

# Case Study on Northwestern Ontario Forest Fire from July 17 to July 22, 2011

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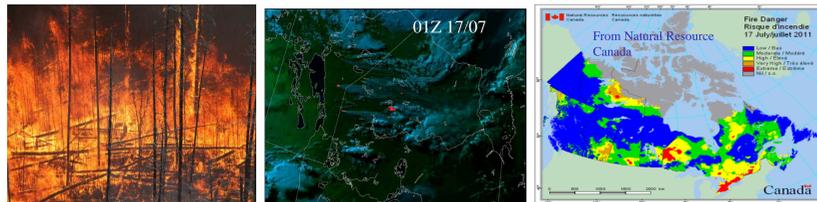
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**Introduction:** A number of severe forest fires were initiated by lightning from a series of thunderstorms rolled through northwestern Ontario in early July. From July 17 to 22 2011, 111 fires blazed over far northwestern Ontario and the smoke plume from the fires was very widespread and extended across northern and southeastern Ontario. The smoke and fires forced several remote communities to be evacuated and burnt nearly 493,000 hectares. This forest fire event was the worst case in Ontario for several years and conditions were considered in the extreme risk category.

The forecast challenge with this forest fire event was primarily the lack of air quality monitoring stations located near the forest fires in northwestern Ontario. Forecasters had to rely on satellite images, dispersion models and air quality monitoring stations located away from the source points.

**Objective:** To show how the smoke plume from the resulting fires was handled by the Atmospheric Transport dispersion model from Canadian Meteorological Centre (CMC); and how pollutants emitted from those forest fires were transported downstream.

### Case viewed by images:

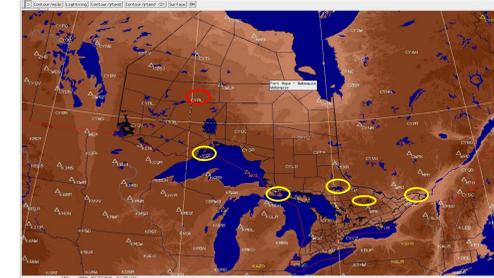


### Dispersion model and its performance:

- A Lagrangian particle dispersion model, MLDP0, is run by the Environmental Emergency Response (EER) Section of CMC.
- The EER provides operational guidance in support to environmental emergencies involving atmospheric transport and dispersion of pollutants.
- The list of pollutants includes radioactive material, volcanic ash, **smoke from forest fires**, releases from chemical fires ...
- MLDP0 is an off-line models and driven with meteorological fields from CMC's operational regional and global analysis and forecast systems. Dispersion is estimated by calculating the trajectories of a very large number of air particles (or parcels).

### Pollutants Transportation:

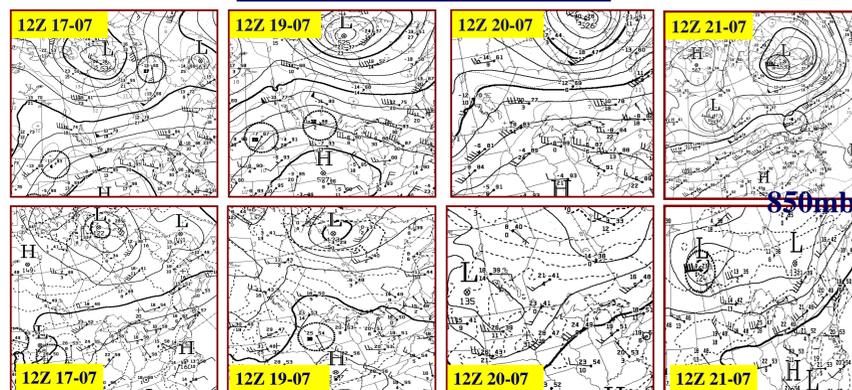
Pollutant source location and downstream air quality monitoring stations



