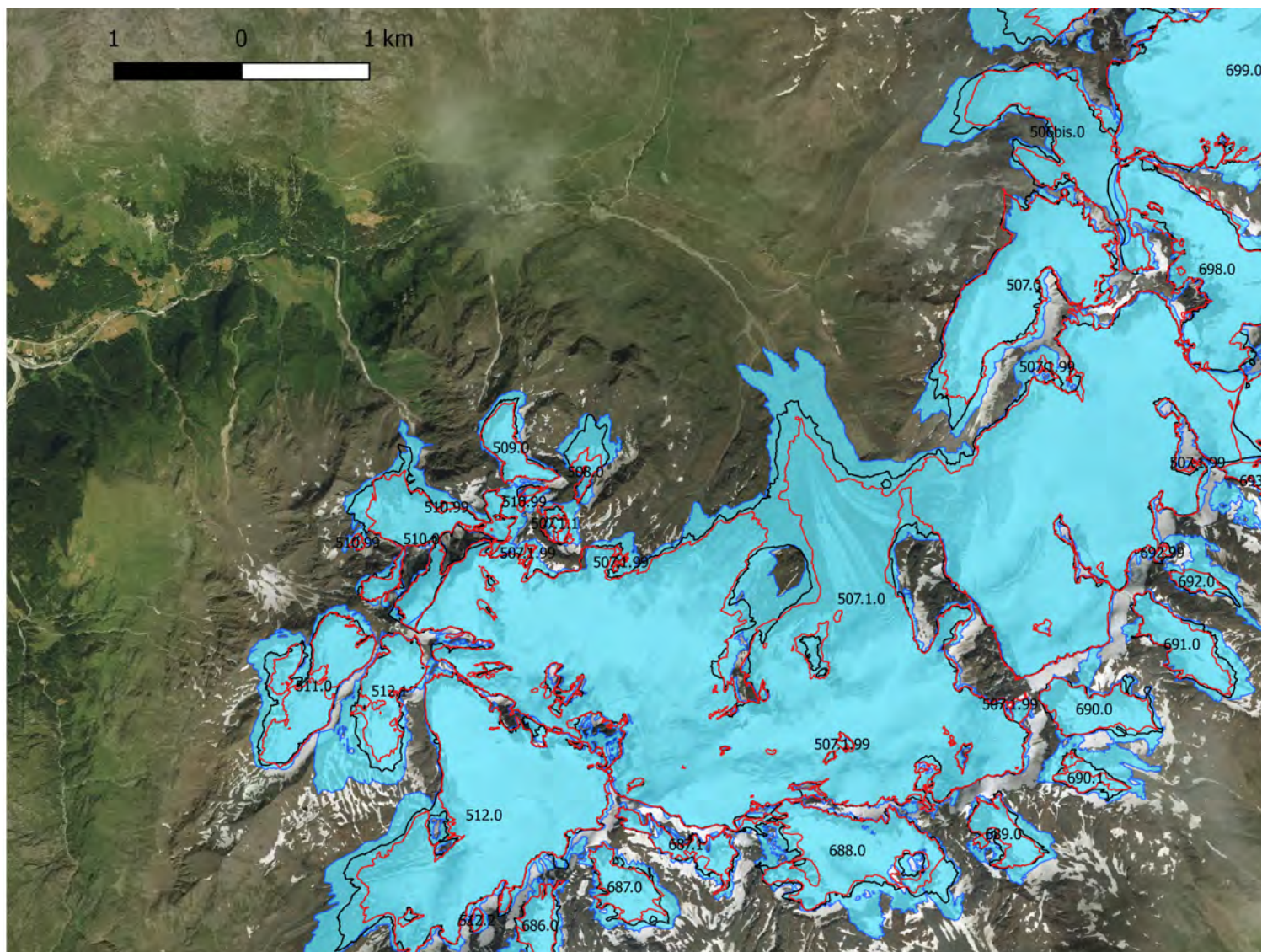
2015



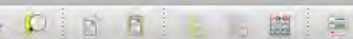


2015





code	sub_code	wgi_code	max_el ev	min_elev	tot_area	deb_area	exp_area	max_width	min_width h	max_length h	mean_ or	mean_ slop e	date_	x_coord	y_coord	NOMEGRUPPO	SUPGRUP_N
219	0	IT4L01517011	4810	2279	6.382	0.419	5.963	1584.6	0.0	4093.1	SE	21	23082006	6.893	45.832	Monte Bianco	Massiccio del Monte Bianco
304	0	IT4L01502002	4334	2356	9.809	0.846	8.963	1963.5	0.0	5030.7	SW	21	4092006	7.833	45.909	Breithorn - Lyskamm	Gruppo del Monte Rosa i.s.a.
314	0	IT4L01042009	4297	2718	1.547	0.190	1.357	1292.9	58.4	2369.9	SE	34	4092006	7.891	45.919	Monte Rosa	Gruppo del Monte Rosa i.s.a.
299	0	IT4L01504005	4181	2925	0.946	0.038	0.908	781.0	0.0	2428.3	SW	27	4092006	7.788	45.914	Breithorn - Lyskamm	Gruppo del Monte Rosa i.s.a.
