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Heat stress in Switzerland: from climate projections to user-relevant information

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Global mean temperature is projected to increase until the end of the 21st century under all emission scenarios. Likewise, temperature extremes such as the highest daily temperature, the number of tropical nights or heat wave intensity and duration are projected to increase. Under hot conditions the human body is able to regulate its core temperature via sweat evaporation, but this ability is reduced when air humidity is high. These conditions invoke heat stress which is a major problem for vulnerable groups of the population and people doing physical work. In this context, climate services play a crucial role by bridging the gap between meteorological information and sustainable solutions to mitigate future heat stress.

In the present work we explore the CH2018 Swiss climate scenarios (www.climate-scenarios.ch) in order to present 1) climate change projections of heat stress considering different sources of uncertainty and 2) applications of such climate projections in the framework of climate services. Heat stress is expressed through the Wet Bulb Temperature (TW), which is a relatively simple proxy for heat stress on the human body and which depends non-linearly on temperature and humidity. A large ensemble of state-of-the-art RCM simulations from the EURO-CORDEX initiative is used to produce climate change projections of TW. Model data are statistically adjusted to the local, site-specific climate at 67 Swiss locations through empirical quantile mapping prior to the TW calculation.

Climate change projections indicate increasing heat stress over Switzerland, which is accentuated towards the end of the century. Heat stress events (more than 3 consecutive days with TW>22°C) might be about 3-5 times more frequent for the strong RCP8.5 emission scenario than for the RCP2.6 mitigation scenario by the end of the 21st century. Climate analogs are used as an example of application to derive user-relevant information from the climate scenarios. These are locations that experience a climate today that is similar to the projected (i.e. the future) climate of a given site of interest. In this study climate analogs are identified based on similarity in the frequency and mean length of heat stress events. Our results show that climate analogs by the end of the 21st century for Swiss stations at low elevations highly depend on the emission scenario, moving from Central Europe under the mitigation scenario, to Mediterranean, coastal locations under the strong emission scenario. These results highlight the importance of timely and precise prevention strategies in the context of heat-health action plans.