M6.2 Modelling with WRF-TEB

The results of the different WRF/TEB runs highlight the potential of the different adaptation measures. Irrigation of the arable land in the surrounding of Vienna (Marchfeld) shows a clear cooling effect of up to 3 K during daytime, but only at the place of irrigation. The cooling effects propagate a little bit into the city borders of Vienna, but only in order of 1 to 2 km and the cooling effect is strongly reducing with the distance to the irrigated area. It is not crossing the Danube. The irrigation cooling effect is a little bit reduced, when considering the humidity effect. During the nighttime the cooling irrigation vanishes totally.

Optimized green infrastructure unfolds its effect directly in the city and reaches a similar magnitude of up to 3 K during daytime (Fig. 14). But here also a moderate cooling effect of up to ~ 1 K can be seen during nighttime (Annex A 31). This means that optimized green infrastructure can reduce the urban heat island effect. The model experiments also highlight the limits of adaptation concerning urban heat waves. On the spatial average of the whole city of Vienna the maximum cooling effect is in the order of 1 K and this is only for some hours during noon (Fig. 15). During nighttime the cooling only reaches a value of ~ 0.5 K for the whole city area. Considering the warming trends of the last 40 years of ~ 0.5 K per decade, all adaptation measures investigated together can only compensate for 1 decade warming during nighttime and 2 decades warming during daytime.

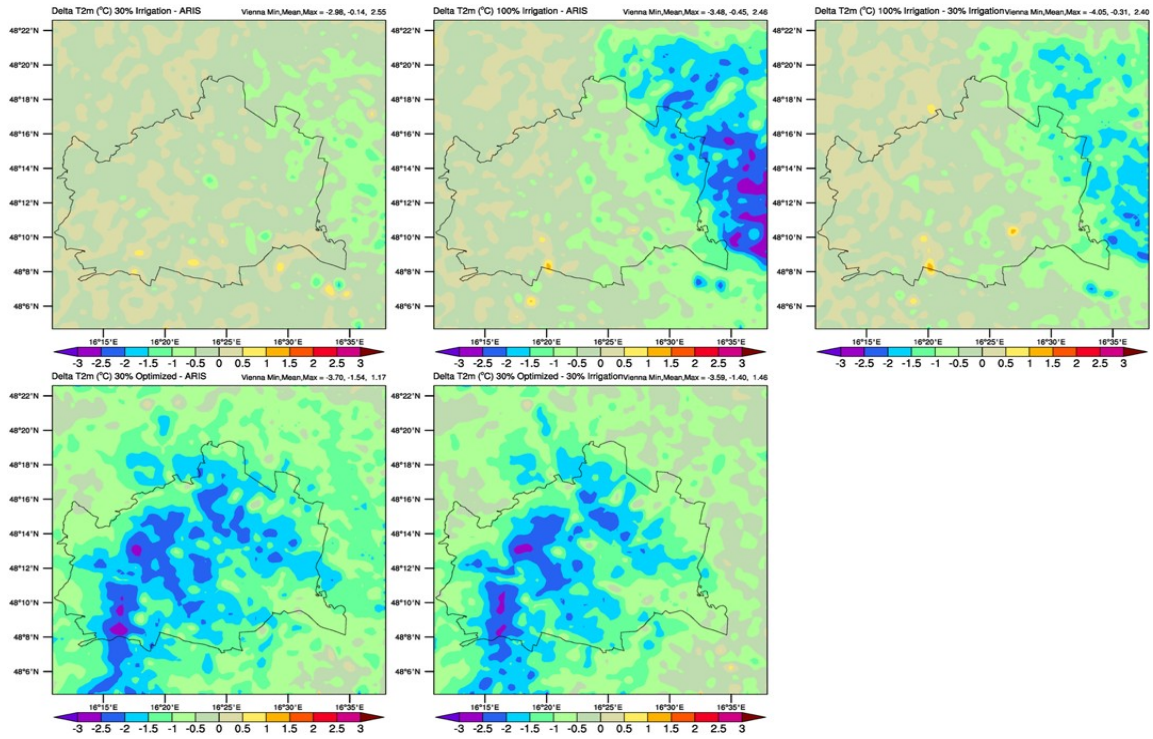

Figure 14. Daytime reduction of 2m air temperature between different irrigation scenarios. First row: (a) 30% irrigation Marchfeld (30% Irr – ARIS), (b) 100% irrigation Marchfeld (100% Irr – ARIS), (c) Cooling archieved by increase of 30 to 100% irrigation in Marchfeld (100% Irr – 30% Irr), second row: (d) cooling effect of green roofs, more vegetation in the city and 30% irrigation in Marchfeld (OPT – ARIS), (e) cooling effect of green roofs and more vegetation in the city (OPT – 30% Irr).

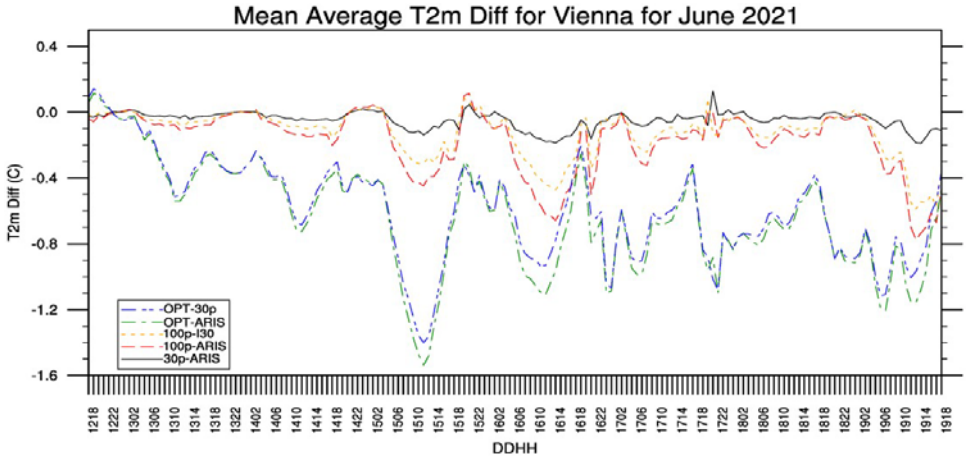

Figure 15. Timeseries difference plot showing the influence of: (1) Optimized green infrastructure in Vienna (OPT-30% Irr), (2) Maximum green cooling effect using vegetation and irrigation in Vienna and Marchfeld (OPT-ARIS), (3) Difference between 30% and 100% of Marchfeld being irrigated (100% Irr – 30% Irr), (4) effect of 100% irrigation of Marchfeld (100% - ARIS), (5) effect of 30% irrigation of Marchfeld (30% - ARIS).