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# Polar low variability and future change diagnosed by a dynamically downscaled global climate model ensemble

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17 members of NCAR's CESM Large Ensemble (LENS) are dynamically downscaled to a 12 km horizontal grid mesh using the quasi-hydrostatic ALARO model within the HARMONIE script system running in climate mode (HCLIM-ALARO). The domain covers the Norwegian, Greenland, Barents, and Kara Seas. Three time-periods are used: years 1990–2005 from the historical period, and years 2026–2035 and 2071–2080 from the RCP8.5 scenario, respectively. For comparison, the ERA-Interim reanalysis (1989-2010) is also downscaled using the same model setup.

A cyclone tracking algorithm is used to identify and track individual storms based on local vorticity maxima when the surface wind speed exceeds 15 m/s and the difference between the sea-surface temperature and the 500 hPa temperature exceeds 43 K. The climatology of cyclone strike maps, frequencies, and life times are compared between the different periods and model runs. For the future climate scenarios, the genesis region is diagnosed to move northward in accordance with the ice retreat. The preliminary results also indicate that in the Norwegian and Greenland Seas the number of polar lows decreases in the beginning and end of the season, while they increase in February. In the Barents Sea an increase in the occurrence of polar lows is produced in the model calculations, due to an increase in ice-free area. However, this region is more affected by positive ice biases in the historical period, which render the conclusion less certain. A specific feature of the global model ensemble is a pronounced mid-tropospheric temperature increase in the Arctic during the autumn. This is investigated and discussed along with changes in predominant circulation regimes.