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Long-term changes in thunderstorm environments over Europe and the United States in response to a globally warming climate

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The recent release of the ECMWF ERA5 reanalysis presents a significant opportunity for severe thunderstorm climatology. The reanalysis horizontal grid spacing of 0.25 degree combined with 137 sigma vertical levels and 1-hourly temporal resolution allow exploration of previously undiscovered aspects of convective environments, their associated parameters and diurnal cycle. In this study preliminary results for the climatological characteristics of convective parameters over Europe and United States for the 40-year period from 1979 to 2018 will be described. Parcel parameters are computed using the native model data reaching up to 20 km above ground level. The choice to use model levels is found to allow for superior characterization of parameters such as convective inhibition or most-unstable parcels which are sensitive to vertical resolution. Long-term changes will be analyzed in the context of spatial, diurnal, annual and monthly cycles of parameters characterizing thermodynamic instability and vertical wind shear. The results from this study will provide further understanding as to potential connections to a warmer world over both Europe and the United States, along with context for the processes driving shifts in the convective environments. Preliminary results regarding long-term changes indicate that as the increase in thermodynamic instability is observed the mean vertical-wind shear decreases.