Who's Smoke is It, Anyway?

Robert Elleman **EPA Region 10**

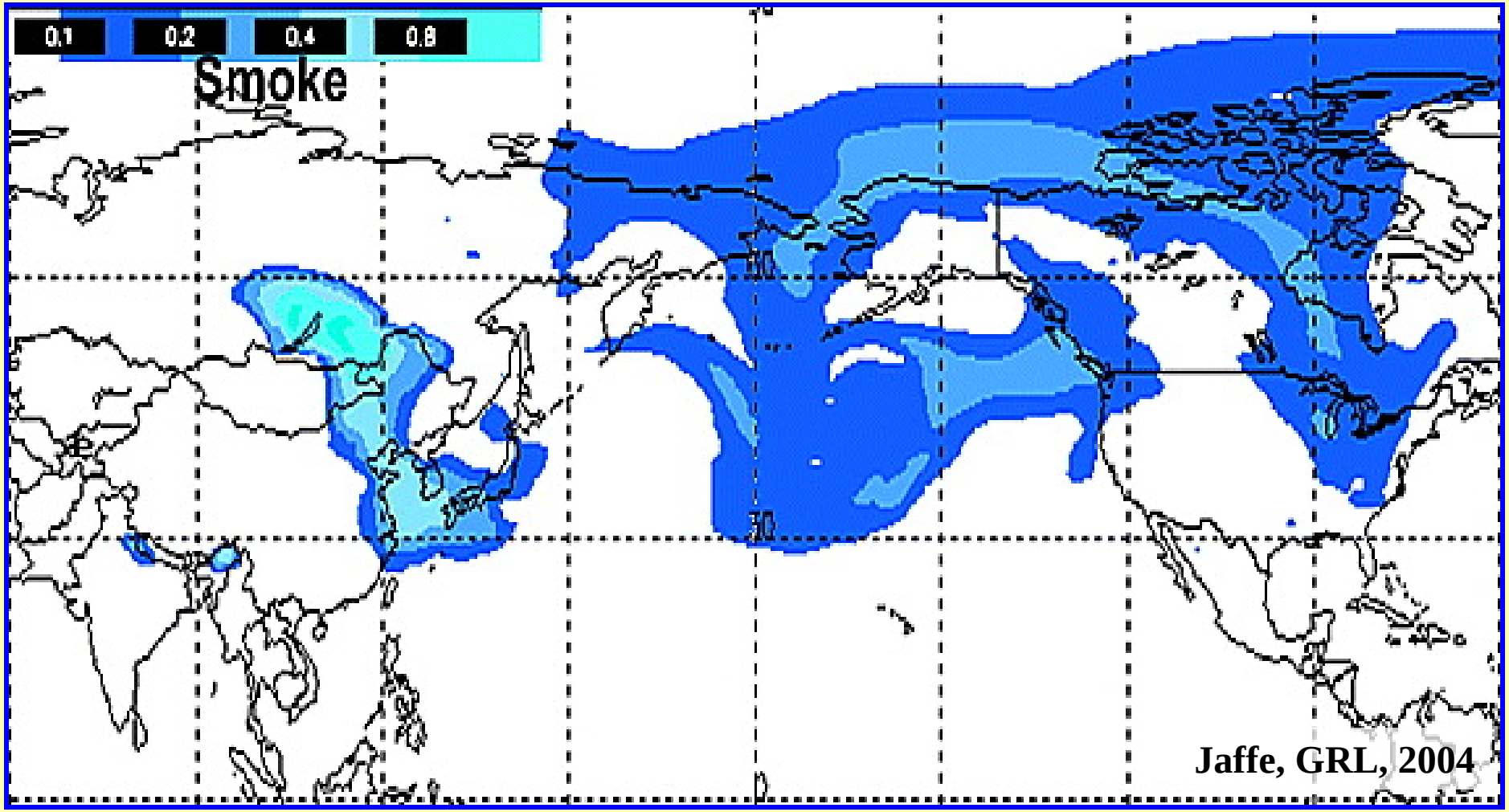
The Set-Up

- **I’m here to tell you what you already know**
- **But from the perspective of a meteorologist**
- **The points**
  1. **That smoke is ours. We all own it.**
  2. **It can end up anywhere.**
  3. **Meteorological forecast tools are useful but have a limit.**
  4. **An effective management plan combines real-time decisions and long-term strategies**