298	0	IT4L01504005	4039	2822	1.133	0.233	0.900	781.8	0.0	2778.5	SW	23	4092006	7.775	45.917	Breithorn - Lyskamm	Gruppo del Monte Rosa i.s.a.
129	0	IT4L01513007	4038	2813	1.766	0.034	1.732	1011.6	0.0	3117.9	NW	21	4092006	7.257	45.522	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
130	0	IT4L01513008	3864	3183	0.364	0.000	0.364	554.4	0.0	1640.1	NW	22	4092006	7.254	45.516	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
440	0	IT4L01123011	3850	2550	5.000	0.000	0.000	2200.0	0.0	5000.0	S	22	0	9.948	46.372	Bernina	Catena Bernina - Scalino
73	0	IT4L01451044	3849	3683	0.033	0.000	0.033	209.2	0.0	256.8	SE	33	4092006	7.273	45.514	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
128	0	IT4L01513006	3825	3050	1.166	0.027	1.139	1420.0	0.0	1265.9	W	31	4092006	7.262	45.536	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
329	1	IT4L01211026	3799	3682	0.020	0.000	0.020	281.9	0.0	110.8	E	33	6092007	7.896	45.982	Cima di Jazzi	Gruppo del Monte Rosa i.s.a.
113	0	IT4L01512023	3749	2961	1.202	0.013	1.189	887.6	0.0	2182.9	NE	20	4092006	7.280	45.540	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
490	0	IT4L01137003	3724	2866	1.029	0.257	0.772	590.3	158.7	2551.2	S	19	0	10.537	46.493	Ortles	Gruppo Ortles - Cevedale
301	0	IT4L01504007	3720	3018	0.343	0.036	0.307	571.7	0.0	1266.9	SW	28	4092006	7.788	45.905	Breithorn - Lyskamm	Gruppo del Monte Rosa i.s.a.
788	0	IT4L00112506	3711	2732	2.928	0.725	2.203	2839.7	0.0	3100.6	W	12	12092006	10.719	46.789	Palla Bianca	Catena Palla Bianca - Similaun
698	0	IT4L00102515	3696	2912	1.214	0.251	0.963	1447.8	0.0	2168.5	E	14	5092006	10.627	46.415	Cevedale	Gruppo Ortles - Cevedale
