Development of Wildland Fire Emission Inventories for 2003-2006 and Sensitivity Analyses

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Emission Inventory Processing

- Contiguous United States
- August 2002 through 2006
- Wildfire, WFUs, prescribed burning
- Agricultural burning excluded

BlueSky Pathway

- Fire Information: SMARTFIRE
- Fuel loading: FCCS
- Fuel Consumption: Consume 3.0
- Emissions: FEPS
Data Sources

- ICS-209 reports: AirFire, FAMWEB, Tom Pace
- HMS fire detects: NOAA HMS (Mark Ruminski)
- MODIS fire detects: USFS Remote Sensing Applications Center (used to fill gaps in HMS data)
- Fuel moisture: USFS Wildland Fire Assessment System
Annual PM$_{2.5}$ Primary Emissions (2003-2006, Lower 48)

Annual Total

<table>
<thead>
<tr>
<th>Year</th>
<th>PM$_{2.5}$ (million tons)</th>
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<tbody>
<tr>
<td>2003</td>
<td>1.28</td>
</tr>
<tr>
<td>2004</td>
<td>0.90</td>
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<tr>
<td>2005</td>
<td>1.10</td>
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<tr>
<td>2006</td>
<td>1.67</td>
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Monthly Totals

- 2003
- 2004
- 2005
- 2006
Effect of Different Fire Information Sources

ICS-209s only
• This was BlueSky’s previous data feed.
• ICS-209s report cumulative area burned.
• We subtracted the previous day’s area from today’s to get the daily area burned.

MODIS Terra and Aqua only
• This is the most commonly used satellite-derived fire data set.
• We developed acres burned per pixel relationship by examining 30 wildfires.
• Used 100 acres per pixel.
SMARTFIRE vs. MODIS vs. ICS-209
Area Burned

Average Annual Acres Burned (2003 - 2006)

- 440,000
- ICS209
- MODIS
- SMARTFIRE
Differences Between MODIS and HMS

Because HMS includes GOES and AVHRR derived fire pixels in addition to MODIS, it detects more fires overall.

This is especially true in the southeast, where fires are often small and/or short lived.

In addition to the increased coverage, HMS provides human quality control.
Yearly Totals

Overall Consumption Rate (tons/acre)

ICS-209 10.0
MODIS 17.6
SMARTFIRE 11.9

MODIS consumption rate is much higher than the other two.

Why?
SMARTFIRE vs. MODIS vs. ICS-209
PM$_{2.5}$ emissions

Annual Average PM$_{2.5}$ (tons)
(2003-2006)

- 100,000
- ICS-209
- MODIS
- SMARTFIRE
Future Work

• Continued validation and improvement of fire size parameters
• Further exploration of fuel consumption rate estimates
• Differences with high resolution fuel loading data (LANDFIRE)
  – 30-m spatial resolution is finer scale than the satellite fire information
  – Will use helicopter flown perimeters or high resolution satellite burn scars to determine area burned
Acknowledgments

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  - Mark Ruminski and John Simko (NOAA NESDIS)
  - Roger Ottmar and Susan Pritchard (USFS)

Thank you!

www.getbluesky.org/smartfire

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Extra slides below here
Acres Burned By Season

Four year average acres

210,000

Average cluster size

Acres

100 - 120
121 - 150
151 - 200
201 - 350

Winter (December - February)
Spring (March - May)
Summer (June - August)
Fall (September - November)

Note: Alaska acres burned are not shown to the same scale.