



Spatial evaluation of storm processes in southwestern Canada, with links to seasonal rainfall patterns

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Spatial and temporal variability of rainfall over the Canadian prairies affects both rural and urban environments. Insured losses from crop and property damage during the extreme rainfall that occurred in June, 2005 throughout the province of Alberta were estimated in the hundreds of millions. These events resulted in the most costly natural disaster in the history of the province. Much of this damage could have been better managed with a stronger understanding of storms bringing precipitation to the region. Southern Alberta storms were researched using data from the Foothills Climate Array (FCA) meteorological network, an array of 300 meteorological stations (HOBO tipping bucket rain gauge and Veriteq temperature-humidity loggers), with a spatial coverage of 24 000 km². The instruments are positioned along 12 west-east transects that traverse the eastern slopes of the Canadian Rocky Mountains, extending through the foothills into the interior of the prairies 40 km east of the city of Calgary. The network samples a great diversity of elevation and surface environments.

Relating seasonal rainfall patterns to the meteorological processes responsible for the observed variability requires detailed information of each unique storm event. This study performed spatial and temporal statistical analysis of rain events (≥ 1 mm) between the months of May and September (2005-2006). Analysis began by identifying the mode (frontal versus convective), and the scale of the forcing mechanism (synoptic versus mesoscale) of each storm event. Spatio-temporal analysis was conducted using rainfall accumulations and intensities at total storm, 1-hour and 5-minute levels of data aggregation. These aggregation levels were then used to examine the spatial and temporal autocorrelation, in conjunction with the descriptive statistics of each storm process offering specific insight into the characteristics of the events. Further analysis assessed the influence that regional topography played on the distribution of the storm

events. The detailed structure of the FCA network provided a new perspective on meteorological processes in Alberta and how they relate to seasonal rainfall patterns.