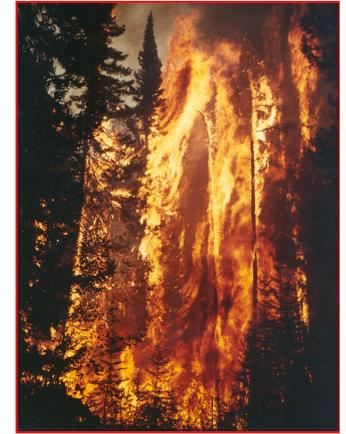


Forecasting, Monitoring, and Analyzing Boreal Fire and Pyroconvection During ARCTAS

P.I. Michael Fromm

Co-I: Brian Stocks

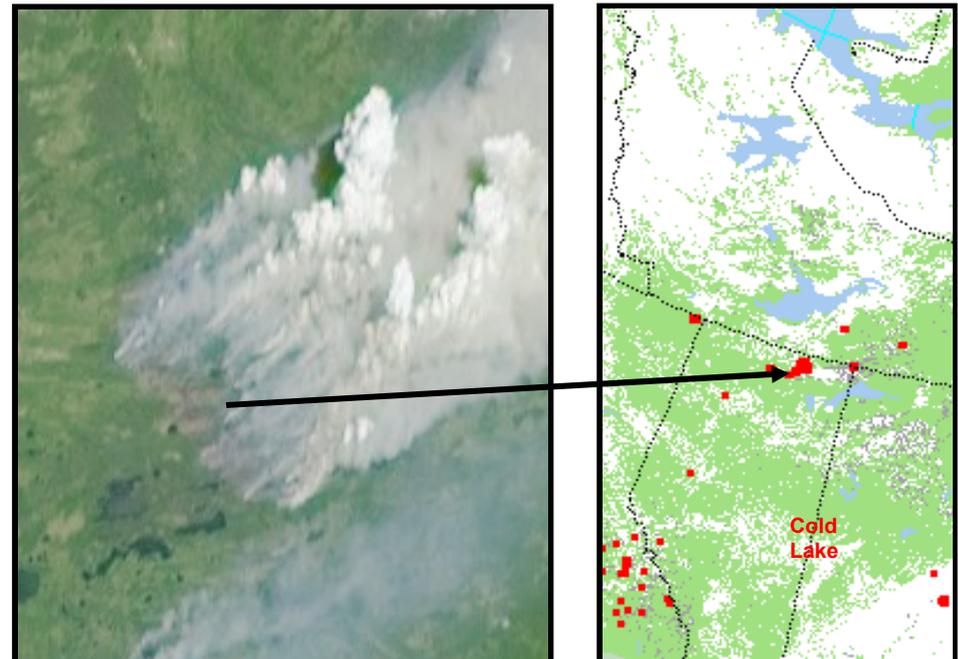
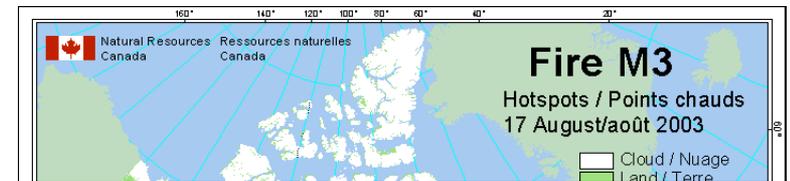


In a nutshell:

Prior to and during ARCTAS Summer 2008, liaise with provincial officials and fire management agencies. Assist with meteorological forecasting for mission planning. During ARCTAS summer campaign, analyze ground and satellite data to monitor fires, pyroconvection, and smoke transport. Prioritize fires by size and blowup potential. Nowcast blowup candidates. Monitor diurnal and day-to-day fire cycles.

