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Project OPS21: The assessment of the average and extreme meteorological and hydrological conditions in Slovenia over the 21st century

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Slovenian Environment Agency (ARSO) is running a project OPS21, The assessment of the average and extreme meteorological and hydrological conditions in Slovenia over the 21st century, which is now in its second half phase. Successful climate change mitigation and adaptation require 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. In April 2016 ARSO initiated a project for estimating average and extreme meteorological conditions over the 21st century. Additionally, the objective of the project was the estimation of the impact of climate change on agricultural and hydrological conditions.

The assessment of the future climate and hydrological conditions is focused on three 30-year periods: near future 2011–40, 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 all simulations, 6 were chosen on the basis of a good agreement between historical runs and observed data and with different combination of global/regional climate models with a main objective 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.

The assessment of the future change of different meteorological conditions and in change of frequency and duration of extremes was done for every model and every model cell independently. Statistical significance of changes in the future with regard to present time was done with t-test and Wilcoxon-Mann-Whitney test, while trends in intensity of extremes were estimated with nonstationary methods of extreme values analysis, the GEV method and with point process method. At the end, the results of 6-member ensemble were combined and uncertainty of projections was estimated in two ways, as a hypothesis testing for a change to happen and as a calculation of confidence intervals.

By now, we already analyzed changes in temperature and temperature related extremes, precipitation and precipitation related extremes, potential evapotranspiration and water deficit. Error corrected simulations of temperature, precipitation and potential evapotranspiration were used in hydrological model to assess impacts of climate change on surface water discharges and in water balance model to assess ground water recharge. They were also used in assessment of soil moisture changes, soil temperature changes and future frost risk.