



Observed heavy precipitation increase confirms theory and early models

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Environmental phenomena are often first observed, and then explained or simulated quantitatively. The complexity and diversity of processes, the range of scales involved, and the lack of first principles to describe many processes make it challenging to predict conditions beyond the ones observed. Here we use the intensification of heavy precipitation as a counterexample, where seemingly complex and potentially computationally intractable processes to first order manifest themselves in simple ways: the intensification of heavy precipitation is now emerging in the observed record across many regions of the world, confirming both theory and a variety of model predictions made decades ago, before robust evidence arose from observations. As the anthropogenic climate signal strengthens and computational capacity increases, there will be more opportunities to test past and present predictions against observations and across a hierarchy of different models and theoretical concepts. Our confidence is highest in those model predictions which are supported by theory and observed trends but the challenge remains to identify where this is the case.