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Comparison of changes in quasi-biweekly oscillation intensity over the western North Pacific during the developing late-summer of super El Niño events

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This study investigated the differences in the changes in the quasi-biweekly oscillation (QBWO) intensity over the western North Pacific during the developing late-summer (1982, 1997 and 2015) of three super El Niño events and the possible reasons. The late-summer QBWO intensity was enhanced in these three years and the enhanced QBWO intensity in 2015, which was the strongest during 1980–2017, was remarkably stronger than that in 1982 and 1997. This mainly resulted from the differences in the anomalous late-summer background atmospheric conditions over the northwestern tropical Pacific, which were further modulated by the differences in the sea surface temperature anomalies in the Pacific. While strong warming appeared in the central and eastern equatorial Pacific (CEEP) in these three years, the warming and its center extended further west in 2015. More importantly, the warming in the central and eastern North Pacific (CENP) in 2015 was the strongest during 1980–2017, whereas there was cooling in 1982 and moderate warming in 1997. In 2015, the strong and westward-extended warming in the CEEP and the strongest warming in the CENP led to the strongest increased lower-level moisture and anomalous easterly vertical shear over the northwestern tropical Pacific during 1980–2017, favoring the strongest QBWO intensity. Numerical experiments confirmed the role of warming in the CENP in 2015. Besides, the frequency of extreme precipitation events over southern China during the late-summer of 2015 was the maximum of 1980–2017 and was closely related to the enhanced QBWO intensity over the western North Pacific.