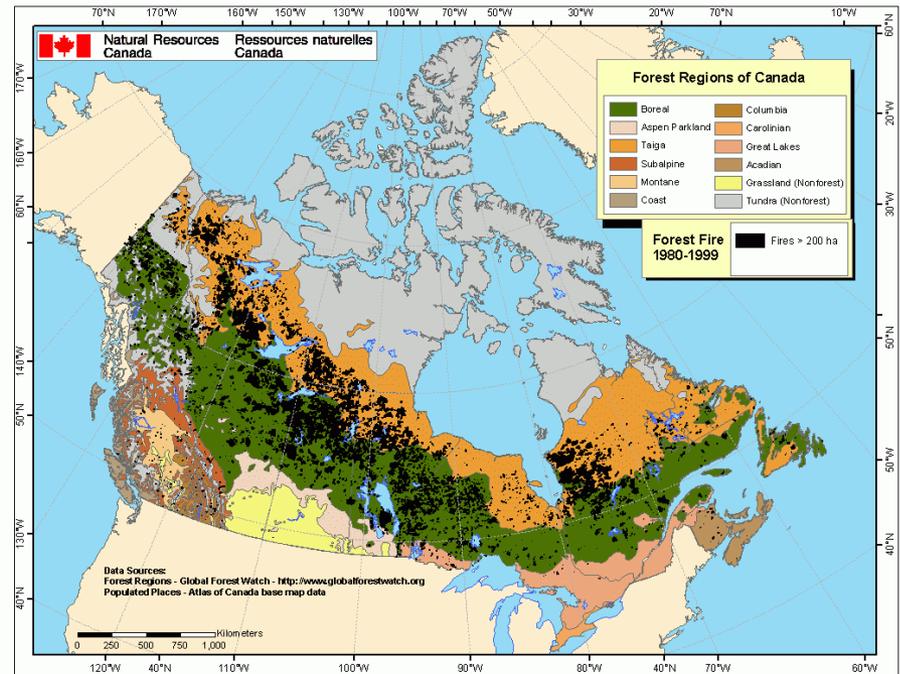
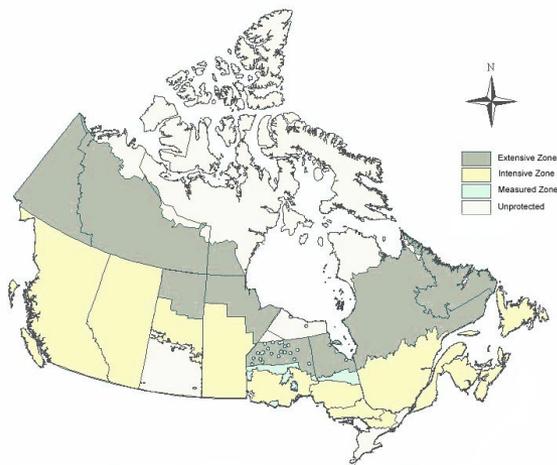
Examples of activities:

- * Briefing at CIFFC BoD meeting January
- * Renewed contact at start of fire season (late April/early May)
- * Updates on progression of fire season weekly through pyroCb email group (using CWFIS and agency surveys/forecasts)
- * Coordination at all times with agencies, even on non-actioned fires
- * Deploy incoming GOES imagery/data to mission team
- * Synthesize satellite data, ground reports, radar, lightning, wx hourlyies.



