



## **European evaluation of regional (MM5) and global climate models (CMIP3/CMIP5): Are extreme cold and warm spells characteristics well represented?**

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Various extreme temperature events punctuated European climate over the last decade: devastating heat-wave of summer 2003, exceptionally mild autumn 2006, winter and spring 2007, extreme cold winter 2010. Thus, the present-day evaluation (i.e 1961-2000 period) of climate variability modeled by GCM/RCM remains critical in order to model consistently extreme events characteristics in the future (Katz and Brown, 1992). In this study, an array of global (CMIP3/CMIP5) and regional (MM5) climate models run on Europe domains compared with ERA 40/ERA Interim reanalysis data is used to analyze different aspects of extreme cold and warm spells. For each model, several cold and warm statistical indices of frequency, intensity, temporal and spatial persistency (Walsh et al., 2001 ; Vavrus et al., 2006 ; Beniston et al., 2007) are calculated in order to assess the capacity of climate models to simulate these extreme events. Good capacity will be defined as a common criterion of good representation of each of the latter extreme events characteristics.

This study proposes also several insights to explain the biases obtained among the models. First, impact of resolution is analyzed comparing regional and global climate models output and studying a global climate model (IPSL-LMDz) on different resolution scales. Second, temporal evolution of intensity (e.g abrupt or slow departure) previewed in climate models compared to reanalysis data. Third, low boundary layers processes are susceptible to mainly influence the intensity of extreme events. Here, they are studied comparing vertical potential temperature profiles showing whether better resolution of low troposphere improve intensity modeling.

Finally, future projections (2045-2065 period; scenario B2) are carried out taking into account the above-mentioned capacity of climate models to represent well the extreme cold and warm events characteristics on present-day period. The model ensemble is used for future cold spell frequency projection.