

EGU22-1204, updated on 06 Oct 2022

<https://doi.org/10.5194/egusphere-egu22-1204>

EGU General Assembly 2022

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Less-deadly heatwaves due to soil drought

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Global warming increases the number and severity of deadly heatwaves. Recent heatwaves often coincided with soil droughts that acted to intensify air temperature but lower air humidity. Since lowering air humidity may reduce human heat stress, the net impact of soil desiccation on the morbidity and mortality of heatwaves remains unclear. Combining weather balloon and satellite observations, atmospheric modelling, and meta-analyses of heatwave mortality, we find that soil droughts—despite their warming effect—lead to a mild reduction in heatwave lethality. More specifically, morning dry soils attenuate the afternoon heat stress anomaly by ~5%. This occurs due to reduced surface evaporation and increased entrainment of dry air from aloft. The benefit appears more pronounced during specific events, such as the Chicago 1995 and Northern U.S. 2006 and 2012 heatwaves. Likewise, our findings suggest that irrigated agriculture may intensify lethal heat stress, and question recently proposed heatwave mitigation measures involving surface moistening to increase evaporative cooling.

The manuscript of the findings is in press for Science Advances.