



## **Cold European winters in CMIP5**

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We look at European winters (domain  $10^{\circ}$  W /  $25^{\circ}$  E /  $38^{\circ}$  N /  $70^{\circ}$  N), specifically the December, January, February (DJF) mean temperature, using pre-industrial control (piControl) experiments from the Coupled Model Intercomparison Project Phase 5 (CMIP5). In contrast to summer heat waves, but also winter cold spells, this aspect of the CMIP5 data has gained little attention so far. Model specific maps of climatological DJF temperatures (mean and standard deviation) are presented, highlighting substantial differences (factor two) in internal variability among models. We then focus on particularly cold winters - with model grid cell DJF temperatures at least two standard deviations below its long term mean - and their spatial extent. The model data suggest that such winters extend over about 10% of the European (see definition above) land mass in 10% of all winters, but can cover more than 50% of the land mass in extreme cases. Corresponding spatial maps are presented. Observation based data sets are used to put the CMIP5 data into context.