



Can the 2011 East African drought be attributed to human-induced climate change?

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In early 2011, the Greater Horn of Africa was impacted by a particularly severe drought. It consisted of the failure of two successive rainy seasons, known in Kenya as the “short rains” (typically October to December) and the “long rains” (March to June). This study applies the technique of event attribution to the two rainy seasons preceding the drought of 2011, aiming to quantify how the probability of this event has changed due to anthropogenic climate change. Using observed sea surface temperatures (SSTs) with the state-of-the-art atmosphere model HadGEM3-A, the precipitation totals during late 2010 (the “short rains”) and early 2011 (the “long rains”) were simulated in a 100-member ensemble to produce possible distributions of precipitation consistent with observed SSTs, sea ice conditions and atmospheric concentrations of greenhouse gases. Several 100-member alternative “natural” distributions of precipitation (consistent with a world in which there was no human influence on climate) were also simulated by removing anthropogenic emissions in the atmosphere and by subtracting the difference in SSTs and sea ice that are due to anthropogenic forcings, as produced in a range of coupled atmosphere-ocean simulations (HadCM3, HadGEM1, HadGEM2-ES). Comparing these simulated precipitation distributions to the observed TAMSAT African rainfall dataset, no evidence was found for a human influence on the 2010 short rains, with their failure being more clearly affected by La Niña. However, human influence was found to significantly increase the probability of long rains as dry as, or drier than, those in 2011. The magnitude of this increase in probability depends on the pattern by which human influence is estimated to have changed observed SSTs, and in turn on the coupled model chosen to calculate this pattern. Combining all these analyses, they indicate that the drought in East Africa as seen in 2011 became more probable as a result of anthropogenic climate change.