Geophysical Research Abstracts
Vol. 20, EGU2018-8017, 2018
EGU General Assembly 2018


# Tropical deep convection impact on the southern winter stratosphere: role of the QBO - deep convection linkage

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The impact of tropical deep convection on the southern winter stationary waves and its modulation of the stratospheric circulation is analyzed using data from the CMIP5 Pre-Industrial Control (piControl) run of the mixed resolution (MR) version of the Max Planck Earth System Model (MPI-ESM-MR). The interannual variability of tropical deep convection over the region of the climatological maximum, from India to the western Pacific, is shown to modulate high latitude stationary waves in the southern winter hemisphere. Deep convection enhancement gives rise to wavenumber 1 eddy anomalies that reinforce climatological Rossby-Kelvin wave couplet observed at the tropical UTLS. The Rossby wave propagates towards the extratropical southern winter hemisphere and upward through the winter stratosphere reinforcing the wavenumber 1 climatological eddies. As a consequence, stronger tropical deep convection is related to greater upward wave propagation and stronger wave convergence in the high-latitude upper stratosphere and, in addition, to a stronger the Brewer Dobson circulation and warmer polar winter stratosphere. Consistently, results reveal that the enhancement of deep convection linked to easterly phase of the QBO (QBO-E) gives rise to a similar response. Thus, wavenumber 1 eddy anomalies generated during QBO-E reinforces climatological eddies in southern winter extratropical UTLS and stratosphere. Consistently a stronger Brewer-Dobson circulation and a warmer extratropical stratosphere is observed during this QBO phase. Our results suggests that the QBO modulation of convection plays a fundamental role in the transmission of the QBO signature to the southern winter stratosphere during the austral winter.