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A two-fold deep-learning strategy to correct and downscale winds over mountains

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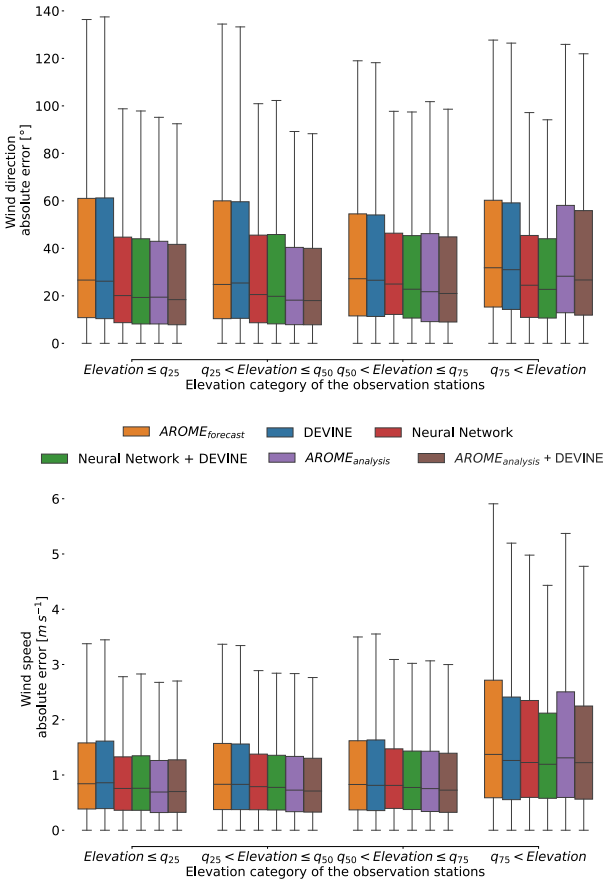

Figure S1. Wind direction absolute error (a) and wind speed absolute error (b) categorized by the elevation of the observation station where the measurements were held. In details, the four categories correspond to the four quartiles of the elevation distribution among observation stations: elevation increases from left to right. Each boxplot color indicates a different model. This figure is similar to Fig. 6 in the main manuscript but also includes AROME$_{analysis}$ + DEVINE model. This model corresponds to outputs of DEVINE forced by AROME$_{analysis}$. This figure only uses data from the test set.

Table S1. Evaluation metrics obtained on a three-folds cross-validation strategy. Three train/test partitions have been obtained following Sect. 3.4 in the main manuscript. Here, the results present the averaged metrics over the three folds, associated with one standard deviation. MAE designates the mean absolute error, RMSE the root mean square error and ρ the Pearson correlation coefficient. The mean absolute error for wind direction was computed by taking care of the cyclic nature of wind direction. The best performances are highlighted in bold. This table suggests that the results obtained in Table 3 from the main manuscript are not specific to the train/test partition selected.

Variable	Metric	AROME$_{forecast}$	Neural Network	Neural Network+DEVINE	AROME$_{analysis}$
Speed	MAE [$m\,s^{-1}$]	1.32 $\pm$ 0.03	1.20 $\pm$ 0.05	1.16 $\pm$ 0.06	**1.15 $\pm$ 0.04**
	RMSE [$m\,s^{-1}$]	1.87 $\pm$ 0.06	1.72 $\pm$ 0.08	**1.64 $\pm$ 0.09**	1.67 $\pm$ 0.07
	Mean bias [$m\,s^{-1}$]	-0.04 $\pm$ 0.07	-0.05 $\pm$ 0.08	**0.00 $\pm$ 0.04**	-0.06 $\pm$ 0.06
	ρ []	0.60 $\pm$ 0.03	0.66 $\pm$ 0.02	**0.70 $\pm$ 0.02**	0.69 $\pm$ 0.02
Direction	MAE [°]	44.0 $\pm$ 1.55	36.2 $\pm$ 1.4	**35.4 $\pm$ 1.22**	37.1 $\pm$ 0.37