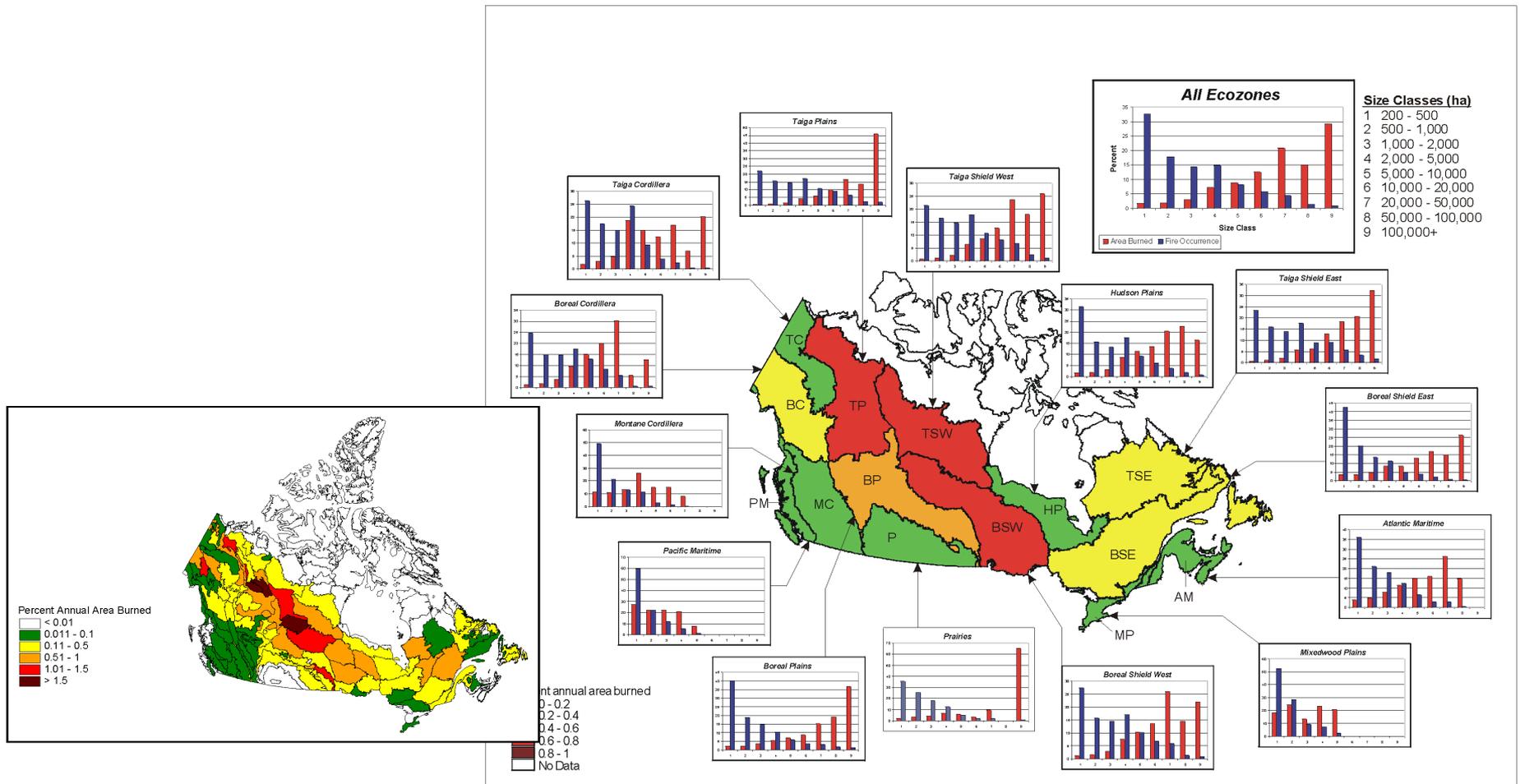
Large Fires in Canada

- 3% of fires >200 ha, 97% of area burned
- Large modified suppression zone where fires receive limited response – focus here as fires burn naturally – unlimited access
- Well within range from Cold Lake AB



Large Fire Database Outputs

- PAAB by ecozones/ecoregions
- Large fire size class distributions
- Fewer large fires contribute most of AB



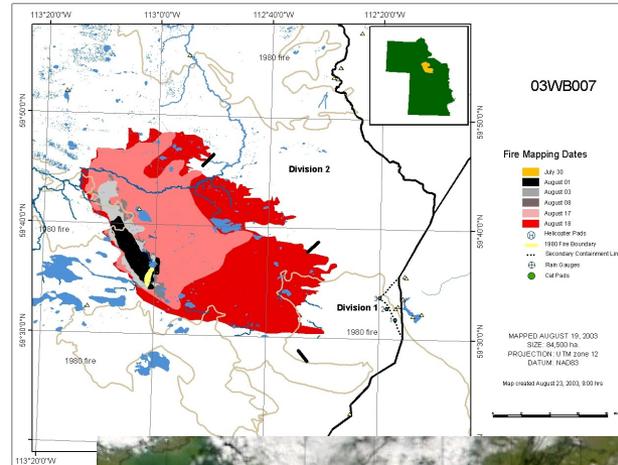
Coordination with Fire Management Agencies

- Briefing at CIFFC BoD meeting January
- Renewed contact at start of fire season (late April/early May)
- Updates on progression of fire season weekly through pyroCbs group (using CWFIS and agency surveys/forecasts)
- Coordination at all times with agencies, even on non-actioned fires

