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# Observed and simulated precipitation responses in wet and dry regions

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Global warming is expected to enhance fluxes of fresh water between the surface and atmosphere, causing wet regions to become wetter and dry regions drier, with serious implications for water resource management. Defining the wet and dry regions as the upper 30% and lower 70% of the precipitation totals across the tropics (30S–30N) each month we
combine observations and climate model simulations to understand changes in the wet and dry regions over the period 1850–2100. Observed decreases in precipitation over dry tropical land (1950–2010) are also simulated by coupled atmosphere–ocean climate models (-0.3%/decade) with trends projected to continue into the 21st century. Discrepancies
between observations and simulations over wet land regions since 1950 exist, relating to decadal fluctuations in El Ni˜no southern oscillation, the timing of which is not represented by
the coupled simulations. When atmosphere-only simulations are instead driven by observed sea surface temperature they are able to adequately represent this variability over land. Global distributions of precipitation trends are dominated by spatial changes in atmospheric
circulation. However, the tendency for already wet regions to become wetter (precipitation increases with warming by 3%/K over wet tropical oceans) and the driest regions drier (precipitation decreases of -2%/K over dry tropical land regions) emerges over the 21st century in response to the substantial surface warming.