

CARESER GLACIER, 1990–1997 AND 1997–2000, ITALY 1:5,000

(Thematic maps)

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Several aerial surveys carried out on the Caresèr Glacier (Central Alps, Ortles-Cevedale Group) in 1967, 1980 and 1990, facilitated assessment of changes occurring during the periods 1967–1980, 1980–1990, and 1967–1990 (Giada and Zanon 1985, 1991, 1995; see in: Literature, FoG, VII, 1990–1995). Results from new surveys carried out in 1997 and 2000, exploiting the simultaneous use of already fully tested calculation programs, aimed at analysing the dynamics and quantitative results of recent changes in this glacial system, representative of the ongoing phase of accelerated glacier shrinkage in the Alps. The method used to compare the 1990, 1997 and 2000 survey results more or less repeats that used in the above research activities.

Areal variations 1990–1997

Comparison of DTM obtained from the 1990 and 1997 surveys led to the production of a thematic map, scale 1:5000, with contour lines indicating changes in the elevation of the glacier surface according to the classes shown in the legend. The map also shows geometric changes occurring in the same period. Overall, between 1990 and 1997, the glacier surface area was further reduced by 13% of its 1990 extent, with definite acceleration of the process relative to preceding comparisons.

Areal variations 1997–2000

Comparison of DTM calculated from the 1997 and 2000 surveys allowed production of a second thematic map 1: 5000, having the same qualitative characteristics as the previous one. Between 1997 and 2000 the glacier surface area was further reduced by 10% of its 1997 extent. The overall reduction was 35.6% of the 1967 value (beginning of mass balance research on the glacier); if the results of a terrestrial survey conducted in 1933, are taken into account, the total reduction is 45% of the 1933 value.

Variations in elevation and volume 1990–1997

Table 1 shows variations in elevation and volume. The latter were calculated by multiplying the level variations of the glacier surface by the area of each 50-metre altimetric zone. All values turned out to be negative, and ranged between -15.31 m for the lower zone (2,860–2,900 m a.s.l.) and -4.20 m for the higher one (above 3,200 m a.s.l.), with a mean variation for the entire surface of -7.75 m, corresponding to -1.10 m a^{-1} . The mean annual value coincides with that previously calculated for the 1980–1990 interval, whereas it is almost 5 times higher than that for the 1967–1980 period. It should be noted that in the altimetric interval between 3,050 and 3,100 m a.s.l., where mean and median elevations, and ELA with zero balance are all found, the volume loss accounts for 22% of the total value between 1990 and 1997.

TABLE 1 – Caresèr Glacier, 1990–1997. Variations in elevation (in m) and volume (in 10^6 m³ and as percentage of total value) for 50-metre vertical zones, obtained by comparing SCM 1990 and 1997 aerial surveys.

Altitude m a.s.l.	1990 area km ²	Δ Elevation m	Δ Volume 10 ⁶ m ³	%
2860–2900	0.0990	-15.31	-1.5155	5.07
2900–2950	0.1985	-14.36	-2.8505	9.53
2950–3000	0.3710	-12.11	-4.4930	15.30
3000–3050	0.6560	-9.82	-6.4420	21.55
3050–3100	0.9645	-6.92	-6.6745	22.32
3100–3150	1.0440	-5.17	-5.3975	18.05
3150–3200	0.3005	-5.27	-1.5835	5.30
3200–3330	0.2240	-4.20	-0.9410	3.15
2860–3330	3.8575	-7.75	-29.8975	100.00

Variations in elevation and volume 1997–2000

Table 2 shows variations in elevation and volume, calculated in the same manner as the 1990–1997 comparison. All values are also negative and range between -11.04 m for the lower zone (2,860–2,900 m a.s.l.) and -4.72 m for the higher one (above 3,200 m a.s.l.), with a mean variation for the entire surface of -7.08 m, corresponding to -2.08 m a^{-1} .

TABLE 2 – Caresèr Glacier, 1997–2000. Variations in elevation (in m) and volume (in 10^6 m³ and as percentage of total value) for 50-metre vertical zones, obtained by comparing SCM 1997 and 2000 aerial surveys.

Altitude m a.s.l.	1997 area km ²	Δ Elevation m	Δ Volume 10 ⁶ m ³	%
2860–2900	0.0650	-11.04	-1.0210	4.28
2900–2950	0.2225	-9.79	-2.2525	9.43
2950–3000	0.3575	-8.35	-3.3405	13.99
3000–3050	0.6050	-7.71	-4.7045	19.70
3050–3100	0.8525	-6.76	-6.5780	27.55
3100–3150	0.8700	-5.89	-4.1085	17.21
3150–3200	0.2400	-5.26	-1.2100	5.07
3200–3330	0.1500	-4.72	-0.6600	2.76
2860–3330	3.3625	-7.08	-23.8750	100.00

This value is almost twice that for 1990–1997 but 10 times greater than that for 1967–1980. For 1997–2000 too, it must be observed that in the critical 3,050–3,100 m a.s.l. zone the volume loss is almost 28% of the total value, indicating the persistence of the considerable state of disequilibrium and acceleration of deglaciation processes at the end of the millennium.