121	0	IT4L01512031	3692	2853	2.224	0.065	2.159	1760.3	0.0	3184.7	NE	15	21082006	7.274	45.597	Grivola Gran Serra	Catena del Gran Paradiso
329	0	IT4L01211014	3692	3299	0.073	0.000	0.073	247.1	0.0	329.2	E	31	6092007	7.898	45.982	Cima di Jazzi	Gruppo del Monte Rosa i.s.a.
74	0	IT4L01451045	3674	3533	0.037	0.000	0.037	175.9	0.0	268.7	SE	28	4092006	7.286	45.511	Gran Paradiso - Rocciaviva	Catena del Gran Paradiso
506bis	0	IT4L01137022	3673	2802	0.767	0.067	0.700	662.4	36.3	2029.8	NW	23	0	10.611	46.424	Ortles	Gruppo Ortles - Cevedale
507	0	IT4L01137023	3665	2970	1.057	0.025	1.032	779.2	25.8	2116.0	SW	18	0	10.607	46.413	Ortles	Gruppo Ortles - Cevedale
507.1	0	IT4L01137024	3664	2514	11.317	0.304	11.013	5559.9	297.4	3291.7	N	19	0	10.591	46.392	Ortles	Gruppo Ortles - Cevedale
510	1		3664	2514	11.317	0.304	11.013	5559.9	297.4	3291.7	NE	19	0	10.591	46.392	Cevedale	Gruppo Ortles - Cevedale
777	0	IT4L00112907	3650	2433	3.896	0.945	2.951	1489.1	0.0	4076.4	N	12	12092006	10.733	46.812	Palla Bianca	Catena Palla Bianca - Similaun
697	0	IT4L00102514	3644	2743	0.929	0.099	0.830	933.5	0.0	1583.4	E	21	5092006	10.638	46.406	Cevedale	Gruppo Ortles - Cevedale
693	0	IT4L00102510	3639	3299	0.099	0.000	0.099	509.8	0.0	600.0	S	0	5092006	10.632	46.400	Cevedale	Gruppo Ortles - Cevedale
316	0	IT4L01042010	3613	2956	0.546	0.007	0.539	972.7	109.9	738.2	SW	18	4092006	10.632	46.400	Cevedale	Gruppo Ortles - Cevedale
439	0	IT4L01123009	3600	2600	5.000	0.000	0.000	2500.0	0.0	2950.0	SE	20	0	9.937	46.359	Bernina	Catena Bernina - Scalino



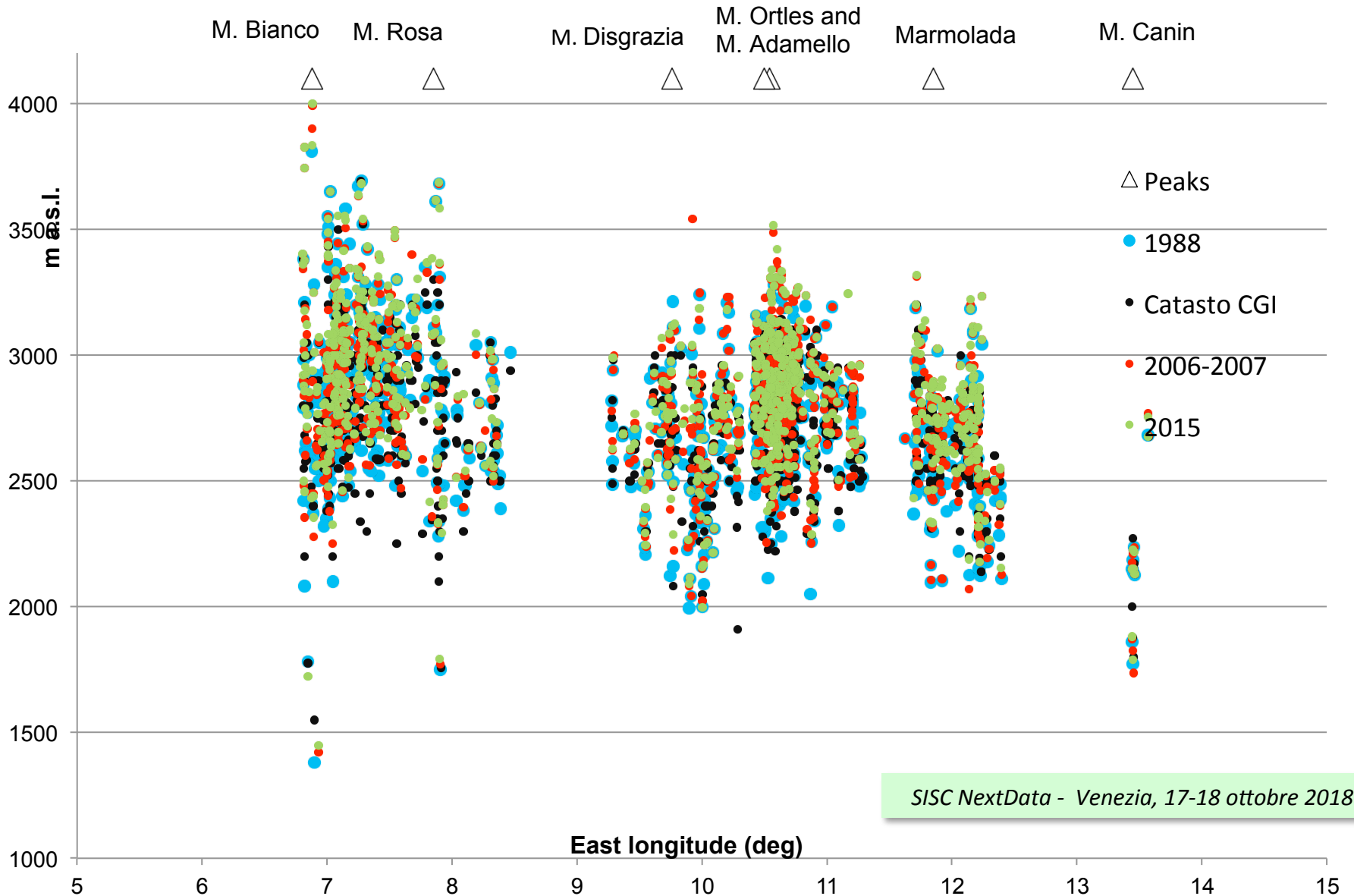
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0	614	1		1989	3318.3	2858.7	0.16	0.008	0.152	530.8		592.7	SE			21	26091988
0	614	2		1989	3324.5	3232.7	0.03	0	0.03	197.5		168.9	SW			28	26091988
