EMS Annual Meeting Abstracts
Vol. 15, EMS2018-395, 2018

An new reason why we should see more extremely high precipitation amounts

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An increase in evaporation and higher cloud tops can explain why we should expect more extreme precipitation with a global warming. However, there are also additional factors. We find that the area of 24-hr precipitation appears to have decreased by 7% between 1998 and 2016, based on satellite measurements between 50°S and 50°N. This implies more concentrated rainfall over a smaller area of the Earth's surface. Such a reduction in area may be a consequence of changes in the cloud statistics and the apparent increase in the atmospheric overturning. The global area of precipitation is key to Earth's hydrological cycle and changes to its state are connected to changes to the greenhouse effect. Still, the precipitation area has not previously received much attention. In addition, there are key precipitation parameters that have not been widely utilised, related to the precipitation area. A decrease in the area implies changes in 24-hr rainfall parameters such as the wet-day frequency f_w and the wet-day mean precipitation μ. Furthermore, there is a simple formula based on these parameters which can be used estimate probabilities for heavy 24-hr rainfall, on par with the normal distribution for temperature anomalies. We demonstrate how this "rain equation" $Pr(X > x) = f_w \exp(-x/\mu)$ is able to quantify the likelihood of excessive amounts around the world, almost without exception. Our results show that this equation is able to capture variations in the number of events compared with observed number of events. A systematic dependency of f_w and μ on large-scale conditions enables the estimation of probabilities of heavy rainfall. Furthermore, trends in wet-day frequency and mean precipitation explain whether an increase in heavy precipitation is due to more rainy days or more intense rainfall or both.