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The role of tropopause polar vortices in the intensification of Summer Arctic cyclones

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Human activity in the Arctic is expected to increase as new regions become accessible, with a consequent need for reliable forecasts of hazardous weather. Arctic cyclones are synoptic-scale cyclones developing within or moving into the Arctic region. Meso- to synoptic-scale tropopause-based coherent vortices called tropopause polar vortices (TPVs) are frequently observed in polar regions and are a proposed mechanism for Arctic cyclone genesis and intensification. While the importance of pre-existing tropopause-level features for cyclone development, and their existence as part of the three-dimensional mature cyclone structure, is well established in the mid-latitudes, evidence of the importance of pre-existing TPVs for Arctic cyclone development is more limited. Here we present a climatology and characteristics of summer Arctic cyclones and TPVs, produced by tracking them in the latest global ECMWF reanalysis (ERA5), and determine the role of pre-existing TPVs in the initiation and intensification of these cyclones.