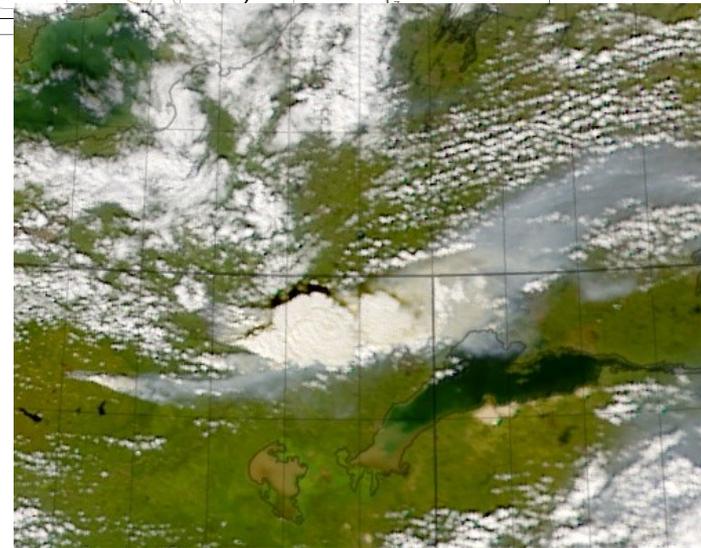


Fire Behavior Documentation

- Spread rates/perimeter growth throughout peak afternoon burning periods
- Relate energy release to column development, injection height
- Use helicopter (agency?) with visual/IR camera
- Tie to CDN FBP System