Siberian Smoke *May 27, 2003*

Siberian Smoke Around the World

June 2, 2003



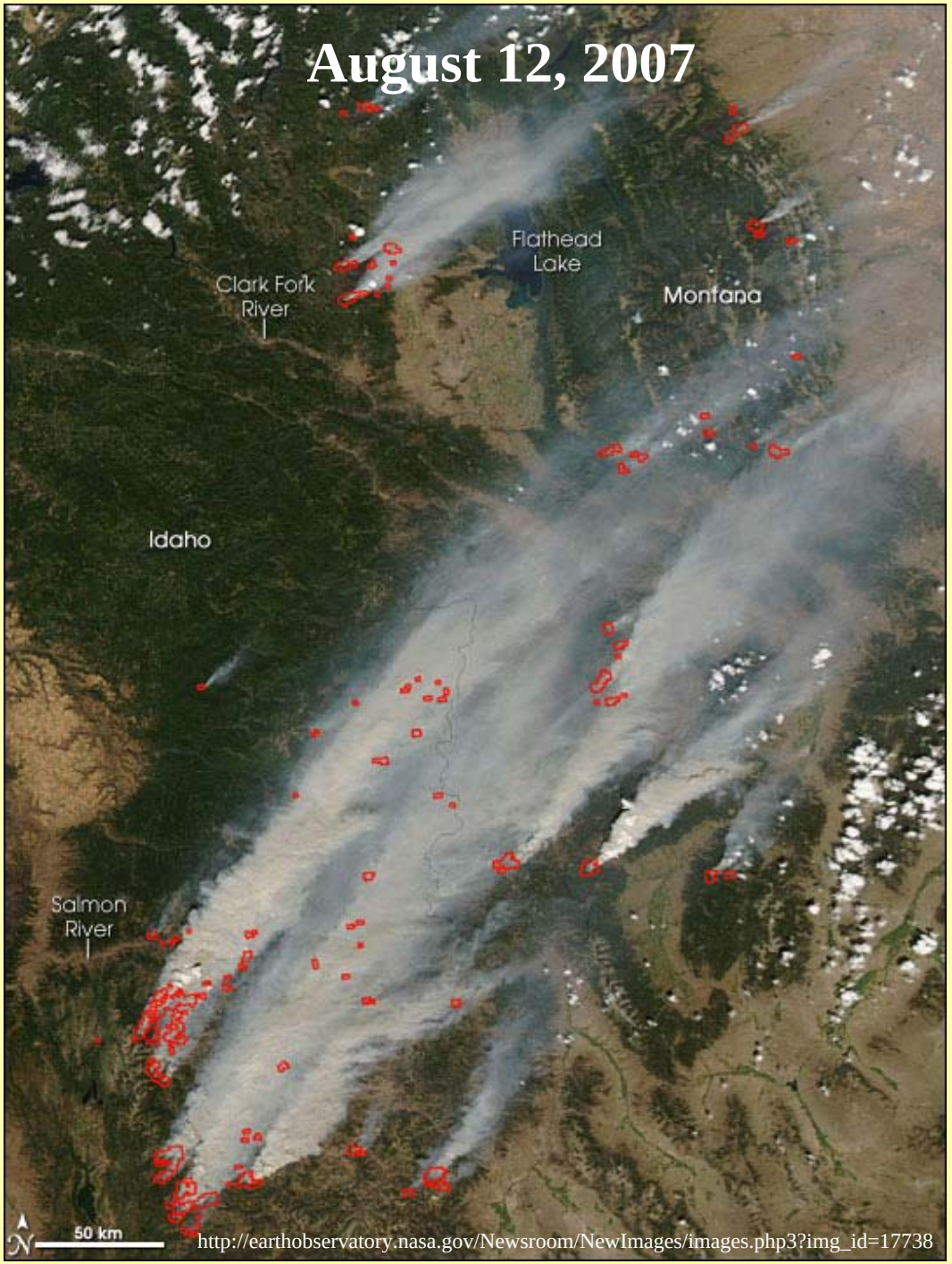
B&B Complex Fire

September 4, 2003

Idaho Fires

July-Sept, 2007

- **Use as example**
  - **Regional nature**
  - **Interaction with meteorology**
  - **Usefulness and limits of forecast tools**



Case Study:
Idaho Fires, July-Sept 2007

- **Burned for most of the summer**
- **Spent most of their time affecting Montana**
- **Some widespread impact in Idaho pop. centers**
  - **August 1-3**
  - **August 14-16**
  - **September 5-6**
  - **September 10-15**

Fire Impacts on Idaho

Date	Site Name	24-hr Avg
8/1/2007	Boise Mountain View	33
8/2/2007	Boise Mountain View	33
8/2/2007	Salmon	23
8/3/2007	Boise Mountain View	24
8/3/2007	Salmon	23
8/14/2007	Kamiah	22
8/14/2007	Salmon	128
8/15/2007	Grangeville	32
8/15/2007	Kamiah	32
8/15/2007	Reubens	21
8/15/2007	Salmon	61
8/16/2007	Grangeville	88
8/16/2007	Kamiah	36
8/16/2007	Reubens	27
8/16/2007	Salmon	21
9/5/2007	Boise Mountain View	29
9/6/2007	Boise Mountain View	40
9/6/2007	Idaho Falls	27
9/10/2007	Boise Mountain View	24
9/10/2007	Kamiah	29
9/10/2007	Reubens	21
9/11/2007	Boise Mountain View	22
9/11/2007	Grangeville	34
9/11/2007	Kamiah	50
9/11/2007	Lapwai	28
9/11/2007	Lewiston	24
9/11/2007	Moscow	26
9/11/2007	Reubens	29
9/11/2007	Twin Falls	24
9/12/2007	Kamiah	24
9/12/2007	Salmon	45
9/13/2007	Boise Mountain View	21
9/13/2007	Idaho Falls	27
9/13/2007	Salmon	34
9/14/2007	Boise Mountain View	38
9/14/2007	Grangeville	39
9/14/2007	Kamiah	58
9/14/2007	Reubens	25
9/15/2007	Boise Mountain View	26
9/15/2007	Kamiah	36

Fire Impacts on OR / WA

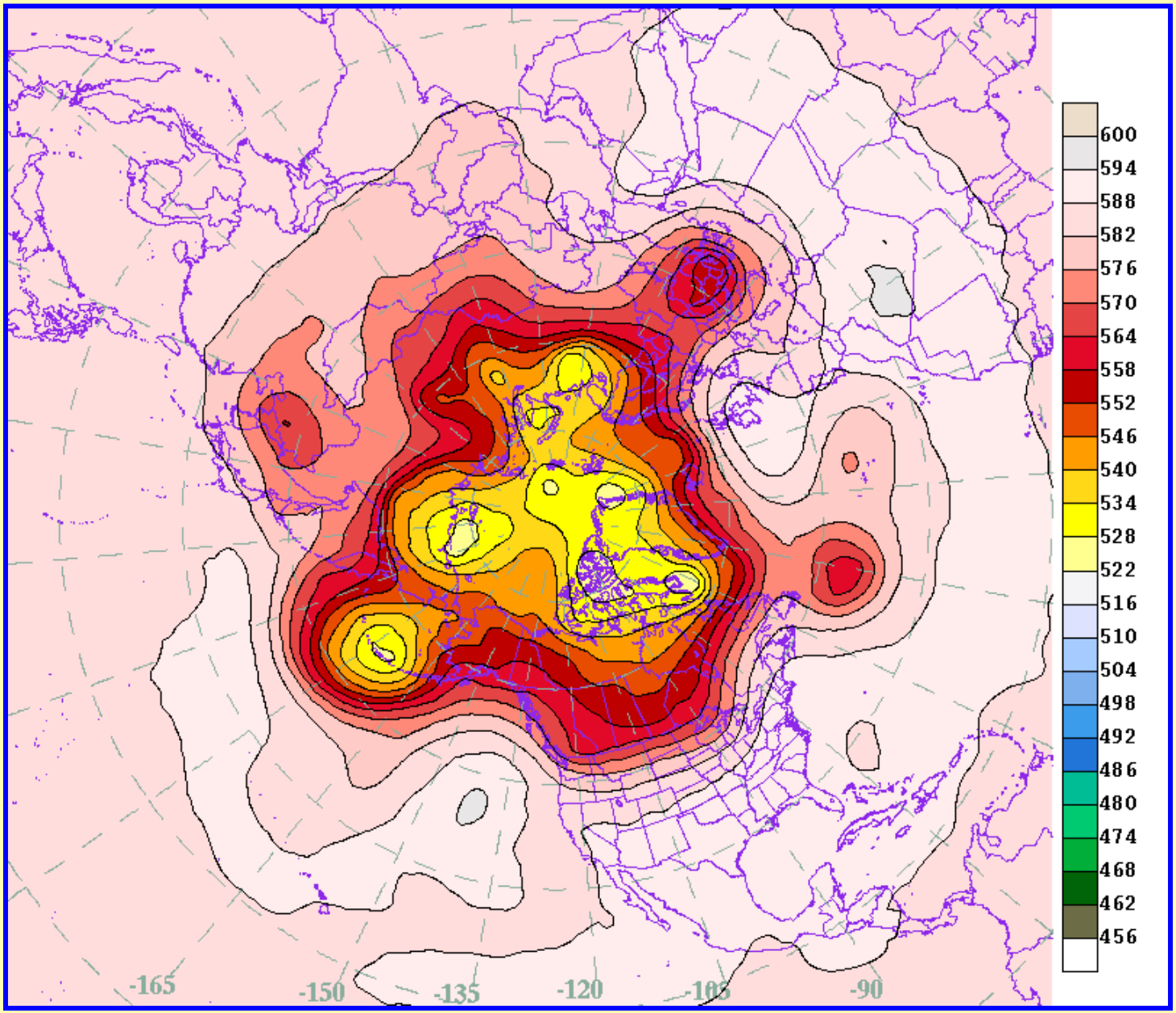
Date	Site Name	24-hr Avg
9/10/2007	Baker City	18
9/10/2007	John Day	21
9/10/2007	La Grande	16
9/11/2007	Baker City	26
9/11/2007	Beaverton	20
9/11/2007	Burns	16
9/11/2007	Enterprise	19
9/11/2007	John Day	22
9/11/2007	La Grande	25
9/14/2007	Baker City	18
9/14/2007	Enterprise	38
9/14/2007	La Grande	15
9/15/2007	Baker City	20
9/15/2007	Enterprise	35
9/15/2007	La Grande	16