0	616	0	IT4L01021003	1989	3145.6	2894.3	0.12	0.011	0.109	495.9		486.3	SW			27	26091988
0	617	0	IT4L01021004	1989	3166.8	2889.6	0.14	0.008	0.132	573.6		434.8	W			33	26091988
0	618	0	IT4L01021005	1989	3079.2	2779.9	0.12	0	0.12	546		455.4	W			29	26091988
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0	620	0	IT4L01021007	1989	3075.2	2830.3	0.14	0	0.14	484.5		430.6	SW			30	26091988
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0	622	0		1989	0	0	0	0	0	0		0				0	0
0	623	0		1989	0	0	0	0	0	0		0				0	0
0	624	0	IT4L01021012	1989	2894.5	2725	0.08	0.011	0.069	467.3		264.1	NW			33	26091988
0	625	0	IT4L01021014	1989	2848.9	2664.9	0.07	0	0.07	255.9		392.2	NW			25	26091988
0	626	0	IT4L01021016	1989	2758	2476.2	0.12	0.027	0.093	410.4		510.1	NW			29	25071988
0	627	0	IT4L01021017	1989	2742	2460.8	0.10	0.031	0.069	738.1		244.5	N			28	25071988
0	628	99		1989	2750	2673.8	0.02	0	0.02	128.4		182.8	NW			23	25071988
0	629	99		1989	2626.3	2525.7	0.02	0.004	0.016	171.8		146.5	N			35	25071988
0	630	0		1989	0	0	0	0	0	0		0				0	0
0	630a	99	IT4L01011001	1989	2463.3	2388.8	0.04	0	0.04	191.2		292.8	E			14	25071988
0	631	0	IT4L01011003	1989	3043.9	2838.1	0.06	0	0.06	235.4		352.4	S			30	26091988
0	632	0	IT4L01011005	1989	3300.4	2991.6	0.18	0	0.18	452.8		643.9	E			26	26091988
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0	634	0	IT4L01011008	1989	3446.9	2593.8	5.69	0.093	5.597	4430.6		4250.6	E			11	26091988
0	638	0		1989	3122.5	2910.6	0.05	0.037	0.013	311.3		291.3	NE			36	26091988
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Metadata on Nextdata geonetwork

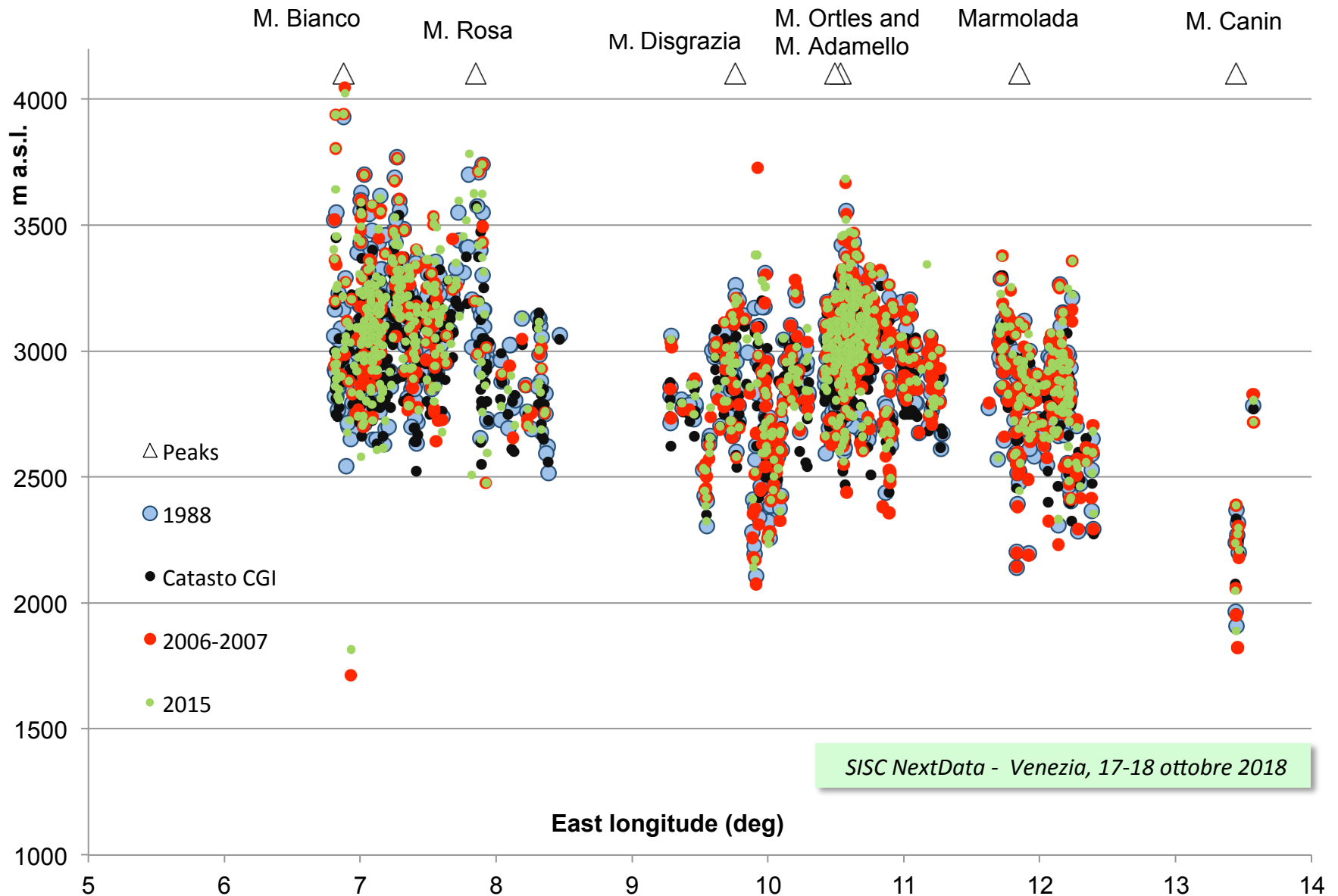
WP2.1 - D2.1.A – Report on the Archives of mountain observation networks.