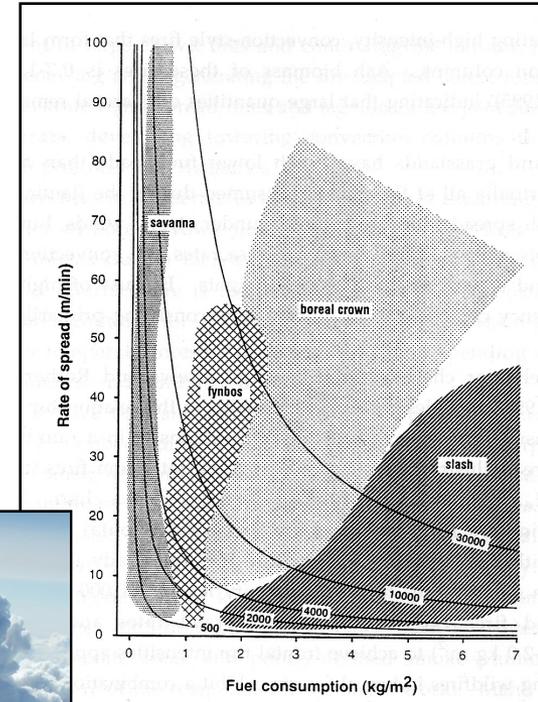
Growth map



Column development

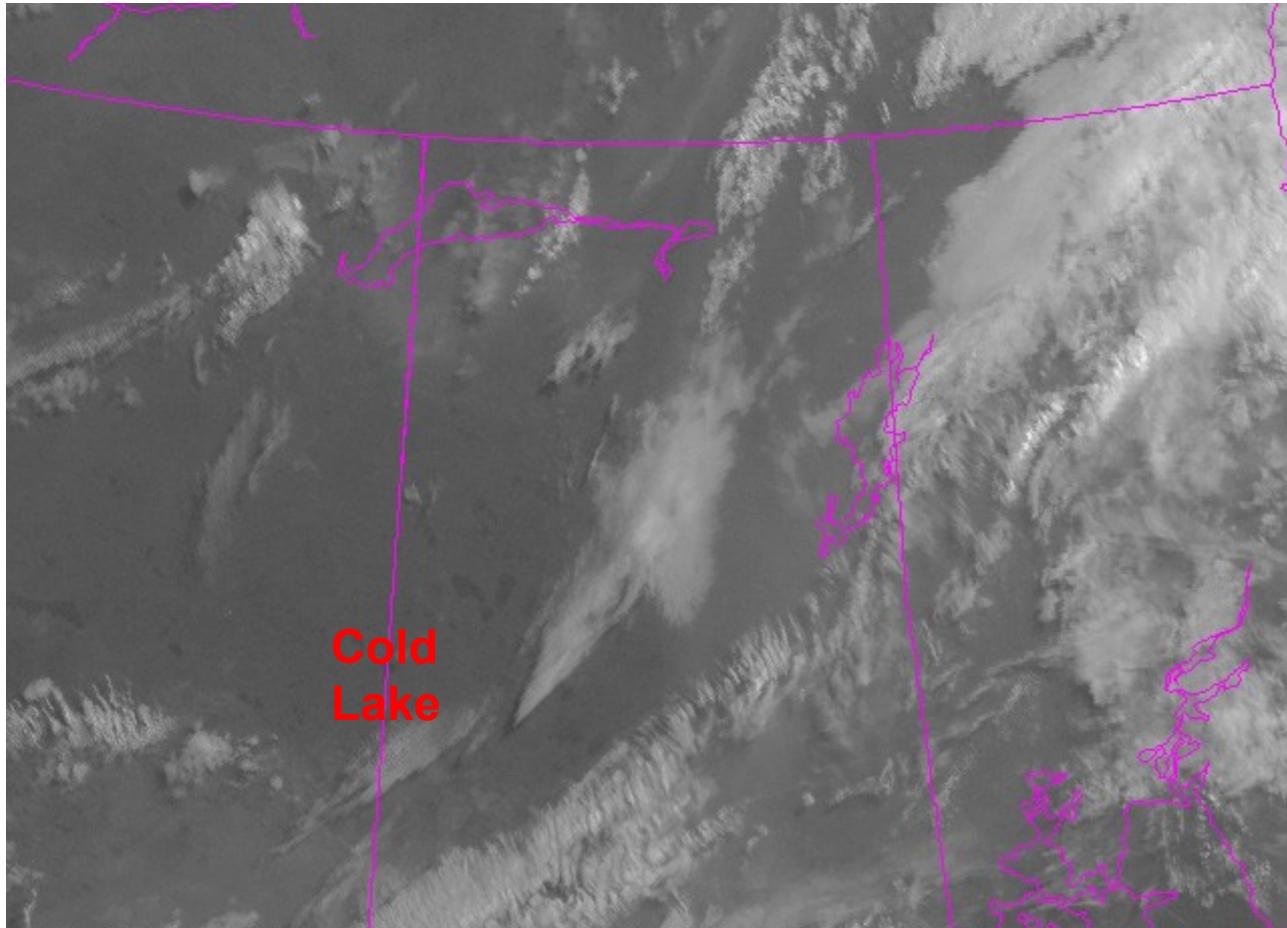
Fire Intensity/Energy Release

- Combine rate of spread/fuel consumption/heat of combustion to determine fire intensity ($I=HWR$) = resistance to control
- Savanna Fires:
 - 0.1-1.2 kg/m²
 - 500-10,000 kW/m
 - Lower convection columns
- Boreal/Temperate Forest Fires:
 - 2.5-5.0 kg/m²
 - 100-100,000 kW/m
 - > fuel consumption & intensity
 - Towering convection columns reaching UTLS



