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Supplementary material

200 years of Equilibrium-Line Altitude variability across the European Alps (1901−2100)

Manja Žebre ¹, Renato R. Colucci ², Filippo Giorgi ³, Neil F. Glasser ¹, Adina E. Racoviteanu ¹, Costanza Del Gobbo ³, ⁴

(1) Department of Geography & Earth Sciences, Aberystwyth University, Aberystwyth, UK
(2) Department of Earth System Sciences and Environmental Technology, ISMAR-CNR, Trieste, Italy
(3) Abdus Salam International Centre for Theoretical Physics, Trieste, Italy
(4) Department of Mathematics and Geosciences, University of Trieste, Trieste, Italy
Fig. S1 (a) Annual cycle of monthly precipitation totals averaged over the Alps for the period 1976-2005 for different EURO-CORDEX RCM historical simulations and the gauge-corrected and gauge-uncorrected LAPrec1901 observations, all interpolated on the 5 arcmin grid. (b) Annual cycle of mean monthly air temperature averaged over the Alps for the period 1976-2005 for different EURO-CORDEX RCM historical simulations interpolated on the 5 arcmin grid and HISTALP observations.
**Fig. S2** Environmental ELA evolution in the Alps for the period 1901-2100. Input data for the historical period 1901-2005 is HISTALP temperature and LAPrec precipitation, whereas each of the twelve bias-corrected EURO-CORDEX precipitation and temperature projections, forced with RCP2.6, RCP4.5 and RCP8.5 scenarios, were used to reconstruct the ELA for the period 2006-2100. Transparent bands correspond to the error of the equation 3 (i.e. 648 mm). RM – centred running mean
Fig. S3 Environmental ELA evolution (11-year centred running mean) for various EURO-CORDEX RCM simulations. Thin lines are individual RCM simulations (36 in total). Thick lines are the RCP means and the transparent bands correspond to one standard deviation. The red line corresponds to the environmental ELA computed with HISTALP and LAPrec historical datasets. The RCMs closest to the multi-model mean environmental ELA are marked with coloured dotted lines. These are EC_EARTH CCLM4-8-17 r12i1p1 for RCP2.6 (r2 = 0.5), HadGEM2-ES RACMO22E r1i1p1 for RCP4.5 (r2 = 0.6) and EC_EARTH CCLM4-8-17 r12i1p1 for RCP8.5 (r2 = 0.8)
### Table S1: Statistics of the environmental ELA by longitude

| Longitude [°E] | Number | Area [km²] | ELA 1971-2000 [m asl] | RCP2.6 ELA 2071-2100 [m asl] | RCP4.5 ELA 2071-2100 [m asl] | RCP8.5 ELA 2071-2100 [m asl] | ELA rise RCP2.6 [m yr⁻¹] | ELA rise RCP4.5 [m yr⁻¹] | ELA rise RCP8.5 [m yr⁻¹] |
|---------------|--------|------------|------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|
| 5            | 7      | 590        | 308                    | 3309                        | 3527 ± 266                  | 3753 ± 282                  | 4208 ± 360                 | 2.2                       | 4.4                       | 9.0                       |
| 7            | 9      | 1641       | 1095                   | 2995                        | 3193 ± 282                  | 3397 ± 293                  | 3791 ± 355                 | 2.0                       | 4.0                       | 8.0                       |
| 9            | 11     | 1006       | 431                    | 3168                        | 3358 ± 252                  | 3546 ± 269                  | 3931 ± 317                 | 1.9                       | 3.8                       | 7.6                       |
| 11           | 13     | 598        | 241                    | 3028                        | 3203 ± 256                  | 3371 ± 259                  | 3737 ± 313                 | 1.8                       | 3.4                       | 7.1                       |
| 13           | 15     | 57         | 15                     | 2567                        | 2728 ± 306                  | 2905 ± 303                  | 3262 ± 327                 | 1.6                       | 3.4                       | 7.0                       |

### Table S2: Statistics of the environmental ELA by latitude

| Latitude [°N] | Number of glaciers | Area [km²] | ELA 1971-2000 [m asl] | RCP2.6 ELA 2071-2100 [m asl] | RCP4.5 ELA 2071-2100 [m asl] | RCP8.5 ELA 2071-2100 [m asl] | ELA rise RCP2.6 [m yr⁻¹] | ELA rise RCP4.5 [m yr⁻¹] | ELA rise RCP8.5 [m yr⁻¹] |
|---------------|--------------------|------------|------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|---------------------------|---------------------------|
| 44            | 45                 | 276        | 66                     | 3379                        | 3609 ± 257                  | 3858 ± 296                  | 4327 ± 357                 | 2.3                       | 4.8                       | 9.5                       |
| 45            | 46                 | 737        | 592                    | 3281                        | 3491 ± 263                  | 3714 ± 280                  | 4142 ± 344                 | 2.1                       | 4.3                       | 8.6                       |
| 46            | 47                 | 2370       | 1234                   | 3049                        | 3236 ± 267                  | 3427 ± 280                  | 3812 ± 333                 | 1.9                       | 3.8                       | 7.6                       |
| 47            | 48                 | 509        | 196                    | 2861                        | 3044 ± 273                  | 3194 ± 262                  | 3556 ± 330                 | 1.8                       | 3.3                       | 6.9                       |