

APPENDIX S1: Details on climatic variables, their range, and intercorrelations

Minimum temperature (TMIN) was estimated as absolute minimum temperature of the coldest month in Europe (Prentice *et al.*, 1992) and as mean temperature of the coldest month for the study area in the Swiss Alps (Ohlemüller *et al.*, 2006). The latter can be seen as a surrogate for the first (Ohlemüller *et al.*, 2006). Growing-degree-days (GDD) were computed with a 5°C base following Prentice *et al.* (1992) and Zimmermann & Kienast (1999). Water balance (WBAL) was computed as the yearly sum of the monthly differences between precipitation and potential evapotranspiration (PET). For the European dataset PET was computed following Lugo *et al.* (1999), i.e., $PET = 58.93 \times T_i/12$ for T_i above zero else $PET = 0$, T_i = mean temperature of month i ; for the Swiss Alps PET was computed using the PREVAH model (Gurtz *et al.*, 1999). The European climatic gradients ranged from an absolute TMIN of -43 to -5°C, 131 to 5064 °C GDD, and a WBAL of -740 to 2564 mm. The climatic gradients in the Swiss Alps ranged from a TMIN of -10 to 1°C, 0 to 2127°C GDD, and a WBAL of 112 to 2193 mm. The climatic variables were correlated as follows for Europe (Spearman's rho): TMIN-GDD 0.802, TMIN-WBAL -0.415, GDD-WBAL -0.725, and the Swiss Alps: TMIN-GDD 0.998, TMIN-WBAL -0.957, GDD-WBAL -0.961 ($p < 0.001$ for all six correlations, Fig. S1.1).

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Figure S1.1: Relationship between the three climatic variables (minimum temperature, TMIN; growing-degree-days, GDD; water balance, WBAL) for Europe (top) and the Swiss Alps (bottom).

