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Investigation of future climate characteristics over the Carpathian Region by “tuning” CORDEX temperature time series – a new perspective

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The answers to the following questions ‘What are the consequences of climate change (warming)...?’ and ‘By when do we have to be prepared for that level of climate change (warming)?’ must be given only with caution. On the one hand, regional or local changes can be inconsistent with global changes, as local processes might not accurately interpreted by global climate models (GCMs) due to their relative coarse resolution. On the other hand, climate model simulations’ outputs are prone to biases compared to observations; furthermore, climate projections can be very different in modelling future temperature characteristics. In this context, while the magnitude of expected change described by a climate model may seem to be reasonable, but the projected temperature is not necessarily realistic (considering the model’s relative bias compared to observations). More specifically, the standard procedure of assessing climate change can be illustrated by taking the mean for a future period (e.g. 2070–2099) and compute the change relative to a reference period (e.g. 1976–2005). Keeping in mind the expected changes based on those projections might come with high degree of uncertainty as simulations might show different mean temperature values for the same assessed periods with even a range of few degrees of °C. When regional climate change is assessed based on at a given regional warming level (WL, e.g. 1.5 °C) added to the observed mean, then the aforementioned uncertainty range is reduced as the models (GCM or regional climate models) are assessed with respect to the same 30-year mean temperature value, but not for the same periods (noting that the WL is defined at regional and not at global scale). Thus the uncertainty of expected changes with regard to temperature can be significantly reduced. In this case an additional uncertainty factor might rise: time, as climate models can reach that WL at different times. Accordingly, we can give information on relative changes with a specific uncertainty as a metric based on the timing of reaching the assessed WL. Aim of the present work is to illustrate the feasibility of this concept for the region of the Carpathian Basin based on high-resolution EURO- and Med-CORDEX simulations.