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Climatology of Lake-Effect Precipitation on Small Lakes in the Lake Tahoe, NV/CA Region

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1. Abstract

This study presents a climatological analysis of lake-effect precipitation events that developed in the Lake Tahoe region of California and Nevada. The frequency and environmental conditions favorable for lake-effect precipitation over Lake Tahoe, Pyramid Lake, and Honey Lake were examined for the 14 winters (September-March) from 1996/97 to 2009/10. Weather Surveillance Radar-1988 Doppler (WSR-88D) data from Reno, Nevada (KRGX) were used to identify 64 lake-effect events. Events occurred as 1) well-defined isolated bands that have an extension downwind (BAND events), 2) an isolated region of precipitation that persists over the lake and has little to no downwind extension (OLC events), 3) a BAND or OLC event embedded within larger synoptic precipitation (SYNOP event), or 4) an event that transitions between any of the previous three categories (TRANS events). OLC events are a unique morphology not previously observed. Seventeen OLC events were documented in this study, occurring on both Pyramid Lake and Lake Tahoe. An examination of the characteristics of all 64 lake-effect events provides several findings that are useful for comparison with other lake-effect studies. October was the most active month with an average of 1.36 lake-effect events per year, a peak notably earlier than that observed in other lake-effect climatologies. Events had an average duration of 6.23 hours, or about half as long as those observed on Lake Champlain or the Great Salt Lake. In general, Lake Tahoe region lake-effect events 1) had air temperatures below freezing, suggesting frozen precipitation, 2) average wind speeds of 2.1 m/s, notably slower than in other studies, and 3) averaged a surface lake—air temperature difference of 9.74°C and a lake—700-hPa temperature difference of 18.53°C. Lake-effect precipitation events had been previously unstudied in the Lake Tahoe region. The notably different results from this study offer themselves to a subsequent investigation of the connections between mesoscale processes and climate variability in the area surrounding Lake Tahoe.