The role of anticyclones in extreme precipitation events: An examination of the record-setting Alberta flood of June 2013

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While forecast skill of mass fields (e.g. 500-hPa geopotential height) has improved greatly over recent decades, Quantitative Precipitation Forecasting (QPF) skill still lags behind, especially for extreme precipitation events. Thus, greater understanding of the synoptic-scale precursors and characteristics of extreme precipitation events can serve to aid the human forecaster in QPF.

Recent refereed research has focused on quantifying the importance of synoptic-scale cyclones in extreme precipitation events. However, other studies have examined the synoptic-scale precursors and characteristics of extreme precipitation events at Montreal, Quebec and Burlington, Vermont and found that the composite intensity of the upstream synoptic-scale cyclone is similar for both extreme and moderate precipitation events, particularly in the warm-season. These results suggest that the presence of a downstream anticyclone may be the distinguishing factor between extreme and lesser precipitation events.

The importance of precursor anticyclones in producing extreme mid-latitude precipitation events is examined from both composite and case study perspectives. Preliminary results indicate that the precursor anticyclone helps to provide the necessary warm, moist, and low stability (high-θ_e) air inherent to extreme precipitation events, but not seen in lesser events. Particular attention will be paid to the large-scale environment of the record-setting Alberta flood event of June 2013 in which numerous precursor anticyclones helped to set the stage for an extreme precipitation event.

The high resolution (0.5 degree, global) NCEP Climate Forecast System Reanalysis (CFSR), will be used as the dataset of choice, to allow for more robust results than older, lower-resolution global reanalysis products.