**Figure S1.** Daily cycle of the average (a) and extreme minimum/maximum (b) values of the 2 m dew point temperature.

**Figure S2.** Example of inland progression of the wind breeze in mainland Portugal, in the afternoon. ECMWF-HRES short-range forecasts of the 10 m wind and dew point depression, valid at 12 UTC (a), 15 UTC (b) and 18 UTC (c) on 17 July 2022. No wind arrows below 2.5 m/s. Black dot shows the location of the Lousã weather station.

**Figure S3.** Timeseries of the differences in the observed data between Penhas Douradas (1380 m asl) and Trevim (1167 m asl). Hourly data in the nighttime period in the summer seasons of 2021 and 2022. The variables shown are the 2 m temperature (a), relative humidity (b), 10 m wind speed (c) and hourly 10 m maximum wind gust (d). In all panels, the 10 m wind direction (approximated to the closest 8 main cardinal points) is also shown in both weather stations. Only differences above or below 2°C, 20% and 2 m/s are shown.

**Figure S4.** Timeseries of the differences in the observed data between Trevim (1167 m asl) and Espinheiro (995 m asl). Hourly data in the nighttime period in the summer seasons of 2021 and 2022. The variables shown are the 2 m temperature (a), relative humidity (b), 10 m wind speed (c) and hourly 10 m maximum wind gust (d). In all panels, the 10 m wind direction (approximated to the closest 8 main cardinal points) is also shown in both weather stations. Only differences above or below 2°C, 20% and 2 m/s are shown.

**Figure S5.** Timeseries of the differences in the observed data between Espinheiro (995 m asl) and Candal (621 m asl). Hourly data in the nighttime period in the summer seasons of 2021 and 2022. The variables shown are the 2 m temperature (a), relative humidity (b), 10 m wind speed (c) and hourly 10 m maximum wind gust (d). In all panels, the 10 m wind direction (approximated to the closest 8 main cardinal points) is also shown in both weather stations. Only differences above or below 2°C, 20% and 2 m/s are shown.

**Figure S6.** Timeseries of the differences in the observed data between Candal (621 m asl) and Lousã (195 m asl). Hourly data in the nighttime period in the summer seasons of 2021 and 2022. The variables shown are the 2 m temperature (a), relative humidity (b), 10 m wind speed (c) and hourly 10 m maximum wind gust (d). In all panels, the 10 m wind direction (approximated to the closest 8 main cardinal points) is also shown in both weather stations. Only differences above or below 2°C, 20% and 2 m/s are shown.

**Figure S7.** Large-scale circulation in western Iberia and close North Atlantic. ECMWF-HRES analysis of the geopotential (dam), wind (kt) and temperature (°C) at 850 hPa, valid at 00 UTC on 20 July 2021.

**Figure S8.** Location and orientation of the cross-section valid at 06 UTC on 20 July 2021, with model orography (ECMWF-HRES) and wind at 900 hPa. Black dots show the location of the Lousã (southwest) and Penhas Douradas (northeast) weather stations.

**Figure S9.** Large-scale circulation in western Iberia and close North Atlantic. ECMWF-HRES analysis of the geopotential (dam), wind (kt) and temperature (°C) at 850 hPa, valid at 00 UTC on 14 August 2021.

**Figure S10.** Location and orientation of the cross-section valid at 06 UTC on 14 August 2021, with model orography (ECMWF-HRES) and wind at 900 hPa. Black dots show the location of the Lousã (southwest) and Penhas Douradas (northeast) weather stations.

**Figure S11.** Large-scale circulation in western Iberia and close North Atlantic. ECMWF-HRES analysis of the geopotential (dam), wind (kt) and temperature (°C) at 850 hPa, valid at 00 UTC on 21 May 2022.

**Figure S12.** Time-series of the observed nighttime hourly values of the 2 m temperature (a) and 10 m wind gust (b), in six valley stations in the northern half of mainland Portugal, including Lousã and Seia. Data for the nighttime period between 00 UTC on 19 May 2022 and 12 UTC on 23 May 2022.

**Figure S13.** Location and orientation of the cross-section valid at 06 UTC on 20 July 2021, with model orography (ECMWF-HRES) and wind at 900 hPa. Black dots show the location of the Lousã (southwest) and Penhas Douradas (northeast) weather stations.

**Figure S14.** ECMWF-HRES short-range vertical profile forecast in Lousã, valid at 06 UTC on 21 May 2022.