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Extreme atmospheric rivers in a warming climate

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Extreme atmospheric rivers (EARs) are responsible for most of the severe precipitation and disastrous flooding along the coastal regions in midlatitudes. However, the current non-eddy-resolving climate models severely underestimate (~50%) EARs, casting significant uncertainties on their future projections. Here, using an unprecedented set of eddy-resolving high-resolution simulations from the Community Earth System Model simulations, we show that the models' ability of simulating EARs is significantly improved (despite a slight overestimate of ~10%) and the EARs are projected to increase almost linearly with temperature warming. Under the Representative Concentration Pathway 8.5 warming scenario, there will be a global doubling or more of the occurrence, integrated water vapor transport and precipitation associated with EARs, and a more concentrated tripling for the landfalling EARs, by the end of the 21st century. We further demonstrate that the coupling relationship between EARs and storms will be reduced in a warming climate, potentially influencing the predictability of future EARs.