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Climatic Change and Dynamics of Northern Hemisphere Storm-tracks: Changes in Transient Eddies Behavior

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An evidence of our understanding of the general circulation is whether we can predict changes in the general circulation that might be associated with past or future climate changes. Changes in the location, intensity or seasonality of major climatological features of the general circulation could be more important than average temperature changes, particularly where these changes could affect local hydrology, energy balances, etc. Under these major climatological features we assume the poleward expansion of the tropical circulation (Hadley circulation), static stability (changes in the vertical temperature structure of the atmosphere), role of SST forcing, sea ice extension, extratropical eddies behavior.

We have a question: would the climate change significantly affect the location and intensity of midlatitude storm-tracks and associated jets? Mean-flow interaction in midlatitudes produces low-frequency variations in the latitude of the jets. It is reasonable to think that a modest climate change might significantly affects the jets location and their associated storm tracks. The storm-tracks are defined as the region of strong baroclinicity (maximum meridional temperature gradient), which are determined on the basis of eddy statistics like eddy fluxes of angular momentum, energy, and water (with the use of high-bandpass filter). In the Northern Hemisphere, there are two major storms: in the region of Atlantic and Pacific. The storm-tracks play important role in the dynamics of weather and climate. They affect the global energy cycle and the hydrological cycle, and as a result they bring heavy rains and other hazardous weather phenomena in the middle latitudes.

The recent increase in global tropopause heights is closely associated with systematic temperature changes below and above the tropopause. Temperature increases in the troposphere and decreases in the stratosphere. The pattern of warming and cooling also affects the zonal wind structure in the region of the subtropical upper troposphere and lower stratosphere (UTLS). Extratropical tropospheric eddies play a central role in this mechanism. The eddies tend to move eastward with the zonal flow and equatorward toward the subtropics until they reach their critical latitudes, where their phase speed equals the speed of the background zonal flow.

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