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Varying drivers of humid heat extremes over Africa

Cathryn Birch[1], Richard Keane[2], and John Marsham[3]
[1]School and Earth and Environment, University of Leeds, Leeds, UK (c.e.birch@leeds.ac.uk)
[2]Met Office, Exeter, UK (R.J.Keane@leeds.ac.uk)
[3]University of Leeds Met Office Strategic (LUMOS) Research Group, School of Earth and Environment, University of Leeds, UK (J.Marsham@leeds.ac.uk))

Africa is particularly vulnerable to present day and future temperature extremes due to its (sub)tropical location, its growing population and the challenges of adapting to extreme heat in many of its regions. Globally, the vast majority of past research on the drivers of heatwaves is focused on dry bulb temperature extremes. The drivers of humid heat extremes vary by location and there is limited understanding of the drivers in all parts of the world, but particularly over Africa. Previous published research by the authors showed increased humidity, cloud, rainfall and/or evaporation drive events over most of Africa. However, across the central African equatorial belt, where absolute values of wet bulb temperature are highest, humid heat extremes are driven by both increased temperature and humidity, and cloud and rainfall anomalies are less important. Here we use ERA5 reanalysis to identify multi-day, large-scale humid heat events over different regions of Africa and quantify the roles of moisture transport, cloud, rainfall and atmospheric circulation. We compare and contrast the different sub-tropical and tropical climatic regions of Africa and present a detailed case study of coastal East Africa. East Africa is of particular interest due to its high climatological wet bulb temperatures, its high population, and its coastal location where the land-sea breeze may be a key control on humid heat extremes. We identify the time of day and locations in coastal East Africa that experience the highest daily maximum wet bulb temperatures and discuss the controlling factors.