Date	Site Name	24-hr Avg
9/11/2007	Lacrosse	16
9/11/2007	Pullman	23
9/11/2007	Spokane (Ferry)	16
9/11/2007	Toppenish	16
9/11/2007	Walla Walla	17
9/12/2007	Spokane (Ferry)	18
9/12/2007	Toppenish	17
9/13/2007	Ellensburg	30
9/13/2007	Moses Lake	22
9/13/2007	Puyallup	15
9/13/2007	Seattle (Duwamish)	19
9/13/2007	Seattle (Olive)	17
9/13/2007	Tacoma (Alexander)	20
9/13/2007	Yakima	33
9/14/2007	Ellensburg	18
9/14/2007	Kennewick	19
9/14/2007	Moses Lake	30
9/14/2007	Spokane (Ferry)	16
9/14/2007	Starbuck	16
9/14/2007	Walla Walla	18
9/14/2007	Yakima	28
9/15/2007	Spokane (Monroe)	16

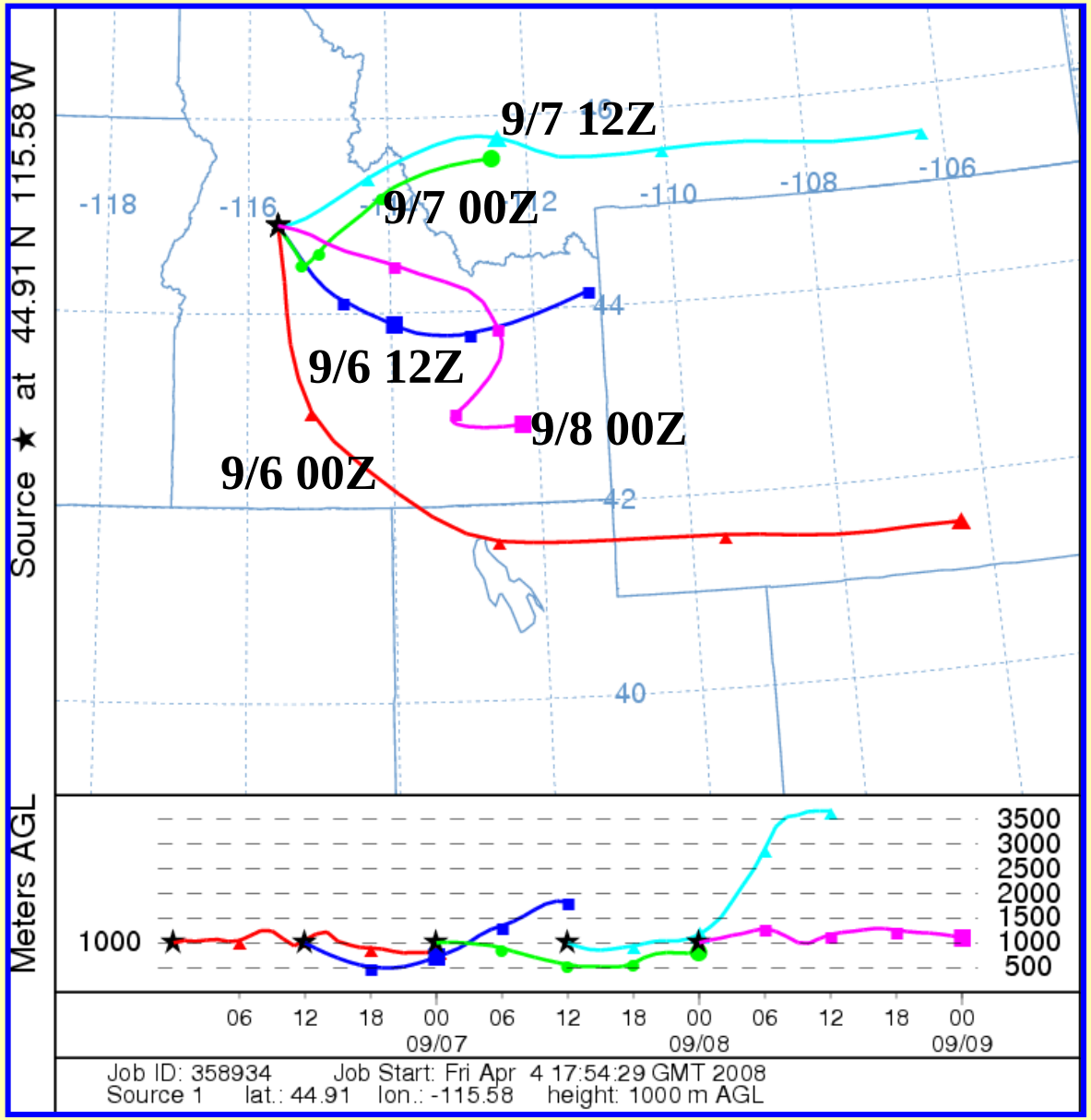
Phases of the 9/11-9/15 Episode

1. **Pre-episode**
   - **Smoke going east *before Sept 8***
2. **1st Hit**
   - **Smoke going SW *Sept 8-9***
   - **Impacts populations *Sept 10-11***
3. **Reprieve**
   - **Smoke going east *Sept 11-12***
4. **2nd Hit**
   - **Smoke going SW, W, NW *Sept 13-15***
   - **Impacts populations *Sept 13-15***

