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Climate change induced heat wave hazard in eastern Africa: Dar Es Salaam (Tanzania) and Addis Ababa (Ethiopia) case study

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Last decades, new records were set in the world for tornadoes, drought, wind, floods, wildfires and hot temperatures, testifying unusual weather and climate patterns with increasing frequency and intensity of extreme weather events. Extreme heat events are natural hazards affecting many regions in the world, nevertheless limited work has been done on the analysis and effects of extreme heat events in Africa, that is considered a continent particularly vulnerable to the effects of climate change. In fact, the increase of temperature expected in the African continent during the 21st century is larger than the global mean warming, being about 3° to 4° C, about 1.5 times the global temperature increase (Christensen et al., 2007; Gualdi et al., 2012), with the subtropical regions projected to warm more than the tropical regions. Observations and downscaled model simulations (RCP4.5 and RCP8.5 IPCC scenarios) are analyzed to describe heat wave characteristics in Dar es Salaam (Tanzania) and Addis Ababa (Ethiopia), spanning the last five decades as well as that projected for the 21st century. Observed data are daily maximum and minimum temperature collected in the period 1961-2011; downscaled model simulations span up to 2050. Heat waves are defined following a peak over threshold approach by statistical comparison to historical meteorological baselines (site dependent), using a fixed absolute threshold.
Projected future warming in the Dar es Salaam and Addis Ababa shows a further increase in the heat waves parameters. Heat wave duration and hot days number are strictly correlated showing that the temperature rise could generate not only an increase of heat waves number but mainly a longer average duration, that can strongly affect the resilience capacity of the population, particularly the elder people. In fact, the impacts of heat waves on the society are determined also by temporal duration (Stephenson, 2008), in addition to their frequency, in fact the capacity of adaptation can be reduced with prolonged exposure to high temperature and humidity.
The expected persistence of long-lived heat waves lasting approximately 1.5-2 weeks is clearly longer with respect to the climatological period (1961-1990). During 100 years, short lived but more intense waves are more than doubled in duration. It is evident the needs for the national health services to develop strategies for the mitigation of the heat wave effects, to enhance the resilience of the population, particularly the elder people.