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# Spatially explicit simulations of the effect of tidal energy dissipation on the climate on early Earth

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The potential impact of the increased rates of tidal energy dissipation on the climate on early Earth is usually assessed in terms of the global contribution to the energy balance which is small compared to the incoming solar radiation. However, tidal energy dissipation depends strongly on the distribution of landmasses, and regional energy input could, in principle, impact the local and global climate state via changes in circulation patterns and feedbacks in the Earth system. Here we investigate these effects by calculating tidal energy dissipation for a randomly generated continental distribution representative of early Earth, and three different rotation rates, and feeding it into a coupled climate model. Despite marginal global impacts, tidal energy dissipation can have significant regional effects caused by changes in ocean circulation and amplified by the ice-albedo feedback. These effects are strongest in climate states and regions where meridional heat transport close to the sea-ice margin is altered. This suggests that tidal heating could have contributed to sustaining regions with no significant ice cover.