Northern Hemisphere Warming: A thickness climatology (1951-2001)

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There is a growing body of evidence that suggests that the Northern Hemisphere has experienced significant warming over the past 20 years. Previous studies have indicated that the warming has been most appreciable during the cool season over the midlatitudes. In this study, a climatology of the 1000-500 hpa thickness is constructed, and the reflection of the warming on the Northern Hemisphere cold pool areal extent and intensity is examined. The climatology is based on the Reanalysis data set from the National Centers for Environmental Prediction (NCEP) on a 2.5 degree latitude-longitude grid for the period 1951-2001.

Preliminary results indicate that the area covered by the coldest air in the Northern Hemisphere (defined as 1000-500 hpa thickness < 498 dm) undergoes considerable inter-annual variability. A general decrease in the areal extent of the cold pool over the past two decades is also seen. Furthermore, the intensity of the cold pool, measured by the average minimum thickness during winter, has decreased during this period. These two results indicate that not only has the areal extent of the coldest air decreased, the cold pool has also reduced in intensity.

A comparison of the mean winter thickness over the periods 1951-1978 and 1979-2001 shows that that the land areas of the mid-latitudes have "warmed" during the latter period, while the oceans have "cooled" during the same period. The most significant increase in mean winter thickness is seen over Western Canada and Siberia, while the most significant decrease in thickness is observed over the North Atlantic. These results are consistent with the predominant sign of the North American ad Arctic oscillations during these two periods, suggesting a relationship between the increase in the strength of the zonal flow over the Northern Hemisphere and the observed warming.