

Trends in the lower tropospheric wintertime cold pool over the past 65 years

by

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A large variety of in-situ and remote measurements point toward a general warming of the planet over the past century and a half. To date, it appears that no attempt at detecting the resulting warming in the lower troposphere has made use of the sophisticated reanalysis data sets that have been made available by various national weather and climate forecasting services (i.e. ERA-40 data, NCEP-NCAR reanalysis data, the Climate Forecast System Reanalysis data, etc.). We construct a 65-year time series of 4-times daily reanalysis data to compute the area, at high latitudes, covered by air whose temperature is below a series of threshold temperatures at 850 hPa. Calculation of the hemispheric area of this cold pool eliminates the parochial nature of individual time series and better testifies to the intensity of the cold season over the entire hemisphere and the variation of that intensity from year to year.

The analysis shows that the areal extent of the Northern Hemisphere wintertime cold pool has systematically decreased in the post-WWII era. This decline is considered in the context of hemispheric snow cover and arctic sea-ice trends as revealed by independent data sets. Trends in the distribution and frequency of wintertime cold air outbreaks over the last 65 years are also explored using these data.