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Future changes in extra-tropical cyclones in HadGEM1

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Extra-tropical cyclones strongly influence weather and climate in mid-latitudes and any future changes in the frequency, distribution or intensity of these cyclones may have large impacts on the local scale. In this study extra-tropical cyclones are located and tracked in mean sea level pressure and 850 hPa relative vorticity data at 6 hourly intervals from experiments carried out with the HadGEM1 coupled ocean-atmosphere model. HadGEM1 has a horizontal resolution of N96 (1.25° latitude x 1.875° longitude). The experiments include a pre-industrial control, a fixed 2xCO2 experiment and an IPCC SRES A1B experiment. The simulated cyclone track densities in the control experiment compare fairly well with observations in all seasons. In the future simulations there are fewer Northern and Southern Hemisphere storms in winter. There are more storms with central pressure below 970 hPa in the Southern Hemisphere, but no shift to deeper storms in the Northern Hemisphere. The tracks shift pole-wards in both hemispheres, except at the easterly end of North Pacific and North Atlantic tracks. The patterns of changes are broadly similar in all experiments and the magnitude of the changes generally increases as the temperature rises. The future changes in storms simulated by HadGEM1 show some similarities to those of earlier Hadley Centre models, e.g. fewer Northern Hemisphere winter storms, but the regional changes vary between the models, showing that large uncertainties remain.