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Large-Scale Circulation Anomalies Associated with Extreme Heat in South Korea and Southern–Central Japan

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The large-scale circulation anomalies associated with extreme heat (EH) in South Korea and southern–central Japan are examined using data during the time period 1979–2016. Statistical analysis indicates that EH days in these two regions are concentrated in July and August and tend to occur simultaneously. These EH days are therefore combined to explore the physical mechanisms leading to their occurrence. The composite results indicate that the anomalous atmospheric warming during EH days is dominantly caused by a significant subsidence anomaly, which is associated with a deep anomalous anticyclone over East Asia. Further investigation of the evolution of circulation anomalies suggests that the anomalous anticyclone over East Asia related to EH is primarily initiated by wave trains originating from upstream regions, which propagate eastward along the Asian westerly jet in the upper troposphere. These wave trains can be categorized into two types that are characterized by the precursor anticyclonic and cyclonic anomalies, respectively, over central Asia. The distinction between these two types of wave train can be explained by the wavenumbers of the Rossby waves, which are modulated by both the intensity and the shape of the Asian westerly jet as the background basic flow.