



Amplification of warming due to intensification of zonal circulation in the mid-latitudes

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We propose a new index to evaluate the impact of atmospheric zonal transport oscillations on inter-annual variability and trends of average air temperature in mid-latitudes, Northern Hemisphere and globe. A simple model of mid-latitude channel “ocean-land-atmosphere” was used to produce the analytic relationship between the zonal circulation and the land-ocean temperature contrast which was used as a basis for index. An inverse relationship was found between indexes and average mid-latitude, hemisphere and global temperatures during the cold half of year and opposite one in summer. These relationships keep under 400 mb height. In winter relationship describes up to 70, 50 and 40 % of surface air temperature inter-annual variability of these averages, respectively. The contribution of zonal circulation to the increase in the average surface air temperature during warming period 1969-2008 reaches 75% in the mid-latitudes and 40% in the Northern Hemisphere. Proposed mid-latitude index correlates negatively with surface air temperature in the Arctic except summer. ECHAM4 projections with the A1B scenario show that increase of zonal circulation defines more than 74% of the warming in the Northern Hemisphere for 2001-2100. Our analysis confirms that the proposed index is an effective indicator of the climate change caused by variations of the zonal circulation that arise due to anthropogenic and/or natural global forcing mechanisms.