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Countrywide climate features during recorded climate-related disasters

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Climate-related disasters cause substantial disruptions to human societies. With climate change, many extreme weather and climate events are expected to become more severe and more frequent. Not all of these events, however, lead to measurable impacts. The International Disaster Database (EM-DAT) records climate-related disasters associated with observed impacts such as affected people and economic damage on a country basis. Although disasters are classified into different meteorological categories, they are usually not directly linked to observed climate anomalies but based on reports from news agencies, non-governmental organizations and insurance companies besides others. Here we investigate country-wide climate features associated with disasters that occurred between 1950 and 2015 and have been classified as droughts, floods, heat waves and cold waves using superposed epoch analysis (SEA). We find that disasters classified as heat waves are associated with significant country-wide increases in annual mean temperature of on average 0.13 °C and a significant decrease in annual precipitation of 3.2 %. Drought disasters show temperature anomalies of 0.08 °C and a 4.8 % precipitation decrease. Disasters classified as droughts and heat waves are thus associated with significant annual countrywide anomalies in both temperature and precipitation. This highlights the importance of considering compound climate extremes instead of single driver events, so as not to underestimate risks associated with climate extremes. During years of flood disasters, precipitation increases by 2.8 %. Cold wave disasters show no significant signal for either temperature or precipitation. We further find that climate anomalies tend to be larger in smaller countries, an expected behaviour when computing country-wide averages. In addition, our results suggest that climate-related disasters in developed countries are typically associated with larger climate anomalies compared to developing countries. This effect could be due to different levels of vulnerability, as a climate anomaly needs to be much larger in a developed country to cause a societal disruption. Our study thus highlights the importance of climate hazards for disaster risk, emphasizing the relevance of well-informed climate hazard projections. To link disasters with specific climate events, more detailed information on the timing and location of disasters is necessary. In conclusion, our findings suggest that changing hazard likelihoods and intensity due to climate change will play a major role in shaping disaster risk in the future.