

EGU24-6068, updated on 14 Feb 2025

<https://doi.org/10.5194/egusphere-egu24-6068>

EGU General Assembly 2024

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21st Century climate change in the European Alps and its elevation dependency

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Climate change is a global phenomenon with regionally varying peculiarities. It is well known that mountainous regions are highly sensitive to climate change. Furthermore, the complex orography exerts a strong control on the expected impacts that often depend on several controlling factors such as elevation, slope, land use etc.. In addition, climate models introduce errors in reproducing local physical processes due to their coarse spatial resolution and partly poorly constrained parameterisations.

Elevation Dependent Climate Change has been observed in the European Alps as a consequence of the interplay of global warming and the specific Alpine orography. The Alpine region is considered as a climate change hot-spot given that a large portion of this region has warmed about twice as much as the global average with warming rates characterised by a strong dependence on elevation. On the contrary, observed precipitation trends show very high spatial variability, sometimes with significant dependence on the elevation. In this study we analyse these complex Alpine temperature and precipitation change patterns with the elevation in the EURO-CORDEX ensemble of regional climate models at 0.11° resolution including CORDEX-Adjust (bias-adjusted CORDEX simulation) and compare these results to different model outputs characterised by coarse grid resolution (GCMs, e.g. CMIP5) and selected convection permitting models. The future trends of climate indices covering both the mean the extremes are explored across spatial scales and different RCPs. This study includes also analysis of the effects of different bias-adjustment techniques on the trend reproduction.