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Projected changes of temperature and temperature related extremes for Slovenia over the 21st century

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Future changes of temperature and temperature related extremes are of very high importance for strategic decisions and planning almost in every sector (civil engineering, agriculture, health, tourism, ...). For Slovenia, those changes were assessed in the frame of a large project where the main goal was an assessment of climate change on the territory of Slovenia over the 21st century.

The assessment of temperature changes is based on bias corrected regional climate model simulations ensemble from the EURO-CORDEX initiative. They were assessed for three different periods: near future (2011–2040), mid-century (2041–2070) and end of the century (2071–2100) and three different GHG emissions scenarios: RCP2.6, RCP 4.5 and RCP8.5.

The projected increase of annual and seasonal mean temperature is consistent with large scale warming over the Europe. It is amplified in summer and winter, and moderate in spring and autumn. While during the first period (2011–2040) there are no significant differences between temperature increase for different GHG emissions scenarios, at the end of the century the temperature increase strongly depends on it.

To assess changes of extreme temperature conditions several ETCCD temperature indices were calculated. For both, extreme minimum and maximum temperature indices, there are significant regional differences in changes, mostly dependant on elevation and distance to the sea. In comparison to mean temperature changes, the changes in extreme temperature are significantly different for different RCPs already in the second time period. While one of the biggest climate change threats to society are summer heat waves, also the change of their intensity, frequency and duration was assessed, based on two methodologies: EFH and HWMId.

Heat wave based on EHF methodology is defined as every three or more consecutive days long period when average daily temperatures are higher than climatological 95th percentile and higher than average temperature of 30 preceding days. Heat wave in HWMId methodology is defined as every three or more consecutive days with maximum temperature above the daily threshold for the reference period 1981–2010 (90th percentile daily maximum temperature).

There are significant changes between the results of two methodologies regarding the changes in number and duration of heat waves. While the EFH method predicts only a minor change in number of heat waves but strong increase of their duration, it is the other way around for HWMId. However, both methods give the consistent results regarding RCPs. There would be no significant changes of heat waves in case of RCP2.6. For both other two scenarios, we can expect moderate changes in magnitude of heat waves in the second period (2041–2070). At the end of the century, the heat waves would strongly intensify only in case of RCP8.5.