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mountains, no mountains and the Atlantic Meridional Overturning Circulation

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Using a global ocean-atmosphere general circulation model, we show that the presence of the Earth's major mountain ranges favours a strong Atlantic meridional overturning circulation (AMOC) and suppresses overturning in the Pacific. A simulation with mountains has a maximum AMOC of $\sim$18Sv compared to $\sim$0 Sv for a simulation without mountains. In the Pacific, the corresponding overturning strengths are $\sim$0 and $\sim$10Sv respectively. Removal of the mountains results in rapid reduction of the AMOC, lasting about a century because of increased precipitation due to removal of the Rocky Mountains and positive feedback from reduced southward freshwater transport. Subsequent slower reduction of the AMOC occurs over several centuries because midlatitude evaporation diminishes as a consequence of weakening air-sea temperature and humidity difference. In the Pacific, overturning is kick-started by a reduction in precipitation and runoff, but the sustained increase is caused by increases in evaporation due to warming of the surface waters in the North Pacific.