



Identification and Climatology of Cut-off Lows near the Tropopause

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Cut-off low pressure systems (COLs) are defined as closed lows in the upper troposphere that have become completely detached from the main westerly current. These slow-moving systems often affect the weather conditions at the earth's surface and also work as a mechanism of mass transfer between the stratosphere and the troposphere, playing a significant role in the net flow of tropospheric ozone. In the first part of this work we provide a comprehensive summary of results obtained in previous studies of COLs.

Following this, we present three long-term climatologies of COLs. The first two climatologies are based on the conceptual model of a COL, using European Centre for Medium-range Weather Forecasts (ECMWF) analyses (1958–2002) and National Centers for Environmental Prediction–National Center for Atmospheric Research (1948–2006) reanalysis data sets. The third climatology uses a different method of detection, which is based on using potential vorticity as the physical parameter of diagnosis. This approach was applied only to the ECMWF reanalysis data. The final part of the paper is devoted to comparing results obtained by these different climatologies in terms of areas of preferential occurrence, life span, and seasonal cycle. Despite some key differences, the three climatologies agree in terms of the main areas of COL occurrence, namely (1) southwestern Europe, (2) the eastern north Pacific coast, and (3) the north China–Siberian region. However, it is also shown that the detection of these areas of main COL occurrence, as obtained using the potential vorticity approach, depends on the level of isentropic analysis used.