Atmospheric Circulation Structures Associated with Freezing Rain in Quebec City, QC and the St-Lawrence River Valley

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An analysis of freezing rain (FZRA) events in Quebec City (YQB), QC, Canada, a climatologically active area, is given over a 30 year period (1979-2008) in an attempt to better understand the synoptic patterns, severity, and frequency of these events. Of the 218 events, 48 are classified as severe and are given a more thorough analysis at various pressure levels. Events are then partitioned into five categories based on synoptic patterns, including the location and organization of surface features, 500 hPa trough location and length, and instantaneous geostrophic wind direction at YQB at the first hour of reported FZRA. Composite analyses of atmospheric variables are then created for each category, and the latter are then compared. Also analyzed is the impact of wind channeling on event duration within the St-Lawrence. Results show that each of the five categories has a unique thermodynamic and dynamic signature. Key factors, which determine event duration, include cold pool maintenance at the surface provided in large part by wind channeling effects, and warm air advection at 850 hPa due to an anomalously strong low level jet. These signatures may be used to improve the prediction of freezing rain events.