

EGU21-11746, updated on 14 Jun 2021
<https://doi.org/10.5194/egusphere-egu21-11746>
EGU General Assembly 2021
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Explosive Cyclones in the CORDEX-CORE projections for Southern Hemisphere domains

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Explosive cyclones (ECs) are extratropical systems, often associated with extreme events, which experience a fast deepening (~24 hPa/24 h) over a relatively short time range. Here, we analyze changes in the austral winter characteristics of ECs in three domains (Africa-AFR, Australia-AUS and South America-SAM) as projected by Regional Climate Model (RegCM4) under RCP8.5 emission scenario in the CORDEX-CORE framework. RegCM4 was nested in three global climate models (GCMs) from CMIP5 (HadGEM2-ES, MPI-ESM-MR and NorESM-1M) and executed with 25 km of grid spacing. The cyclone database was obtained with the application of an automatic detection and tracking scheme to the 6-hourly mean sea level pressure fields. Extratropical cyclones with explosive features are then selected using the Sanders and Gyakum criterium. Following IPCC recommendation, we analyze the reference 1995–2014 period and the end-of-century 2080–2099 period. ECs represent ~13–17% of the total number of cyclones in ERA-Interim reanalysis during the austral winter, while the simulation ensembles, in general, underestimate this value. While in the AFR domain GCMs ensemble represents better the percentage of ECs compared to ERA-Interim, in AUS and SAM domains RegCM4 has a better performance than GCMs. The percentage of ECs compared to the total number of cyclones in each domain is projected to increase, with higher positive trends for the SAM domain (7.4% in GCMs and 5.6% in RegCM4) than AFR (3.3% in GCMs and 3.9% in RegCM4) and AUS (3.9% in GCMs and 1.7% in RegCM4). Compared to the present climate, ECs in the future will be stronger and faster but with a shorter lifetime.