# The Northern Tornadoes Project – Overview and Initial Results


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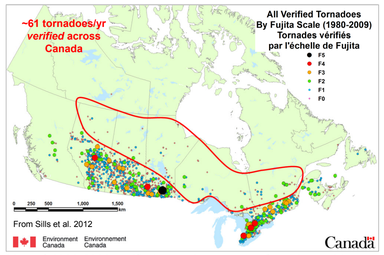
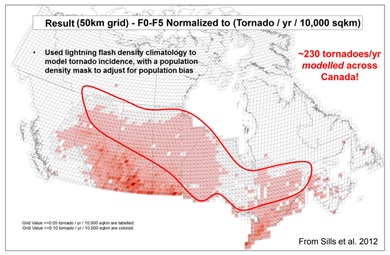
## 1. Project and Motivation

The main goals of the Western / ECCC Northern Tornadoes Project are to:

- Improve understanding of actual tornado occurrence and risk in Canada, and validate ECCC statistical modelling that suggests that only ~30% of tornadoes in Canada are being verified
- Improve methods for detection of tornado damage paths, particularly in rural / remote locations.




Map of 1980-2009 verified tornadoes across Canada, and large area where few reports are ever received (red outline).

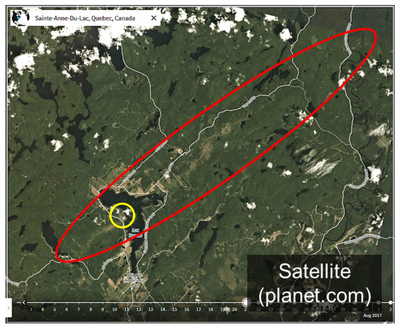



Map showing results of statistical modelling of tornado occurrence across Canada, with low-report area superimposed.

## 2. Detection Process / Data

***Process***

- Two-day tornado potential forecasts to prepare team for possible action
- Use of radar imagery to identify supercell tracks and public reports to identify damage paths
- Ground surveys of areas with potentially tornadic damage, including possible drone flights
- Interrogation of high-resolution satellite data to identify tornado damage paths
- Aircraft flights over tornado damage paths, processing for geo-referencing, and analysis
- Decisions on tornado classification and rating (often in collaboration with ECCC offices).






Images showing the EF3 damage assessed in association with the 18 Jun 2017 Ste-Anne-du-Lac, QC tornado, part of an 11-tornado outbreak that is the largest recorded in Quebec history. Clockwise from left: hi-res satellite, aircraft aerial and ground survey images.

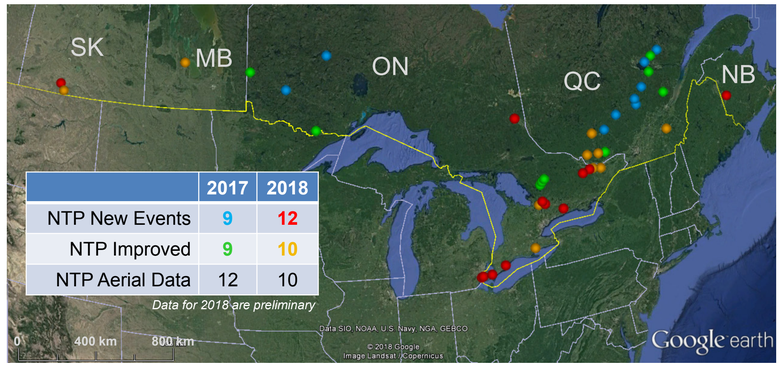
## *Hypothesis*

A project focused on detection of tornadoes across Canada, particularly in non-urban areas, can more accurately assess occurrence and risk

## *Results*

Investigations during the 2017 / 2018 tornado seasons identified numerous events that would otherwise have gone undetected, and improved data for other events

## 3. Project Results 2017 / 2018




| | 2017 | 2018 |
|---|---|---|
| NTP New Events | 9 | 12 |
| NTP Improved | 9 | 10 |
| NTP Aerial Data | 12 | 10 |

*Data for 2018 are preliminary*

Map showing the verified tornadoes investigated by the NTP. The 2017 pilot focused on events in the forests of ON and QC (cool colours). The 2018 pilot focused on capturing all EF1+ events in ON and all significant tornado events across Canada (warm colours).

The EF3 tornado damage in Dunrobin, ON was part of a six-tornado outbreak in eastern ON and southwestern QC on 21 Sep 2018. It's the latest occurrence of EF3+ tornado damage in Canada since the 26 Sep 1898 F3 tornado in Merriton, ON, and preliminary estimates suggest this tornado event is among the most costly ever in Canada.


The Alonsa, MB tornado was the only tornado in North America rated at EF4 (or higher) in 2018, with the most intense damage since the 2007 Elie, MB F5 tornado. It is also the first EF4 (or higher) confirmed in Canada using the EF-scale. Vegetation impacts visible from hi-res satellite included felled trees and discoloured grasses.

## 4. Future Work

- Work with Western Libraries to provide a publicly accessible digital archive for all project materials
- Strengthen detection capacity and working relationships across Canada
- Attempt to automate detection of damage paths present in high-resolution satellite data
- Continue to investigate new approaches to damage assessment in non-urban areas (e.g., trees, crops) making best use of project expertise.

## 5. Acknowledgements / References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