Operational Wildfire Intelligence Systems

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Wildfire in Canada

Figure 2.1: Wildfire area burned in Canada from 1980 – 2010. Burned area (in red) represent all fires documented in the Canadian National Fire Database (CNFB; Canadian Forest Service, 2010), along with the extent of the Canadian portion of the Boreal forest (in grey; Brandt, 2009). Map provided by Natural Resources Canada, Canadian Forest Service (2015).

(Johnston, 2016)
The Future

• Fire activity is gradually increasing

• With as little as 15% increase in fire load resource requirements must double to maintain IA success (Wotton and Stocks, 2006)

• It’s very possible there is a law of diminishing returns with resource allocation (McAlpine and Hirsch, 1998)

• Human encroachment into boreal zone will continue to increase
Torchlight: Automating the art of tactical wildfire mapping

- Emergency use only, hard criteria will be announced soon

- Generally (to be confirmed):
  - Threatening a community or critical value
  - Distance to interface zone ~ 50 km
  - OR has caused evacuation
  - OR has caused State of Emergency
  - OR (TBC) is assigned a Type-1 IMT

- For R&D we are seeking approval to deploy whenever a researcher is attached to the IMT
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Information NOT Imagery
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Isolated Heat = small heat clusters at least 10m from other clusters
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Consolidated Fire Detection and Monitoring System (CFDMS)
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- Frame work for real time data delivery to fire managers
- Capable of delivering raw data (bent pipe) or visualized data (web service)
- To be implemented operationally March 2018 (approx)
Limitation of Hotspots

May 6, 2016
Satellite: Aqua
Time: 14:20 MDT
VZ: 16.2°
GSD_{mean}: 1.06 km

Figure: Dr. Ronan Paugam
Detection
(finding a fire) \textbf{VS} (being the first to find a fire) \textbf{VS} (being the first to report a fire)

\textbf{OPERATIONS}
- EARLY detection
- Locating smoldering fires below a forest canopy

\textbf{REMOTE SENSING}
- Identifying a fire pixel
- Detectable fire size often stated as a flaming area (e.g. 10 x 20 m)
Detection

OPERATIONS
• EARLY detection
• ~ 90% of fires are detected at < 1 ha
  *in response zones
• Typically sub-canopy

REMOTE SENSING
• e.g. 10 x 20 m of flaming area (~900 K) in the MWIR
• ~ 28 x 28 m (0.08 ha) of smoldering area (~675 K) in the MWIR
Limitation of Hotspots

(a) MODIS/LSTIR Smouldering Fire Detectable Area (ha)

(b) VIIRS/IR Smouldering Fire Detectable Area (ha)

Background Temperature (K)
High Temporal Infrared Research
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MWIR 3.9μm; 308-423 K; 400 Hz
Thank you

Questions?

Photo: Bo Lu, CFS
REFERENCES