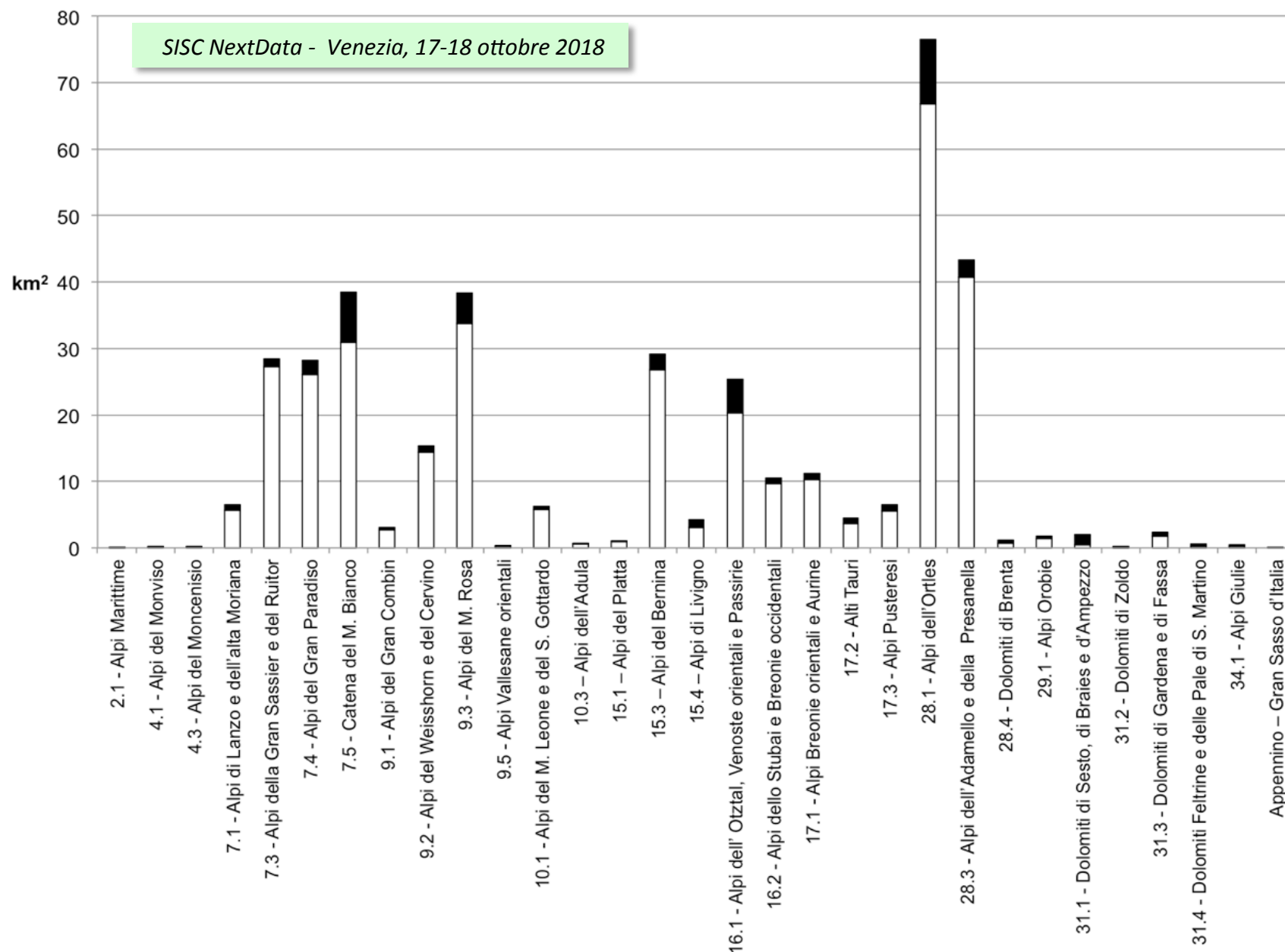
CODE ID	number assinged to the glacier as defined by the Italian Inventory (CGI-CNR, 1959-1962) or new code if glacier was not inventoried before.
SUB_CODE	number attributed to glaciers originated from fragmentation of wider body
WGI_CODE	ID number is assigned to the glacier as defined by the WGMS
TIME_STEP	Hydrological year of survey (yyyy)
MAX_ELEV	Maximum elevation of the highest point of the glacier in meters above sea level
MIN_ELEV	The minimum elevation of the lowest point of the glacier in meters above sea level
TOT_AREA	The total area of the glacier in a horizontal projection in square kilometers
DEB_AREA	Debris cover area in a horizontal projection in square kilometers
EXP_AREA	Debris free area in a horizontal projection in square kilometers
MAX_WIDTH	The maximum width of the glacier in a horizontal projection in kilometers
MIN_WIDTH	Minimum width of the glacier in a horizontal projection in kilometers
MAX_LENGTH	Maximum length of the glacier in kilometers measured along the main flowline in a horizontal projection
MEAN_OR	Mean orientation of the glacier using 8 classes centered on cardinal points (N, NW, W, SW, S, SE, E, NE).
OR_ACC	Mean orientation of the accumulation area using 8 classes centered on cardinal points (N, NW, W, SW, S, SE, E, and NE). FACULTATIVE
OR_ABL	Mean orientation of the ablation area using 8 classes centered on cardinal points (N, NW, W, SW, S, SE, E, and NE). FACULTATIVE
MEAN_SLOPE	Mean slope angle of glacier surface
DATE_	Orthophoto or satellite image acquisition data (ddmmyyyy)
X_COORD	The longitude of the glacier in decimal degrees East GW. Longitude is given to a maximum precision of 3 decimal places
Y_COORD	The latitude of the glacier in decimal degrees North. Latitude is given to a maximum precision of 3 decimal places
GL_NAME	Name of glacier following Italian Inventory (CGI-CNR, 1959-1992) or new name in case of fragmentation of glacial body or in case glacier was not inventoried before.
