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Seasonality and El Niño Diversity in the Relationship between ENSO and Western North Pacific Tropical Cyclone Activity

Yumi Choi

Ocean Circulation and Climate Research Center, Korea Institute of Ocean Science and Technology, and Department of Atmospheric Sciences, Pusan National University, Busan, South Korea

Kyung-Ja Ha

Department of Atmospheric Sciences, Pusan National University, Busan, South Korea

Fei-Fei Jin

Department of Atmospheric Sciences, University of Hawai'i at Mānoa, Honolulu, Hawaii, USA

[Hide authors & affiliations](#) ^

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Abstract

Abstract

Both impacts of two-types of El Niño on the western North Pacific (WNP) tropical cyclone (TC) activity and seasonality in the relationship between genesis potential index (GPI) and El Niño-Southern Oscillation (ENSO) are investigated. The ENSO-induced GPI change over the northwestern (southeastern) part of the WNP is mostly attributed to the relative humidity (absolute vorticity) term, revealing a distinct meridional and zonal asymmetry in summer and fall, respectively. The seasonal change in ENSO (background states) from summer to fall is responsible for the seasonal change in GPI anomalies south of 20°N (over the northeastern part of the WNP). The downdraft induced by the strong upper-level convergence in the eastern Pacific (EP)-type El Niño and both the northwestward-shifted relative vorticity and northward-extended convection over the southeastern part of the WNP in the central Pacific (CP)-type El Niño lead to distinct TC impacts over East Asia (EA). The southward movement of genesis location of TCs and increased westward-moving TCs account for the enhanced strong typhoon activity for the EP-type El Niño in summer. In fall the downdraft and anomalous anticyclonic steering flows over the western part of the WNP remarkably decrease TC impacts over EA. The enhanced moist static energy and middle-level upward motion over the eastern part of the WNP under the northern-off sea surface temperature warming as well as longer passage of TCs toward EA are responsible for the enhanced typhoon activity for the CP-type El Niño. It is thus important to consider the seasonality and El Niño pattern diversity to explore the El Niño-induced TC impacts over EA.

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Corresponding Author: Kyung-Ja Ha, Department of Atmospheric Sciences, Pusan National University, Busan, South Korea, 46241, Email: kjha@pusan.ac.kr, Phone: +82-51-510-2177, Fax: +82-51-515-1689

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Phone: 617-227-2425

Fax: 617-742-8718

Headquarters:

45 Beacon Street

Boston, MA 02108-3693

DC Office:

1200 New York Ave NW

Suites 450 & 500

Washington, DC 20005-3928

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