



Predictability of cut-off low systems occurrence using reforecasts

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Cut-off low pressure systems (COLs) are important mechanisms of stratosphere-troposphere exchange (STE). In cut-off low systems, the tropopause is anomalously low, thus contributing to produce STE by convective or radiative erosion of the tropopause. There are also two other possible mechanisms of STE: turbulent mixing near the jet stream associated with the cut-off system and tropopause folding along the system. Although smaller in magnitude, the STE is similar to that produced by tropopause folding associated with upperlevel cyclogenesis. The STE associated with COLs is essential to explain anomalous values of tropospheric ozone in northern mid-latitude and in subtropical areas.

Based in the larger scale climatology of these systems by Nieto et al. (2005) over the whole Northern hemisphere and using the CDC reforecast dataset (a dataset of 15 ensemble forecasts from 1979 to 2005 with a 2.5° by 2.5° resolution -version of the NCEP MRF 1998 model-), we will attempt to shed light on the prediction of COLs for a period valid in climatological time. Another objective is to find the most predictable seasonal distribution pattern for the main areas of occurrence of COLs using the 15 members of the ensemble for five years.

The same automated procedure by Nieto et al. (2005) was used to identify grid points that fitted the COL criteria. For this study we use geopotential, zonal wind, and temperature daily data from 250, 500 hPa. Cutoff systems northward of 70° or southward of 20° were not included in the study.

The total number of COLs, when the ensemble mean forecast is used, decreases exponentially in the medium range, beyond two to three days of forecasting. As in Nieto

et al. (2005) there are three preferred areas of cutoff low occurrence for the six first ensemble forecast time (12 to 72h): southern Europe and the eastern Atlantic coast, the eastern North Pacific, and the North China–Siberian region extending to the north-western Pacific coast.

In general, COLs are detected at higher latitudes between two to three days of forecasting. The frequency distribution as a function of latitude for the ensemble mean seems higher between a band of 30°-50°N (more than 70% of the systems), and very few systems was detected over 60°N.

0.1 Reference: R. Nieto et al. (2005), ‘Climatological features of Cut-off low systems in the Northern Hemisphere’. J. Climate 18, 2805-2823.