The effects of CO$_2$ increase and its link to the mass extinction at the Permo-Triassic boundary

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The Permo–Triassic Boundary (PTB) marks a time of profound climatic change. Near the PTB (~252 Ma), the largest known mass extinction occurred with more than 90% of marine species and 70% of terrestrial species became extinct. The mass extinction is linked to a massive warming event at the PTB, where tropical regions became too hot for survival of species. The increase in atmospheric CO$_2$ during the Permian and the PTB is mainly attributed to the decrease of chemically weatherable fresh silicate rock due to orogenesis, and the CO$_2$ released in the atmosphere from the Siberian Traps. In this study, we use the UK Met Office fully coupled HadCM3L General Circulation Model (GCM) to perform Permo-Triassic climate simulations with different atmospheric CO$_2$ values that encompass most of the estimates of atmospheric CO$_2$ concentration during this time, to provide more insights about the climate changes during the end Permian – early Triassic. Specifically, we focus on: a) the spatial extension of dry conditions/lethally hot temperatures under different CO$_2$ conditions, b) the seasonal surface temperature difference and precipitation changes at higher latitudes and c) the effects of increased atmospheric CO$_2$ on the large-scale wind and monsoonal circulation.