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Evolution of the stratospheric polar vortex in the Southern and Northern Hemispheres over the period 1979 – 2020

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The stratospheric polar vortex in the Southern Hemisphere plays an important role in the intensity of the stratospheric ozone destruction during austral spring, which started in the late 1970s. The so-called ozone hole has in turn influenced the evolution of weather patterns in the Southern Hemisphere in the last decades (WMO, 2018). The Northern Hemisphere polar vortex is less stable because of larger dynamical activity in winter. It is thus less cold and polar arctic ozone losses are less important. The seasonal and interannual evolution of the polar vortex in both hemispheres has been analyzed using meteorological fields from the European Center for Meteorology Weather Forecasts ERA-Interim reanalyses and the MIMOSA model (Modélisation Isentrope du transport Méso-échelle de l'Ozone Stratosphérique par Advection, Hauchecorne et al., 2002). This model provides high spatial resolution potential vorticity (PV) and equivalent latitude fields at several isentropic levels (675K, 550K and 475K) that are used to evaluate the temporal evolution of the polar vortex edge. The edge of the vortex is computed on isentropic surfaces from the wind and gradient of PV as a function of equivalent latitude (e.g. Nash et al, 1996; Godin et al., 2001). On an interannual scale, the signature of some typical forcings driving stratospheric natural variability such as the 11-year solar cycle, the quasi-biennial oscillation (QBO), and El Niño Southern Oscillation (ENSO) is evaluated. The study includes analysis of the onset and breakup dates of the polar vortex, which are determined from the wind field along the vortex edge. Several threshold values, such as 15.2m/s, 20m/s and 25m/s following Akiyoshi et al. (2009) are used. Results on the seasonal and interannual evolution of the intensity and position of the vortex edge, as well as the onset and breakup dates of the Southern and Northern polar vortex edge over the 1979 – 2020 period will be shown.

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