



## **Pan-European climate simulations using the HARMONIE limited area model – the benefit of ”grey zone” horizontal resolution for precipitation and its extremes.**

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There are well known difficulties to run numerical weather prediction and climate models at resolutions traditionally referred to as ”grey-zone” ( $\sim 3-8$  km) where deep convection is neither completely resolved by the model dynamics nor completely sub-grid. In this study we describe the performance of an operational NWP model, HARMONIE, in a climate setting (HCLIM), run at two different resolutions (6km and 15km) for a ten-year period; 1998-2007. This model has a convection scheme particularly designed to operate in the ”grey-zone” regime and has been shown to increase the realism and accuracy of the time and spatial evolution of convective processes compared to more traditional parametrizations. HCLIM is evaluated against standard observational data sets over Europe as well as high-resolution, regional, observations. HCLIM shows that not only the large scale climate is very well represented but also on the regional scale and for higher order climate statistics the model is in good agreements with observations. The added value when making climate simulation at  $\sim 5$  km resolution compared to more typical RCM resolutions is mainly seen for the very rare, high precipitation events. HCLIM at 6 km resolution reproduces the frequency and intensity of these events better than at 15 km resolution and is in closer agreement to the high-resolution observations.