Torrential Rains and Flash Flooding in Québec's Outaouais Region on June 23-24th 2011

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Summary of Events

- A series of moisture charged thunderstorms affected a number of municipalities in Québec's Outaouais region along the Ottawa River Valley, including the City of Gatineau, Chelsea, Cantley and Pontiac.
- The first line of thunderstorms happened in the evening of June 23rd and the second line of thunderstorms hit the same region in the afternoon and evening of June 24th.
- According to Québec civil security, 23 landslides occurred in the municipalities of Chelsea, Cantley and Gatineau.
- Flooding closed highway 148 between Gatineau and Pontiac in Luskville.
- In total, close to 250 mm fell over certain sectors. Radar accumulations for the events of June 24th.
- Using the Forecast Guide - 1: Radar accumulations for the events of June 23th.
- Using the Forecast Guide - 2: Radar accumulations for the events of June 24th.
- Using the Forecast Guide - 3: Energy profile and wind shear.
- Using the Forecast Guide - 5: Thermal gradient due to cloud cover.

Forecasting Torrential Rain – The Operational Guide Used at the QSPC

- In the Québec SPC we try to follow a forecast guide for torrential rain (TR) in the warm sector, defined as 50 mm or more in one hour. Since storms began and continued mostly in daylight hours, the daytime guide will be used.
- Conditions to look for:
  - A slow moving weather system
  - A moisture ridge with precipitable water greater than 35 mm.
  - CB generating an energy profile that is long and skinny.
  - A K-index that is greater or equal to 34.
  - Weak to moderate wind shear.
  - A low level jet; it can be relatively weak, that is slow moving and cuts a trail or a thermal gradient.
  - Low level jet should be parallel or within 30 degrees of the upper level jet.
  - In the absence of a clear upper jet, look for low level convergence zones.
- Other Effects – Local Convergence
  - Also of note, although the synoptic flow was southerly, at the surface in the Ottawa River Valley winds were easterly, enhancing convergence locally.
  - Gatineau airport (CYND) meteor data for June 23rd (top) and June 24th (bottom).

Back to the Forecast Guide

- Overall the guide checklist seems to point to torrential rain in this case. There is an addition to the guide that narrows the extent and amount of rain:
- According to the previous table, this case would be number 2: Slow moving LLJ + LLJ < 30 knots + K index ≥ 34, giving a small extent of TR with PWAT under 50 mm.
- Both days received at least twice the guide amount, so other local effects were probably at play.

Other Effects – Local Barrier Jet and Ascent

- It is possible that the Gatineau Hills helped create a barrier jet in the Ottawa Valley.
- The synoptic southerly flow would be forced above the local easterly jet at the surface enhancing convection near this barrier jet.
- On the other side of the river, the Gatineau Hills also provide additional orographic lift.

Conclusion

- The thunderstorms on the evening of June 23rd and the afternoon of June 24th 2011 had resulted in significant damaging torrential rain in and along north of the Ottawa River Valley from Gatineau to Pontiac.
- There were many ingredients pointing to the possibility of torrential rain as seen in the forecast guide.
- Local effects such as convergence, the barrier jet and orographic lift may have also played a role in the severity of the event.

References

Mainville , S. 2004. Heavy convective rain events over Québec: a forecasting tool. presented at MMS 22nd Conference on Severe Local Storms, P&J.