



A Climatology of Frozen-In Anticyclones in the Spring Arctic Stratosphere over the Period 1960-2011

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During springtime, following the stratospheric final warming, intrusions from low latitudes can become trapped at polar latitudes in long-lived anticyclones. Such “frozen-in” anticyclones (FrIACs) have occasionally been observed to persist as late as August, advected by summer easterlies.

In this study, the high-resolution advection contour model MIMOSA is used to advect a pseudo-potential vorticity tracer. The model is driven by ERA-40 and the ERA-Interim reanalyses over the period 1960-2011. We first identify a remarkable FrIAC event in spring 2011. In addition, we developed a method to detect the characteristic size of low-latitude intrusions into the polar region at the time of the spring transition, over the period 1960-2011. Years are classified as either Type-A when the intrusions are small, or as Type-B when intrusions are large, potentially evolving into FrIACs. For a FrIAC to occur, we require an additional criterion based on the in-phase character of the core of the intrusions and the anticyclone.

During the 52 analysed years, 9 events have been identified: 1 in the 1960s, 1 in the 1980s, 2 in the 1990s and 5 from 2002. FrIAC are predominantly long-lived intrusions, which occur in association with abrupt and early reversal to summer easterlies with a large heat flux pulse around the date of this wind reversal. Finally, the results are discussed in a climatological context.