Stratosphere-troposphere coupling: The impact of QBO on the tropical convection and cyclone tracks in the Northern Hemisphere warm season

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The impact of stratospheric Quasi-Bienniel Oscillation (QBO) on the tropical deep convections, tropical cyclone tracks, and extratropical circulations during the Northern Hemisphere warm season is examined using various observational and reanalysis data sets. It is found that the QBO modulates convective activities in the subtropical western North Pacific (~10N and ~170E) primarily by modifying absolute vertical wind shear in the upper troposphere and lower stratosphere. The resulting localized heating then excites Rossby wave trains into the extratropics, modifying extratropical circulation especially over the North Pacific. Implications of this finding to the atmospheric low-frequency variability such as Pacific-North American teleconnection (PNA) and Madden-Julian Oscillation (MJO) are discussed. Although QBO-induced circulation change is relatively weak, it is found to affect the tropical cyclone tracks. A statistically significant impact is particularly observed in the typhoon tracks over the western North Pacific. In general more typhoons approach the East China Sea during the westerly phase of the QBO. However, no sensitivity is found in the intensity and frequency of tropical cyclones.