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Future changes of circulation types associated with extremes over Sweden

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The large-scale atmospheric circulation is one of the most important factors influencing weather and climate conditions on different timescales. Its short- and long-term changes considerably determine both mean and extreme values of surface parameters like temperature or precipitation rates. Future changes of circulation patterns are of particular interest as these may significantly alter or amplify the expected thermodynamic changes due to changing concentrations of greenhouse gases, albedo and land use. We analyse both historical as well as future climate simulations of the SMHI large ensemble (S-LENS) performed with the EC-Earth3 global climate model to examine large-scale circulation situations and their association to extremes in precipitation and temperature over Sweden. Various methods exist to classify mostly sea level pressure or geopotential height fields into characteristic circulation types, and we compare several of these methods for their applicability to represent precipitation and temperature variability over our region of interest. S-LENS consists of a 50-member ensemble for a historical period (1970-2014) and four 50-member climate change scenario ensembles covering the 21st century differing in terms of assumptions made for future radiative forcing development. We study the efficiency of circulation types in the historical period to give rise to extremes, and examine further the frequency and within-type changes of those circulation types associated with extremes by the middle and the end of the 21st century under the different climate change scenarios. S-LENS with its comparatively large number of both multi-decadal scenarios and realizations for each scenario serves as a perfect testbed to study potential changes in events of low frequency within the environment of a single model.