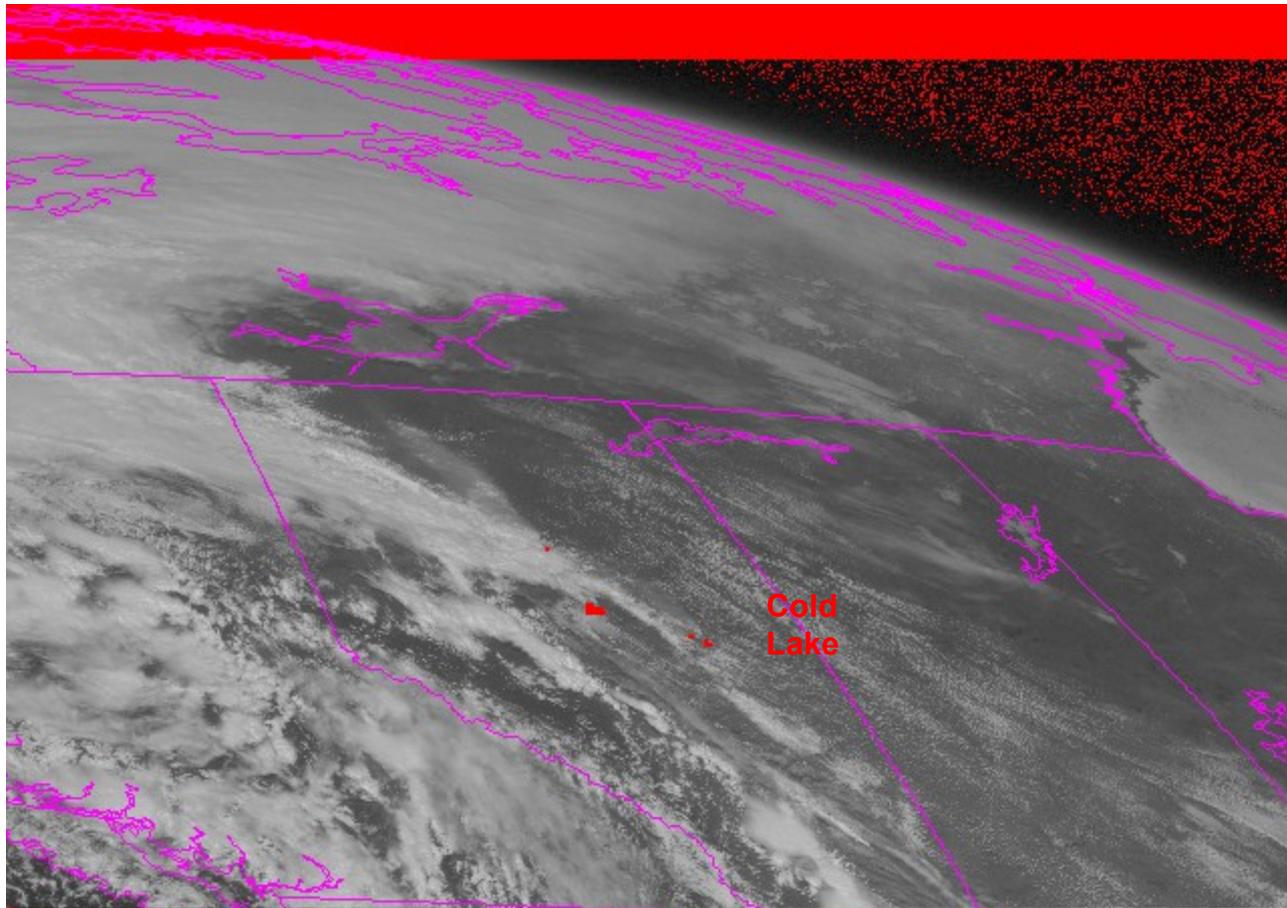
A typical high-intensity boreal crown fire convection column viewed from an altitude of ~10 km (photo courtesy Mr. Todo, JAL)