### Climatology of Ontario Forest fire:

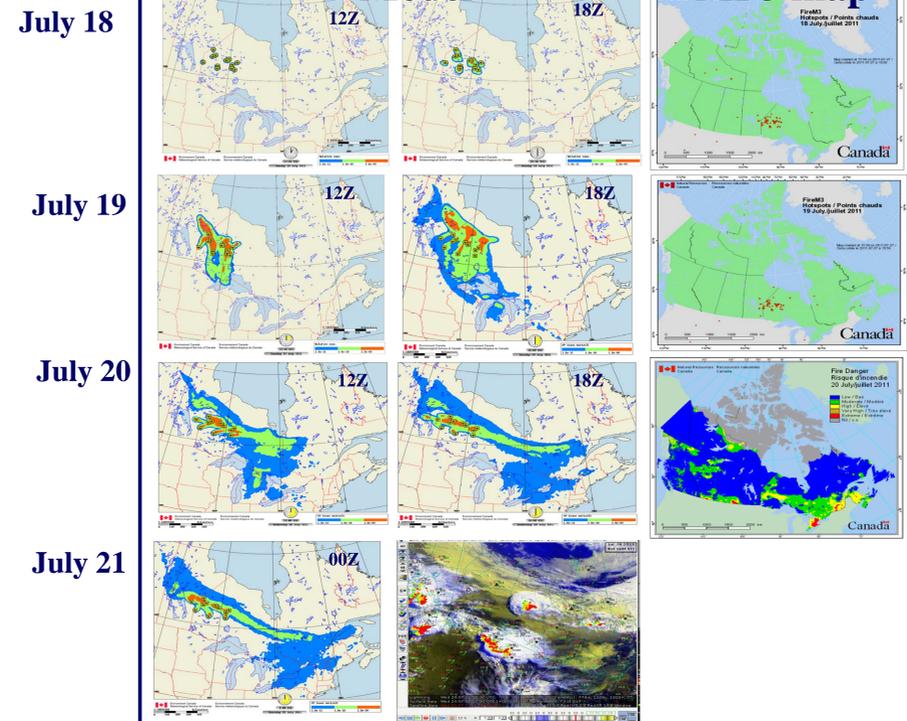
Year	Fires	Hectares	Source: Ontario Ministry of Natural Resources
2008	341	1,316	
2009	384	20,656	
2010	890	14,778	
10 Year Avg. (mean)	956	68,108	
2011 to date	1,081	628,859	
July 17 to 22	111	493,000	

### Synoptic background:

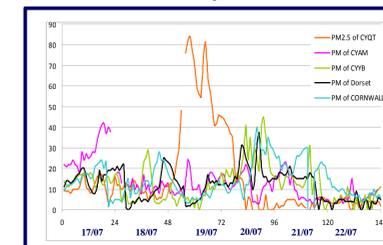


NW and W basic flow patterns

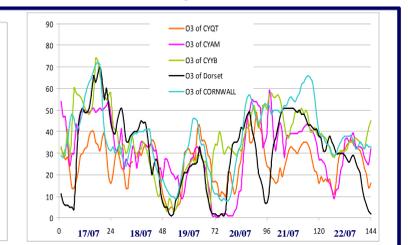
### Model MP3 map



PM<sub>2.5</sub> of different monitoring sites away from the source during the episode



O<sub>3</sub> of different monitoring sites away from the source during the episode



### Summary:

- This forest fire event was the worst case in Ontario for recent several years;
- Overall the dispersion model by CMC was doing well in capture the fire coverage and shape. It is a good guidance for the forecast;
- Pollutants, especially PM<sub>2.5</sub>, were well transported downstream.

### Primary References:

- Réal D'Amours and colleagues, 2010: Application of the atmospheric Lagrangian particle dispersion model MLDP0 to the 2008 eruptions of Okmok and Kasatochi volcanoes. *JOURNAL OF GEOPHYSICAL RESEARCH*, VOL. 115, D00L11, doi:10.1029/2009JD013602.
- Shabbar, Amir, Walter Skinner, Mike D. Flannigan, 2011: Prediction of Seasonal Forest Fire Severity in Canada from Large-Scale Climate Patterns. *J. Appl. Meteor. Climatol.*, 50, 785–799, doi: 10.1175/2010JAMC2547.1.

### Acknowledgement:

- Frank Dempsey and Pamela Fairbridge from Ontario Ministry of the Environment for providing the air quality monitoring data
- <http://www.mnr.gov.on.ca/en/index.html> Ontario Ministry of Nature Resources for the Forest Fire Danger Map.