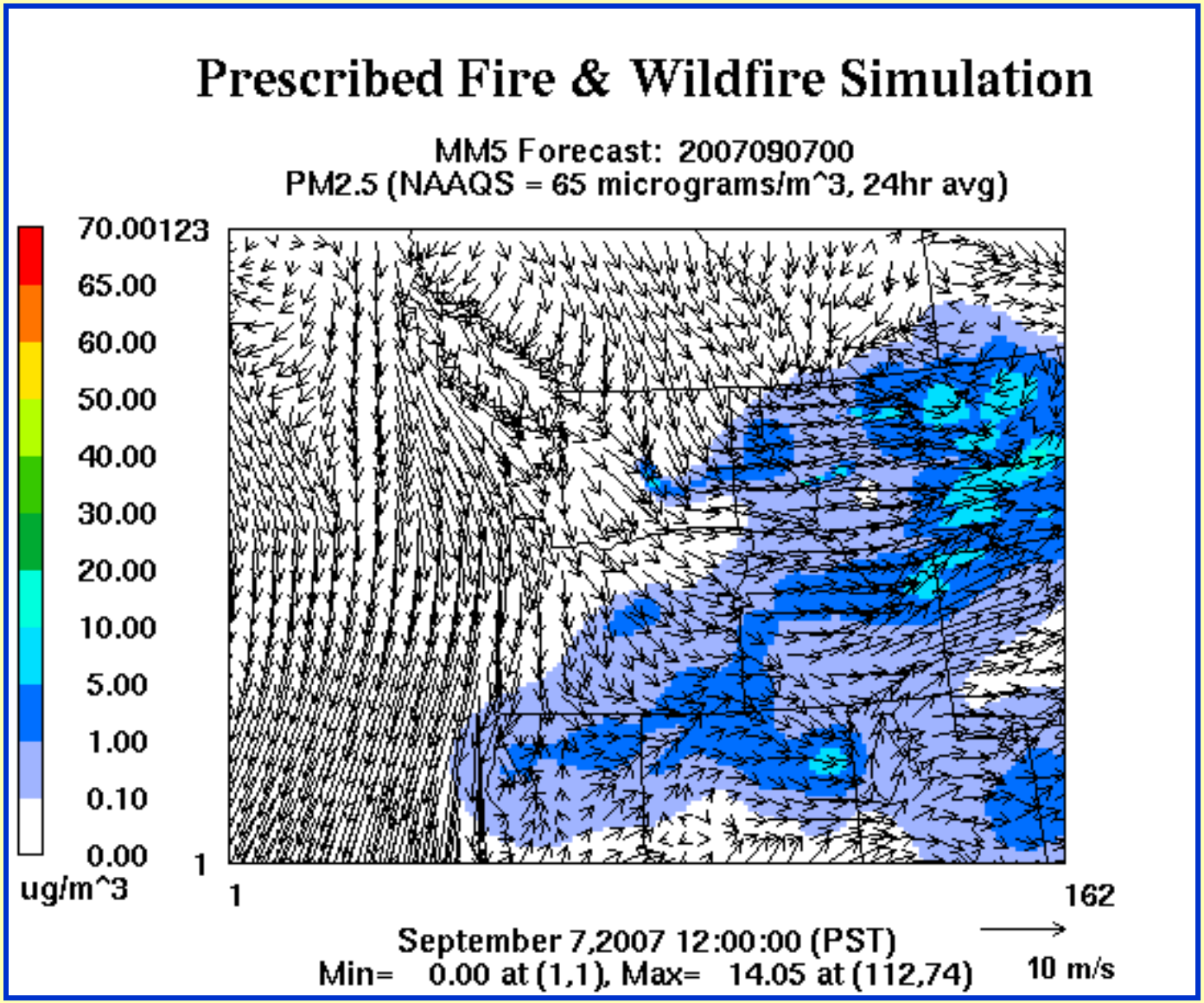
Pre-episode: *Sept 7*



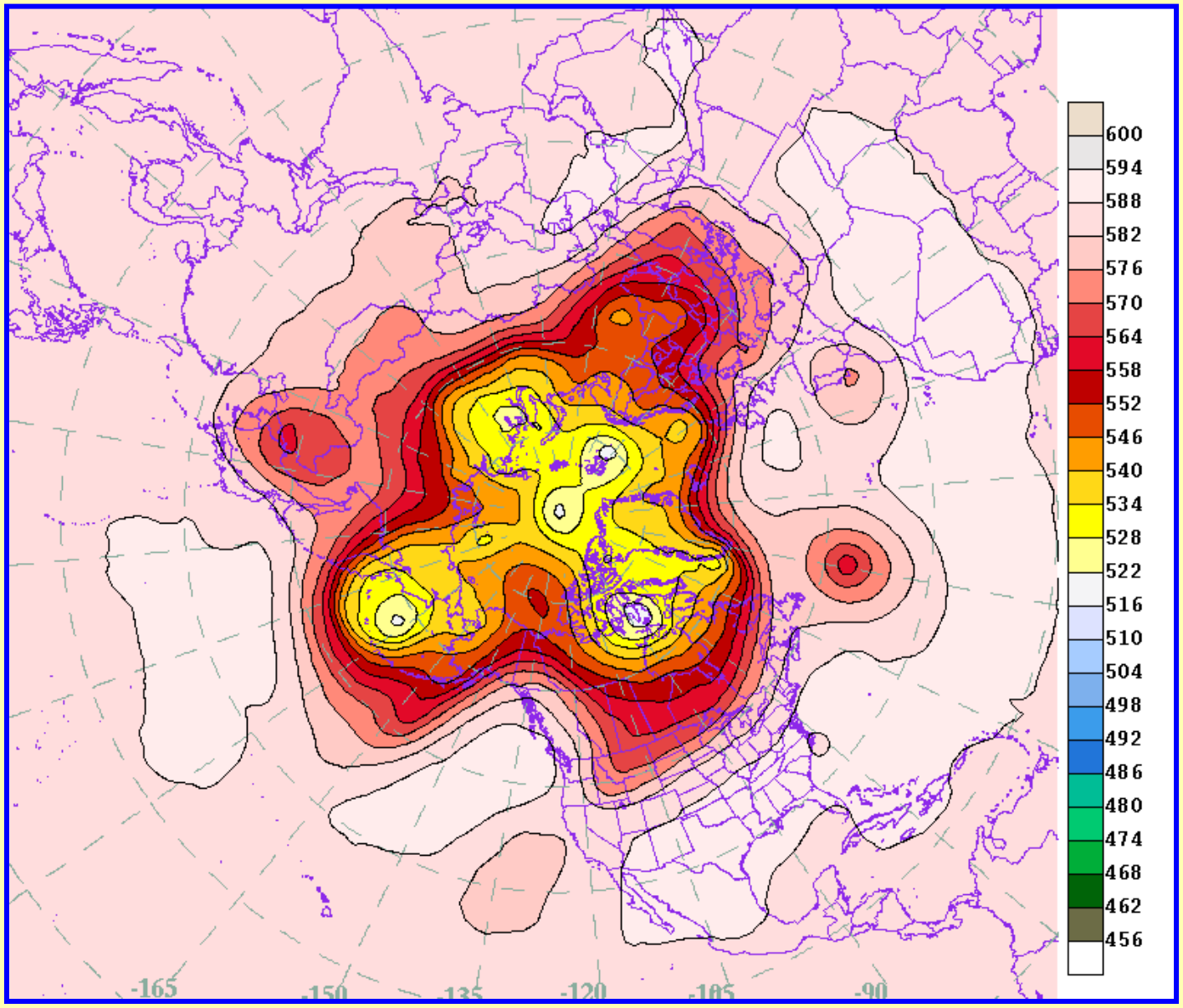
Pre-episode: *Sept 7*



