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成層圏オゾン減少に伴う対流圏循環の変化における eddy の役割について
A role of eddy on the tropospheric circulation trend corresponding to the stratospheric ozone reduction in boreal summer

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The tropospheric responses to changes in the stratospheric ozone radiative heating are examined by assessing influences of long-term trends in the stratospheric ozone on the troposphere. A linear trend analysis was applied to five reanalysis data sets and five chemistry climate models (CCMs) for boreal summer (June-July-August) in ozone depleting period (1981-2000). Sensitivity simulations of depleting ozone using CCMs show poleward shifts of the subtropical jet and expansion of the Hadley cell as well as reanalyses show. Anomalous radiative heating associated with the decrease of the ozone induces the negative potential vorticity (PV) anomalies near tropopause. Steady responses to the ozone radiative heating anomalies evaluated by the PV inversion technique show the poleward shift of the subtropical jet but have small amplitudes in the lower to middle troposphere. Eddy feedback associated with changes in the basic state due to PV anomalies is examined by idealized experiment using dry general circulation model (GCM). In the upper troposphere, wave forcing accelerates the zonal wind north of the jet and decelerates south of the jet. Then, the deceleration forcing south of the jet drives anomalous residual mean circulation in the lower latitudes corresponding to the expansion of the Hadley cell in the middle troposphere. The Coriolis force associated with the anomalous residual mean circulation expand the zonal wind anomalies around the jet from the upper troposphere to the lower troposphere. The results suggest an important role of the stratospheric ozone on the tropospheric climate changes via modifying the eddy activity in the troposphere.

キーワード: 成層圏オゾン, 化学気候モデル, 長期変化
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