PRIMARY_CL	The primary classification of the glacier
FORM	The form of the glaciers

Glaciers of Italian Alps: front elevation

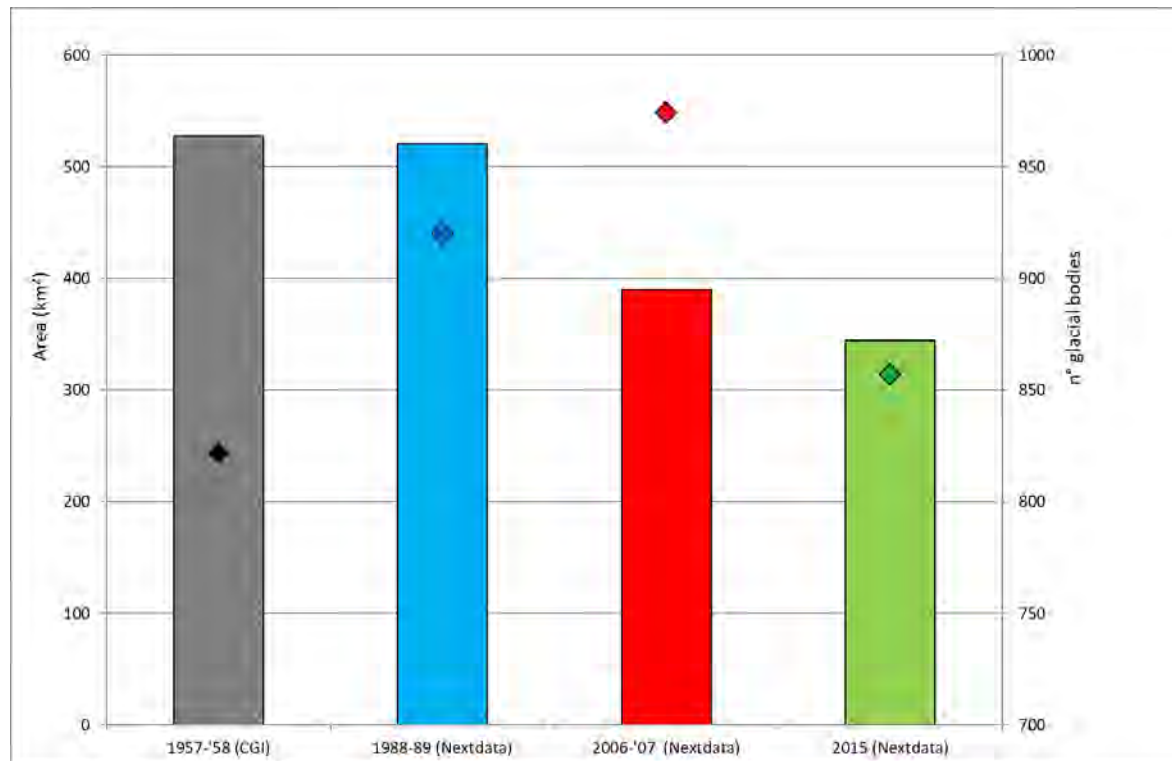


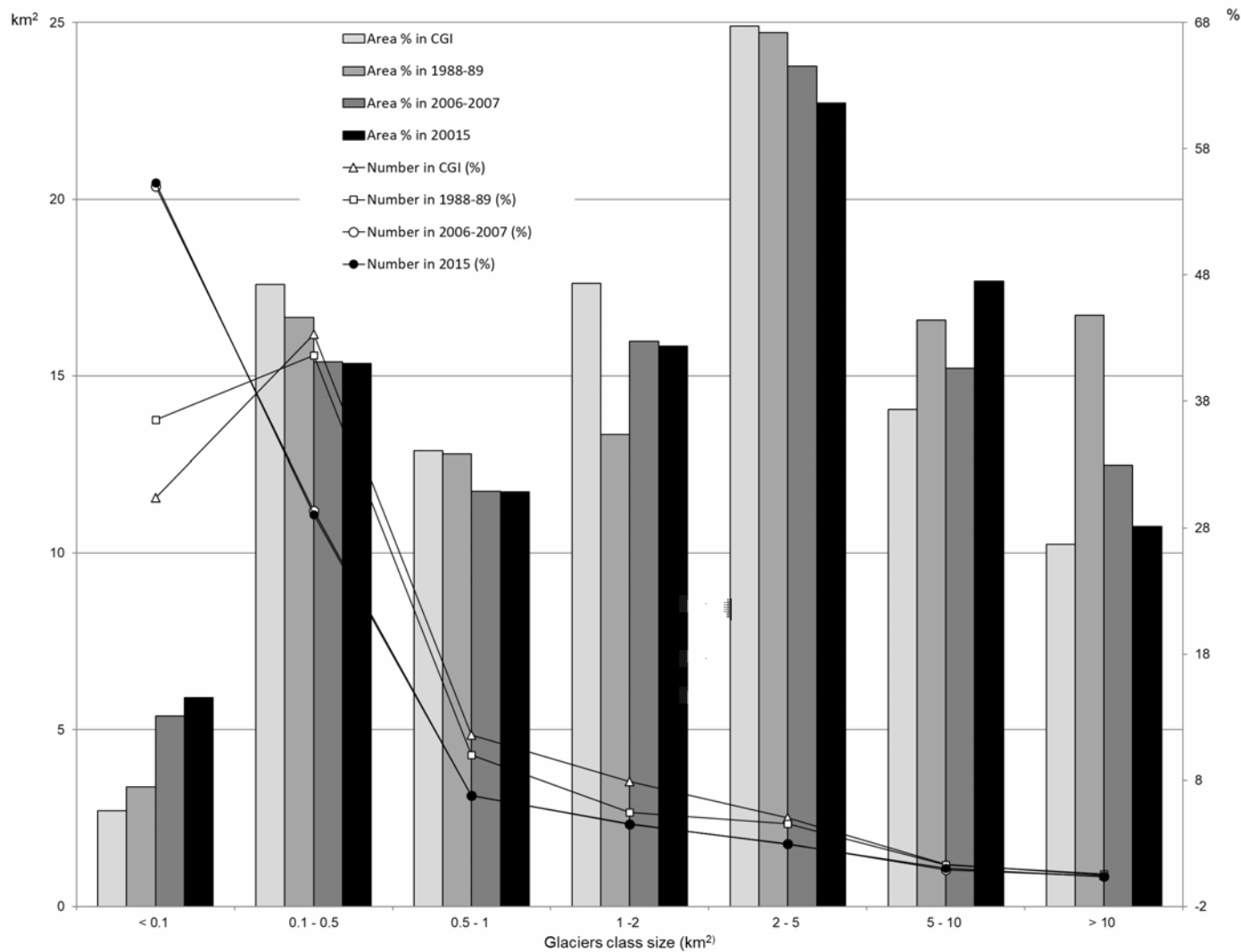
Glaciers of Italian Alps: mean elevation

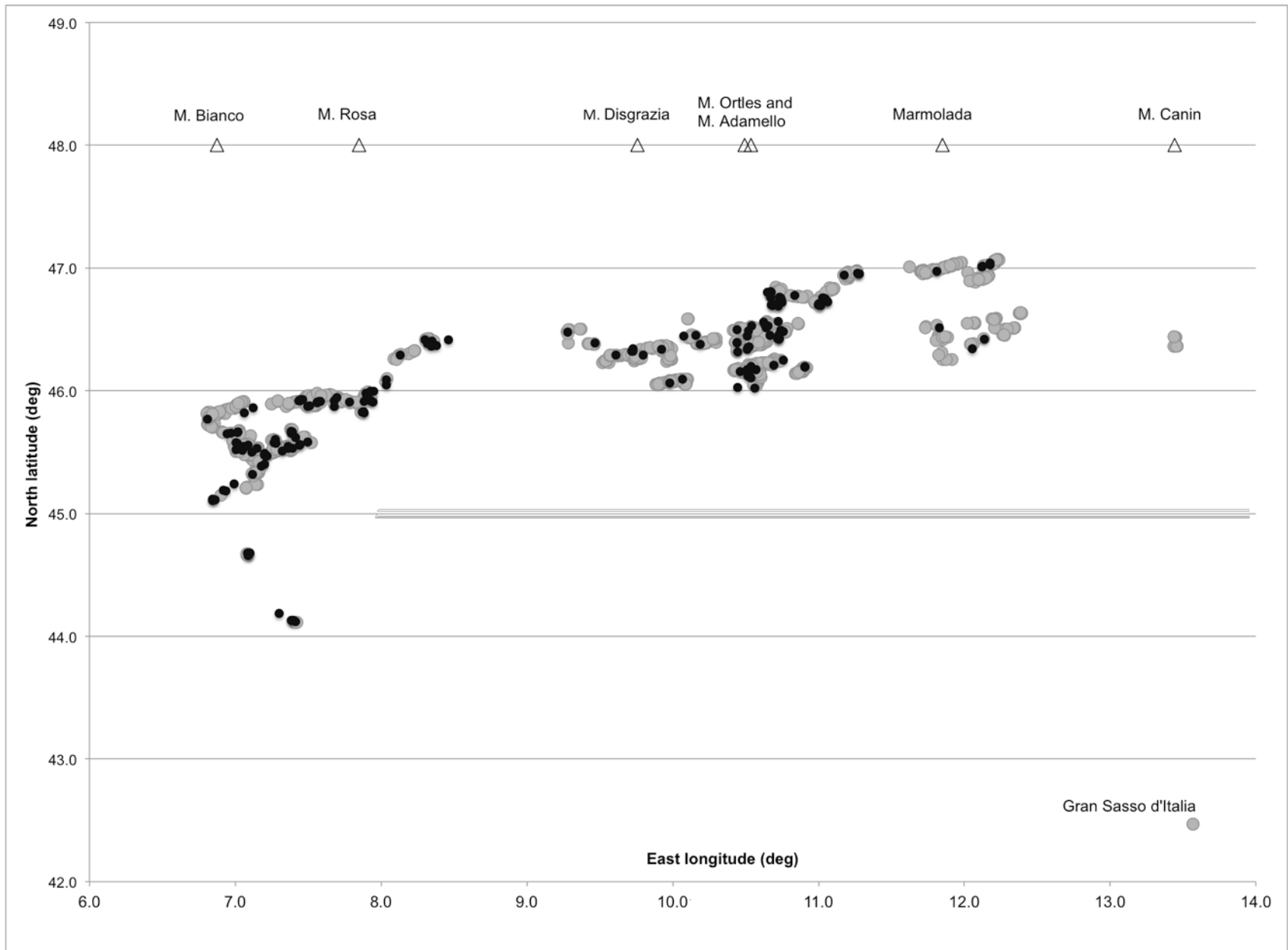