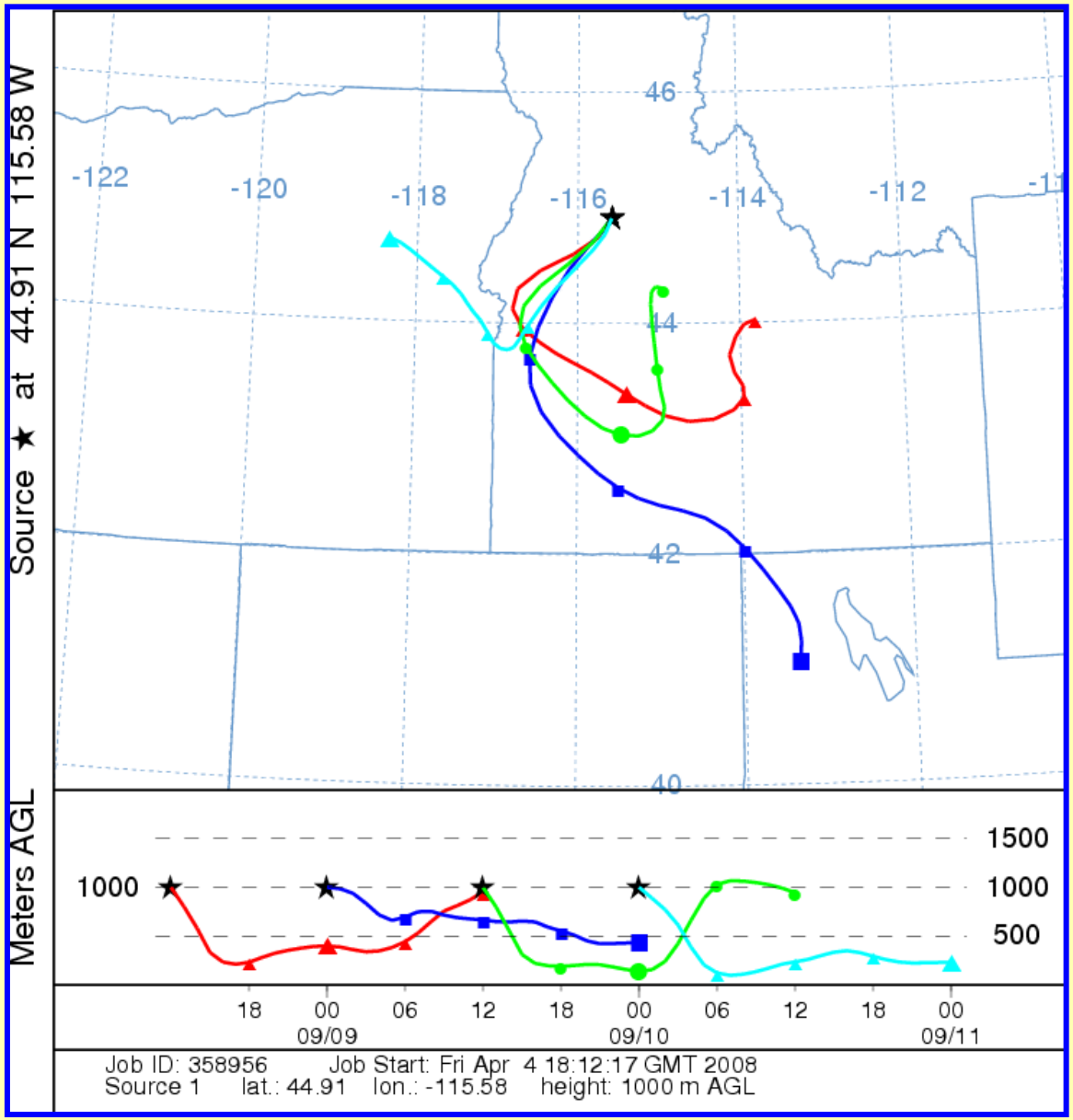
Pre-Episode: *Sept 7, 12 PM*



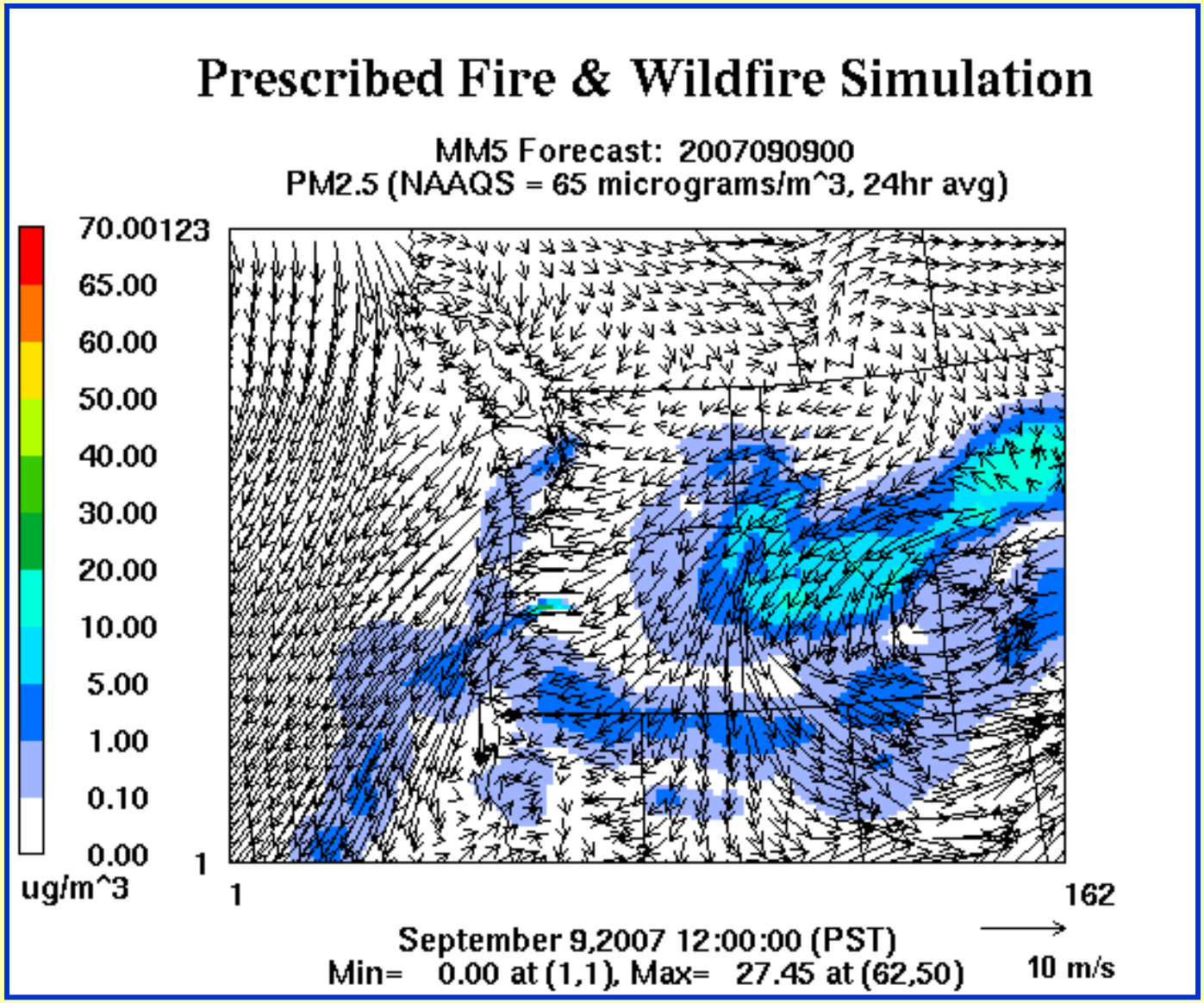
1st Hit: *Sept 8-9*



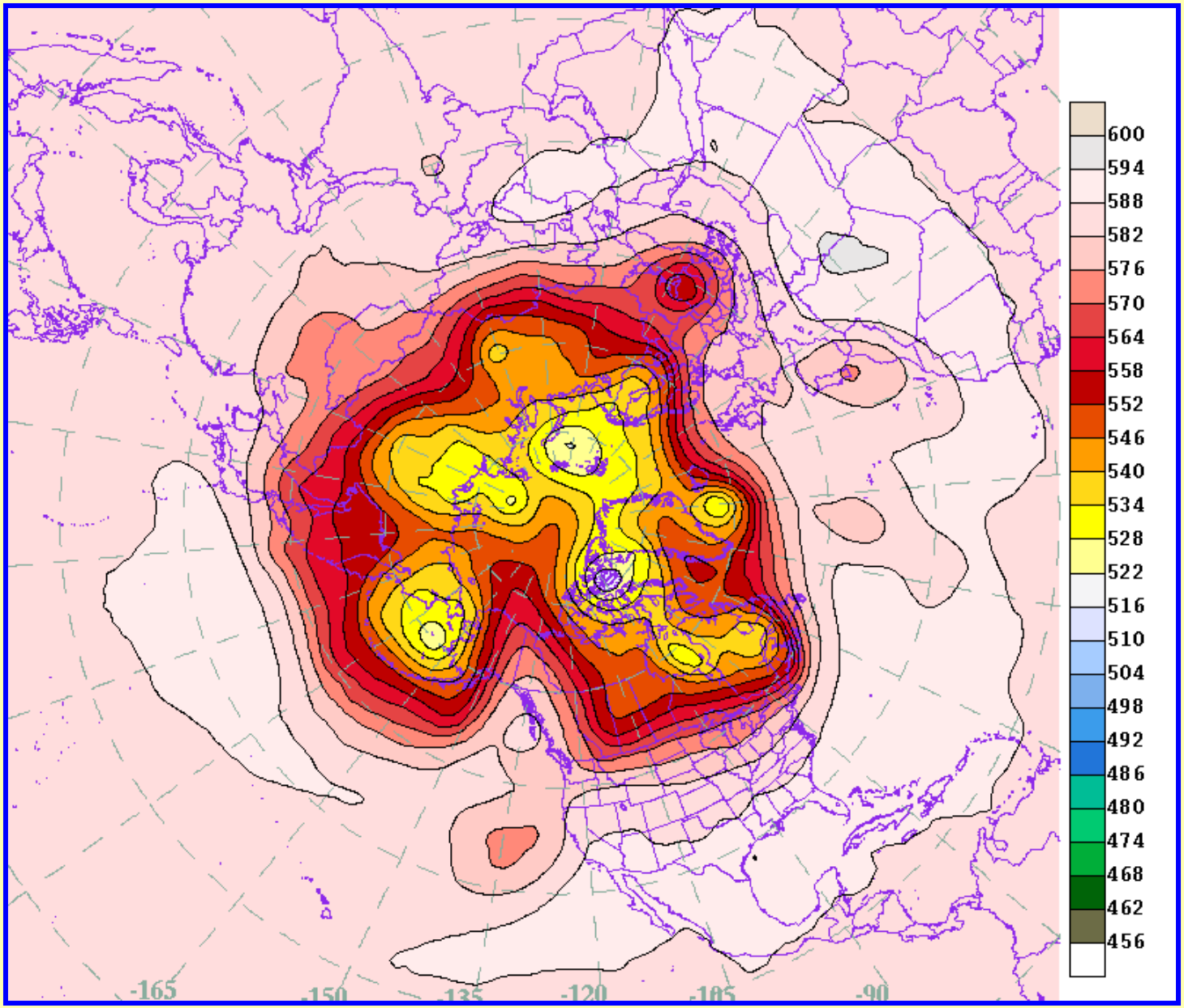
