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User tailored climate change projections for Slovenia

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Successful climate change adaptation requires the knowledge of the change in climate in the future. Beside the average changes of meteorological conditions due to climate change, it is also very important to estimate the frequency, intensity and duration of extreme weather events due to their impact on environment and society. This is the reason that Slovenian Environment Agency (ARSO) initiated a project The assessment of the average and extreme meteorological and hydrological conditions in Slovenia over the 21st century (OPS21). Additionally to assessment of basic climate variables, the objective of the project was the estimation of the climate change impact on hydrological and agricultural conditions.
The assessment of the future climate and hydrological conditions is focused on three 30-year periods: near future 2011–2040, mid-century 2041–2070 and end of the century 2071–2100. It is based on the error-corrected 0.11° regional models simulations of the EURO-CORDEX initiative. Three different greenhouse gas emissions scenarios were taken into account. From available model simulations, six were chosen on the basis of a good agreement between historical runs and observed data and with different combination of global/regional climate models to take into consideration as much future variability as possible. Temperature, precipitation and calculated reference evapotranspiration data were error-corrected with a modified method of quantile mapping, which preserves consistency between temperature and precipitation and does not change original model trends of individual variable. Reference data were 1981–2010 observations, interpolated into a regional model grid with kriging.
After assessment of temperature and precipitation changes, the impact of those changes on hydrological cycle, agricultural conditions, energy production and consumption condition was assessed. Different aspect of changes were investigated with special focus on extreme conditions.
Beside the changes of average hydrological cycle, the extreme hydrological conditions were investigated. This information is essential for long-term strategic plans in spatial planning and hydro energy production. Both, changes in low and high river flow were assessed and trends in river flow return levels were calculated using GEV. The results show that in the eastern part of Slovenia the risk of food will become higher in the winter, irrespective to emission scenario.
In Slovenia, farmers have already experienced climate change impact. Two phenomena, droughts and spring frosts, with very high agricultural impact, were investigated under the changed climate conditions in the future. The results show that the risk of droughts will be higher in the future, following the emission scenarios RCP4.5 and RCP8.5. On the other hand, the risk of spring and autumn frosts would not change significantly, taking into account projections uncertainty.