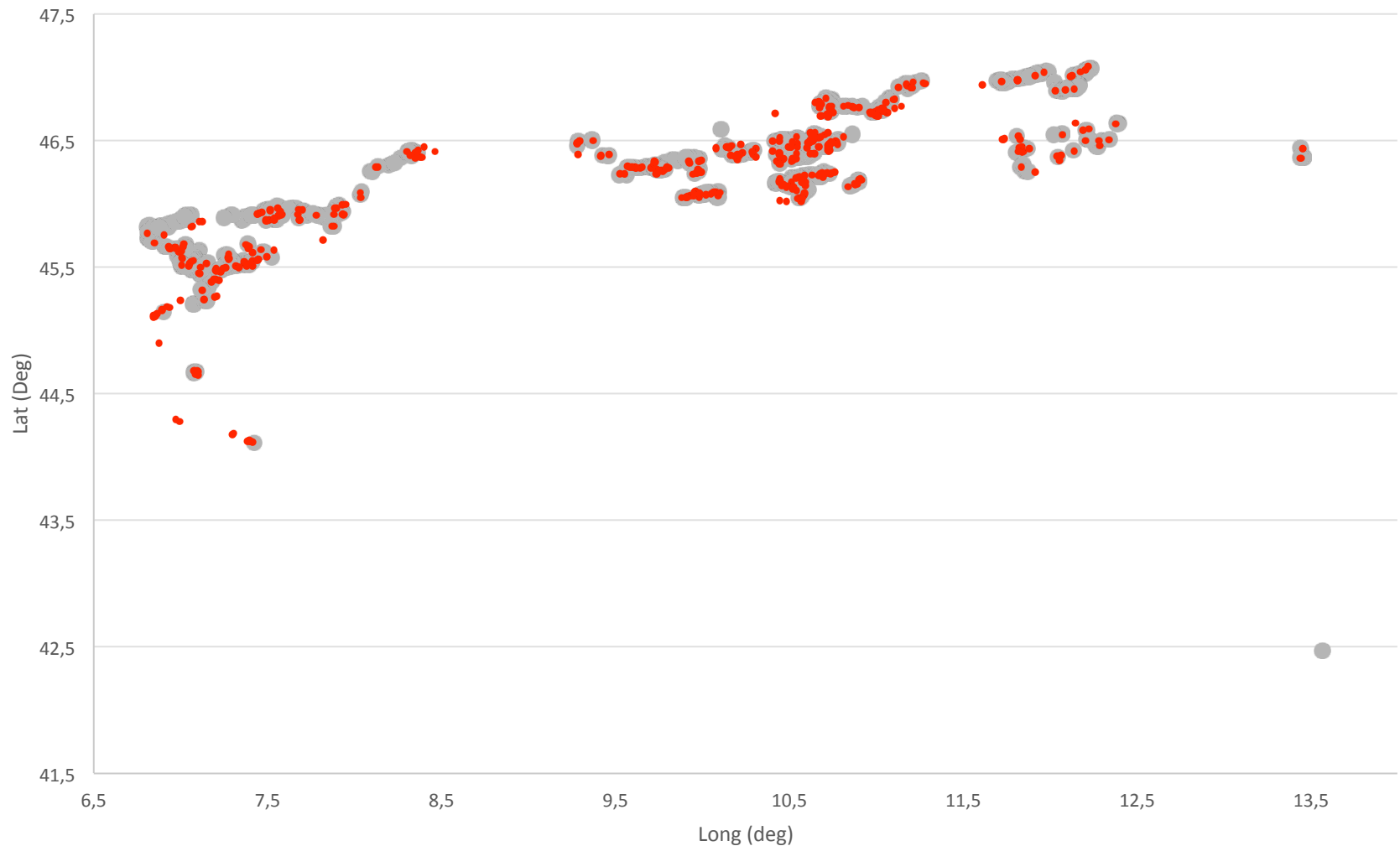
Frequency of glacier areal extent in each ISMSA subsection and in the Apennines in terms of debris-free (white) and debris-covered area (black). Data refer to 2006-2007; after Salvatore et al., 2015, GFDQ.







Snapshot of existing (in gray) and extinct (in black) Italian glaciers in 2006-2007 hydrological period (extinct glaciers respect to 1957-58)



Snapshot of existing (in gray) and extinct (in red) Italian glaciers in 2015 hydrological period (extinct glaciers respect to 1957-58)

Thank you for your kind attention!