1st Hit: *Sept 8-9*



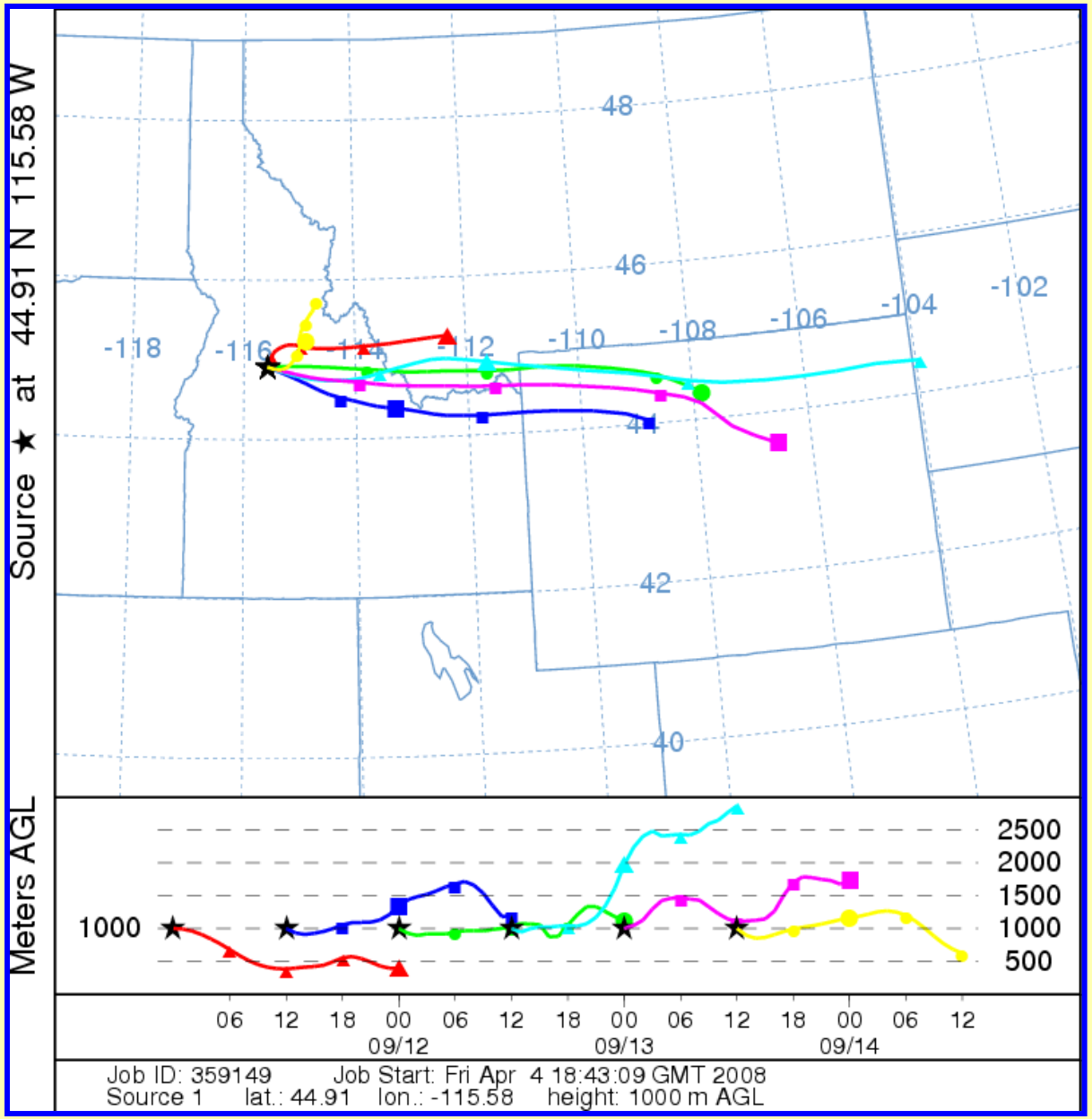
1st Hit: *Sept 9, 12 PM*



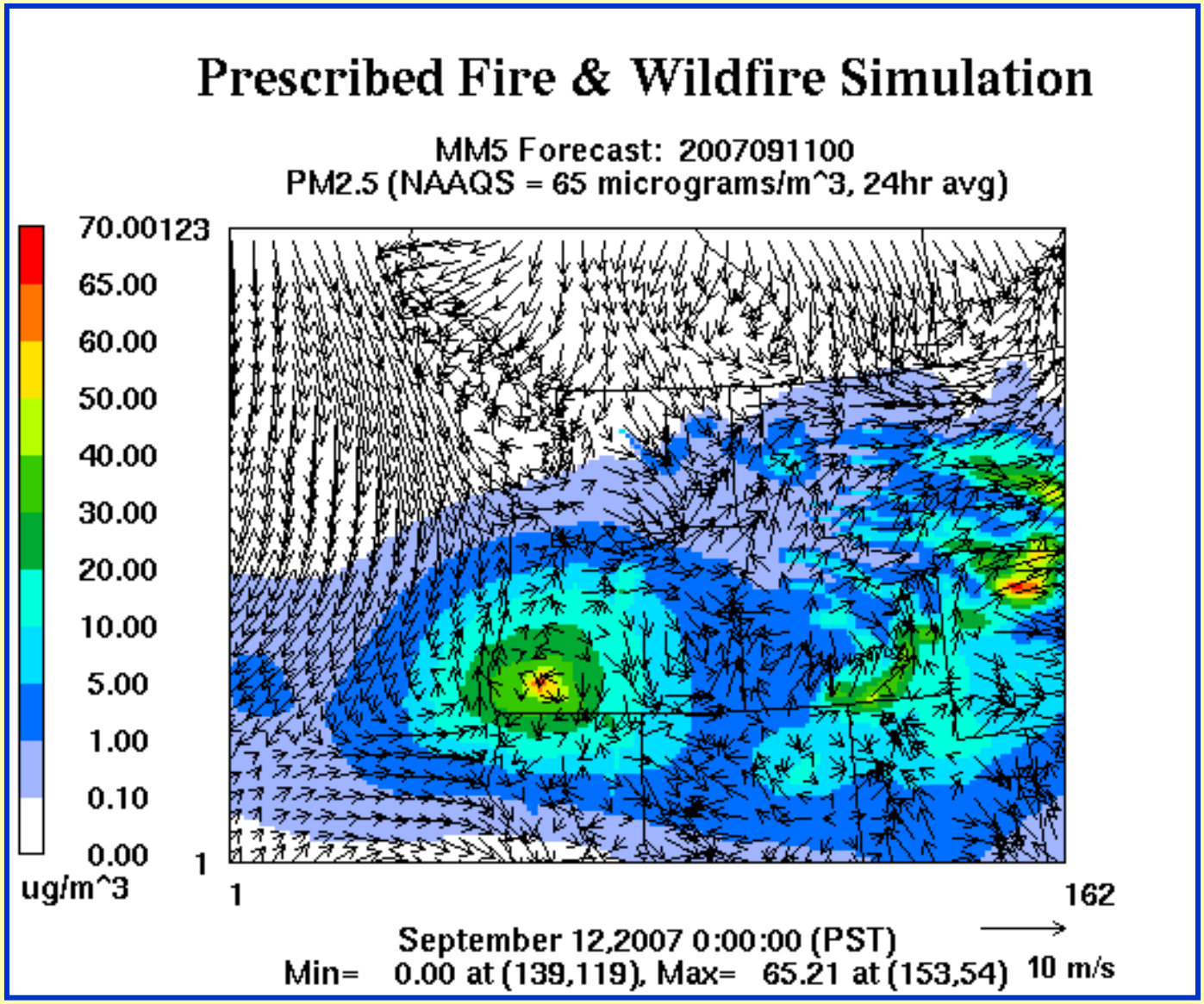
