Some Unique Features Associated with the June 2013 Alberta Flooding: Precipitation, Atmospheric River and Evapotranspiration

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Excessive rainfall associated with an intense weather system triggered severe flooding in southern Alberta in June 2013. The event was characterized by a slow-moving upper level low pressure system west of Alberta, blocked by an upper level ridge, while an associated surface low pressure system kept southern Alberta, especially the eastern slopes of the Rocky Mountains, in continuous precipitation for up to two days. The event was first dominated by significant thunderstorm activity, and then evolved into mainly continuous stratiform precipitation. Both the thunderstorm activity and upslope winds associated with the low pressure system produced large rainfall amounts. In addition, a relatively high freezing level led to rain falling on the still snow-covered higher terrain, which enhanced the already significant runoff. The large-scale circulation associated with the blocking pattern slowed the eastward propagation of the weather system, maintained the upslope motion on the lee side of the mountains, and enabled an atmospheric river-like long-distance transport of moisture from the central Great Plans into southern Alberta. Analyses from satellite products and air parcel trajectories show that a significant amount of the moisture originated from the central Great Plains, transported into Alberta by a southeasterly low-level jet associated with the Warm Conveyer Belt (WCB). Evapotranspiration from the Great Plains and southern Prairies significantly modified the atmosphere and provided sufficient moisture to support the heavy precipitation during this event.