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A strong temperature dependence in intense-storm rainfall indicated by inter-hemispheric contrast of storms

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Extratropical cyclones, a major element of day-to-day weather in the midlatitudes, comprise fine-scale cold and warm fronts, and imbedded fine-scale storms, as part of an organized cloud-precipitation system. They are sometimes associated with intense precipitation that can lead to flash floods. In the past, it has been difficult for both climate models and satellite observations to capture the statistical features of the fine-scale precipitation systems embedded within cyclones. Here we use a state-of-art global high-resolution model and a new satellite dataset, which for the first time are able to resolve such features in the midlatitudes, to study the climatology of the mean precipitation from intense cyclones and its expected changes with warming. Comparisons to observations suggest that the model realistically represents the observed averaged spatial pattern of the precipitation around intense cyclones in the present climate. Simulations show that, for the most intense cyclones, the precipitation depends on surface air temperature following the Clausius-Clapeyron scaling of 7 % K^{-1}, which holds for any combinations of hemispheres and climates. Our findings indicate that hemispheric contrast in the present day climatology of intense cyclones provide a compelling indication of how they will change with future warming.