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The Relative Impacts of El Niño Modoki, Canonical El Niño, and QBO on Tropical Ozone Changes since the 1980s

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Abstract
Some studies showed that since the 1980s Modoki activity—a different sea surface temperature (SST) anomaly pattern from canonical ENSO in the tropics—has been increasing in frequency. In the light of an analysis of the observations and simulations, we found that Modoki, as a new driver of global climate change, can modulate the tropical upwelling that significantly affects mid-lower stratospheric ozone. As a result, it has an important impact on the variations of tropical total column ozone (TCO), alongside QBO or canonical ENSO. Our results suggest that, in the context of future global warming, Modoki activity may continue to be a primary driver of tropical TCO changes. Besides, it is possible can serve as a predictor of tropical TCO variations since Modoki events precede tropical ozone changes.

Key words: tropical TCO, Modoki, canonical ENSO, QBO.