The Global Early Warning System for Wildland Fire

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Presentation Outline

1. Wildland fires and space-based data
2. Fire danger and early warning
3. Overview of the Global Fire EWS
4. Regional early warning and capacity building
5. Future activities in fire early warning

Global Fire EWS website at
FIRE GLOBE Global Fire Monitoring Center:
http://www.fire.uni-freiburg.de/gwfews/index.html
Global Wildland Fire

- 300-450M ha of vegetation is burned around the world each year (~size of India)
- most fire is unmonitored and undocumented
- fires occur on all vegetated continents and in all biomes
- vast majority of fire is human-caused; primarily land management in grasslands (crops, livestock, wild game)
- approx. half of all fire occurs in sub-Saharan Africa
- some fires inevitably become disaster fires causing
  - death
  - long-term health impacts
  - socio-economic impacts
Wildland Fire and Space-based Data

Wildland Fire Information Needs:
1. How many fires will start today, tomorrow, …?
2. How large will these fires grow?
3. Will any of these fires threaten human health and safety, property or have social, economic, and/or environmental impacts?
4. What will it take to control these fires?

Goal: mitigate or prevent disaster fires through early warning and preparedness planning
Wildland Fire and Space-based Data

EO Data Needs:

1. Fire Monitoring
   • Current fire activity (hot spots)
   • Fire behaviour (Fire Radiative Energy, fire spread rate, vegetation/fuel data)

2. Fire Mapping
   • fire perimeters, unburned islands
   • fire severity (dNBR)

3. Fire Modeling
   • Climate change and fire modeling
   • Carbon emissions calculation
   • Building predictive tools for fire mgt. (early warning)
What is Fire Early Warning?

Wildland Fire Danger – a measure of the potential for fire to start, spread and do damage; it is a primary fire management decision-aid tool.

Early warning is advanced knowledge of future fire danger conditions.
Why Fire Early Warning?

Fire early warning provides:

1. Time to implement fire management actions that mitigate or prevent wildland fire disaster before fires occur
2. Guidance in the planning and appropriate use of prescribed fire
Global Fire EWS website at FIRE GLOBE Global Fire Monitoring Center:

http://www.fire.uni-freiburg.de/gwfews/index.html
April 5, 2013

FWI - Fire Weather Index
April 5, 2013

FWI - Fire Weather Index
## Pre-Suppression Planning Guide

<table>
<thead>
<tr>
<th>Wildfire Threat Level</th>
<th>Resources on Standby</th>
<th>Alert Period</th>
<th>Dispatch Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>crews, hand tools</td>
<td>mid-day</td>
<td>60-min</td>
</tr>
<tr>
<td>Moderate</td>
<td>crews, hand tools, pumps, water tanks</td>
<td>all day</td>
<td>30 min</td>
</tr>
<tr>
<td>High</td>
<td>crews, hand tools, pumps, water tanks, control line-building equipment</td>
<td>all day</td>
<td>15 min</td>
</tr>
<tr>
<td>Extreme</td>
<td>crews, hand tools, pumps, water tanks, aircraft, burnout equipment</td>
<td>all day</td>
<td>30 min</td>
</tr>
</tbody>
</table>
# Prevention and Detection Planning Guide

<table>
<thead>
<tr>
<th>Potential Ignition Level</th>
<th>Prevention Activity</th>
<th>Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>None</td>
<td>Activity: None, Period: None</td>
</tr>
<tr>
<td>Moderate</td>
<td>Post local warning signs</td>
<td>towers, mid-day</td>
</tr>
<tr>
<td>High</td>
<td>Local media warnings</td>
<td>towers, all day</td>
</tr>
<tr>
<td></td>
<td>Prescribed fire restrictions</td>
<td>vehicle patrol, mid-day</td>
</tr>
<tr>
<td>Extreme</td>
<td>TV and radio warnings</td>
<td>towers, all day</td>
</tr>
<tr>
<td></td>
<td>Prescribed fire exclusion</td>
<td>vehicle patrol, all day</td>
</tr>
<tr>
<td></td>
<td>Local community meetings</td>
<td>aircraft patrol, mid-day</td>
</tr>
</tbody>
</table>
Regional EWS Prototype: Central and South America
Southeast Asia – Calibration of FFMC

Ignition Potential Predictor
based on FFMC and hot spots
Next Steps in Regional Early Warning

1. Training in FDRS/EWS and fire management
2. Develop local decision-aids
3. Train the trainer – local capacity building

Photo: Working on Fire
Future EO Data Applications

- regional system calibration with fire data
- spatial rainfall (esp. at low amounts)
- biomass (fuel load), affecting emissions as well as fire behaviour
- vegetation phenology change (leafless/leaf-out condition)
- vegetation green-up/curing (live:dead ratio)
- snowcover/snowfree dates
- fire behaviour: fire radiative energy, indicating fuel consumption and emissions; fuel consumption with rate of fire spread, indicates fire intensity
Fire and Carbon Emissions Modeling
Area Burned Data

Landsat

SPOT-VGT

AVHRR

Russian Area Burned Polygons
Date of Burn

MODIS hot spots used to determine daily fire activity

Example of MODIS and AVHRR data

Julian Date

- 165
- 166
- 167
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- 178
- 179
Carbon Emissions Modeling

Map showing carbon emissions modeling with different colors indicating various levels of emissions.
Fire Weather Interpolation

- Fire weather is interpolated to each fire (averaged by weather associated with each MODIS hot spot)
Fire Danger and Climate Change

Change in Future Fire Weather Severity

Cumulative DSR Anomalies
IPSL-CM4 a2 2091-2100

Legend
Change in DSR
- Large Increase (more than 3x)
- Increase (1.1 to 3x)
- No Change (0.9 to 1.1x)
- Decrease (0.33 to 0.9x)
- Large Decrease (less than 0.33x)

Increases
- 2.5x
- 2x
- 1.5x

0 1,500 3,000 7,000 11,400 15,000
Kilometers

Canada
Thank You

GOFC-GOLD Global Fire EWS Project Team

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Global EWS website at
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