60°N



Cold
Lake

4 0004 DERIVED DATA 17 AUG 03229 140143 03049 09362 02.00



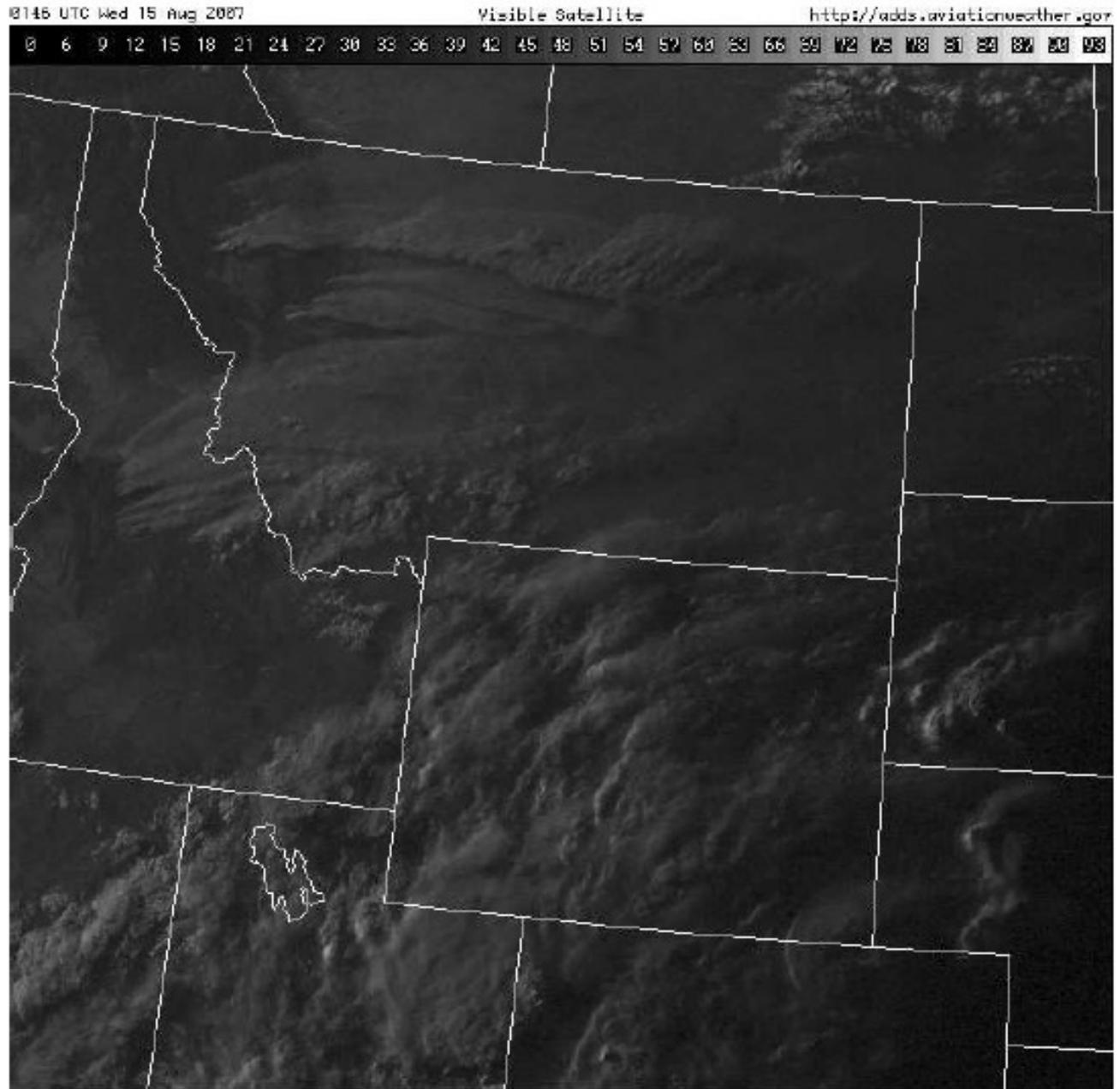
1 0001 DERIVED DATA 28 MAY 01148 213015 02589 16205 02.00

McIDAS

Jim Whiteway
York U.

