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Future changes in Australian East Coast Cyclones based on convection permitting simulations

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Changes in the intensity of the most extreme Australian East Coast Lows (ECLs) are of the highest importance from a socio-economic point of view as ECLs are responsible for much of the high-impact weather affecting the east coast of Australia including damaging winds, large ocean waves and more than half of all major floods. To assess possible future changes in these systems, we have created a large ensemble of simulations using the Weather Research and Forecasting model and a triple nesting approach with a large inner domain run at convection permitting resolution (2 km). The ensemble allows to assess the sensitivity of some of the key drivers that might lead to future changes including the role of diabatic heating, sea surface temperatures (SSTs) and large-scale atmospheric boundary conditions. The evaluation of the historical simulations using precipitation and ocean wind datasets shows an overall good performance with little differences among the various configurations of the model and the specific SSTs. The largest differences in the performance of the ensemble are related with the specific large-scale conditions. The analysis of future changes in ECLs shows systematic increases in precipitation rates irrespective of the resolution and the multi-physics member considered with larger scaling rates for the highest resolution simulations. Differences in the scaling rates appear to be associated with some dynamical contribution within the storm. On the other hand, no clear changes arise in near surface wind speeds in future simulation compared with the historical values suggesting that the overall intensity of the storms remain unchanged.