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Growing Pacific Linkage with Western North Atlantic Explosive Cyclones

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Explosive cyclones (ECs), defined as developing extratropical cyclones that experience pressure drops of at least 24 hPa in 24 hours, are impactful weather events which occur along highly populated coastal regions in the eastern United States. These storms occur due to a combination of atmospheric and surface processes, such as jet stream intensification and latent heat release. Even though previous literature has elucidated the role of these processes in EC formation, the sources of interannual variability that impact seasonal EC frequency are not well known. To analyze the sources of interannual variability, we track cases of ECs and dissect them into two spatial groups: those that formed near the east coast of North America (coastal) and those in the North Central Atlantic (high latitude). The frequency of high-latitude ECs is strongly correlated with the North Atlantic Oscillation, a well-known feature, whereas coastal EC frequency exhibits a growing relationship with an atmospheric wave-train emanating from the North Pacific in the last 30 years. This wave-train pattern of alternating high-and-low pressure resulted in heightened upper-level divergence and baroclinic instability along the east coast of North America. Using a coupled model experiment, we show that the tropical Pacific Ocean and North Pacific oceans are the main driver of this atmospheric wave train and the subsequent enhancement seasonal baroclinic instability in the North Atlantic.