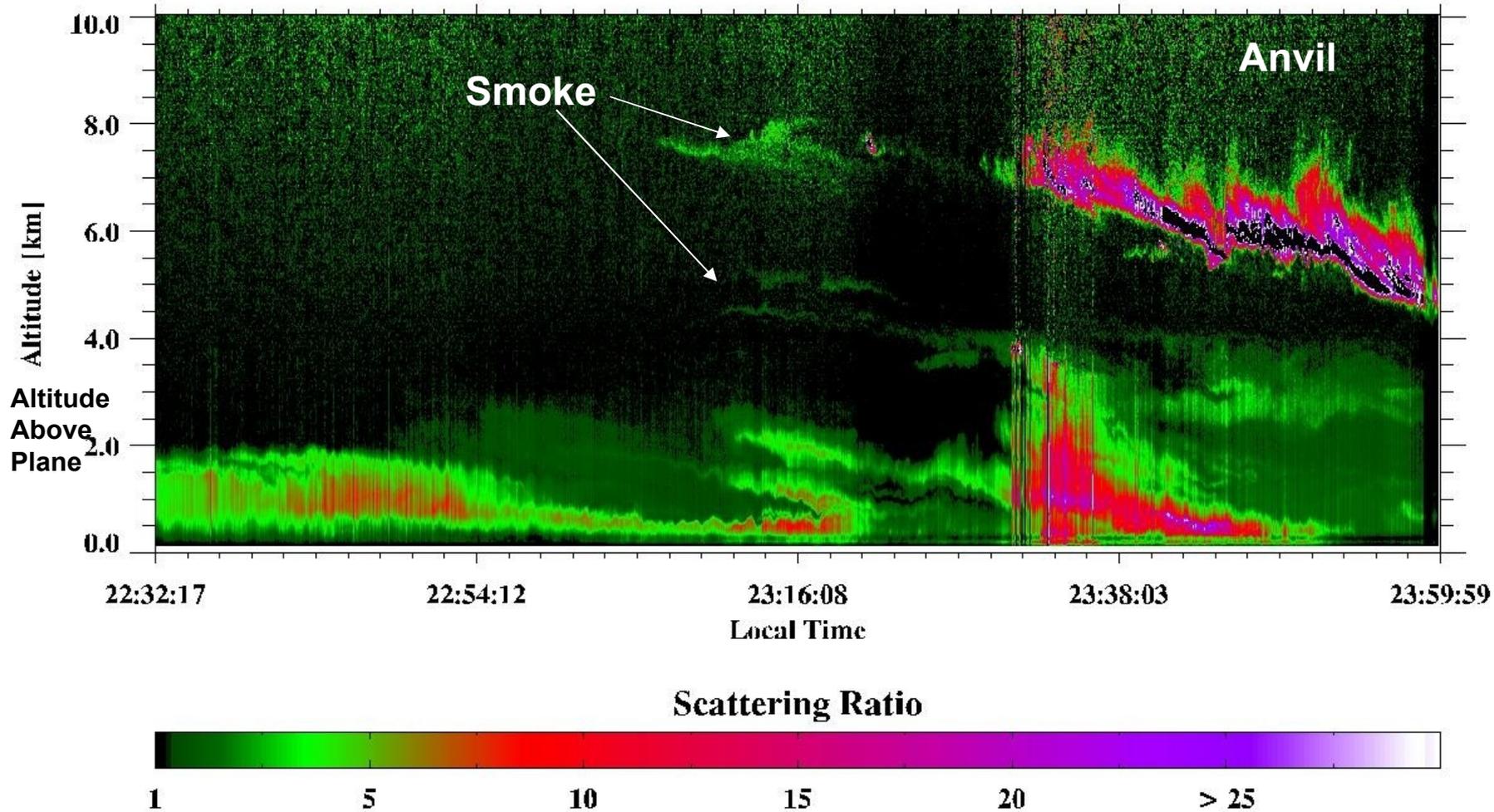
Smoke Chasing
August 2007

Bases:
Grand Junction CO
Billings MT
Williston ND



Jim Whiteway Flight, Twin Otter
Williston ND – Billings MT

Field Campaign - 16/08/2007 22:32:17 - 23:59:59



Jim Whiteway Lessons Learned:

Lesson 1:

I would suggest looking at the situation with the pilots with respect to low visibility, thunderstorms, night flying, mountains, lack of alternate airports etc. Make sure pilots and scientists understand the objectives and the limitations. The Twin Otter pilots were never comfortable with the conditions on any of our flights.

Lesson 2:

Main lesson learned from Aug. 16/17 was to start in a location with good visibility and no storms and fly upwind into the smoke and thunderstorms. If we had started out from Billings we would not have had a flight because of the low visibility and unstable weather.

Lesson 3: Visibility, VFR, and IFR

Make sure you are on the same page as the pilots with respect to the limitations of VFR and IFR. FAA required us to fly VFR with the lidar running. Several flights were cancelled because we got into the air and the pilot said visibility was too low for VFR. He wouldn't entertain the option of us turning off the laser and flying IFR until the visibility improved. This was one of the reasons that we moved the base to Williston from Great Falls.

Forecasting, Monitoring, and Analyzing Boreal Fire and Pyroconvection During ARCTAS

Requirements

- * High-speed internet access
- * ARCTAS LAN
- * Phone line
- * prog analyses for forecast trajectories
- * matches and gas 😊

WG Interface issues

- * duplication of effort (e.g. satellite image deployment)
- * duplication of data flows
- * naming/tracking convention for fires
- * ground-air communication for mid-flt guidance
- * lessons learned from prior air campaigns (e.g. J. Whiteway 2007 mission)

Other Issues

- * Pre-deployment plumes still around during Cold Lake
- * Asian biomass burning during Cold Lake
- * TC4-like measurements of “regular” Cb