Reprieve: *Sept 11-12*



Reprieve: *Sept 11-12*



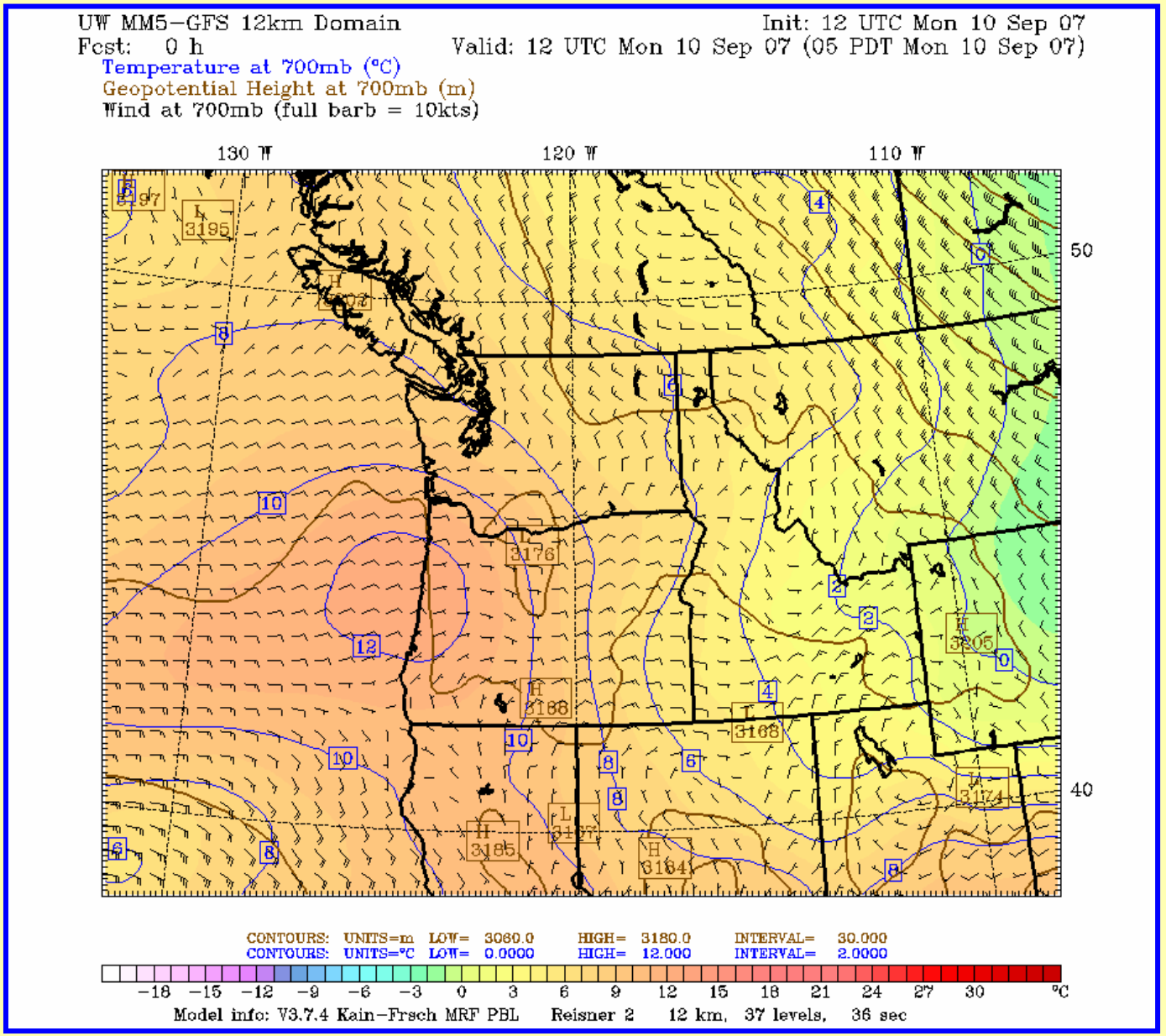
Reprieve: *Sept 12, 12 AM*



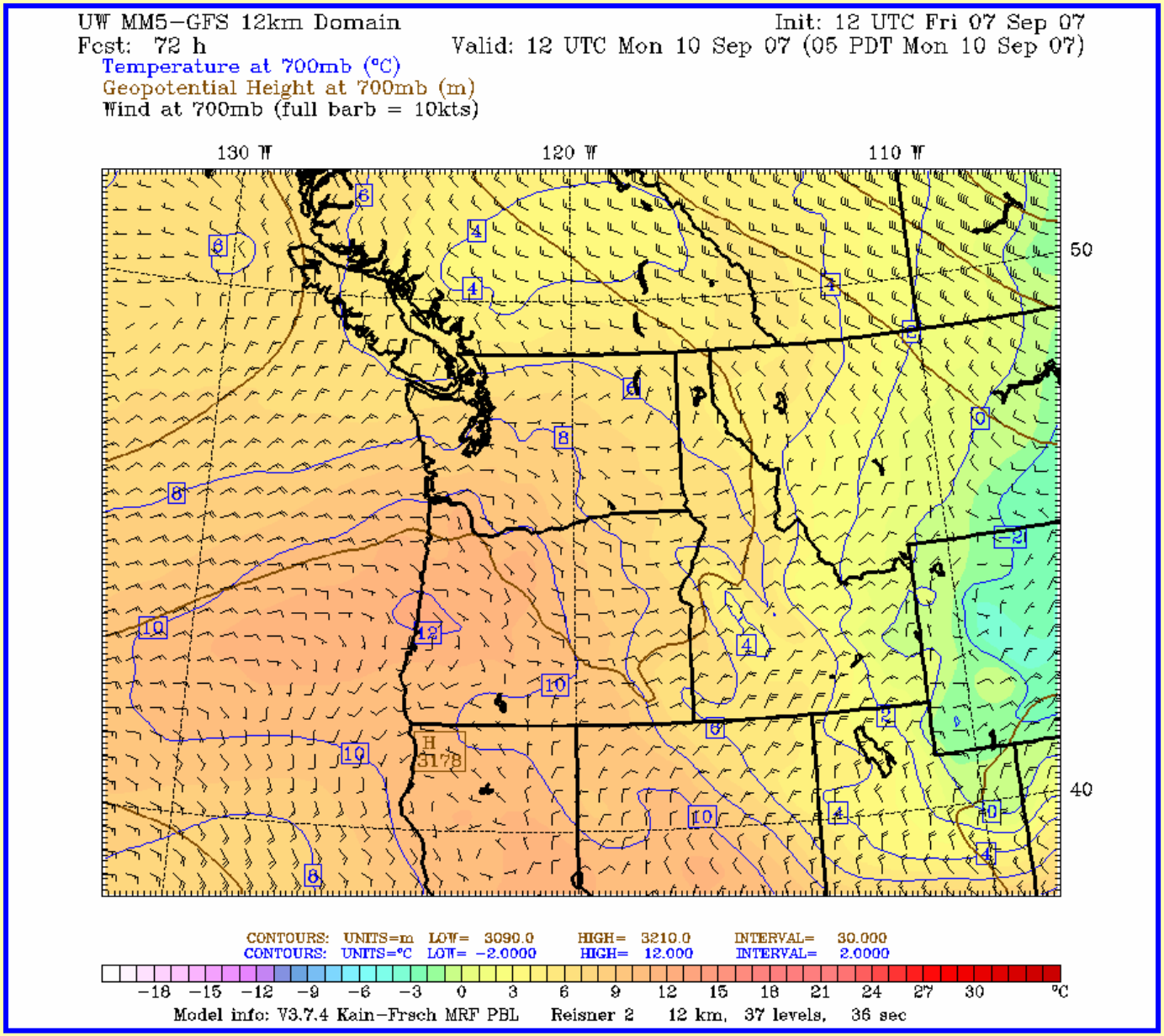
How good was the forecast?

- **Example of the reprieve forecast**
  - **9/10 4 AM PST**
- **700 mb wind up to 72 hours in forecast**

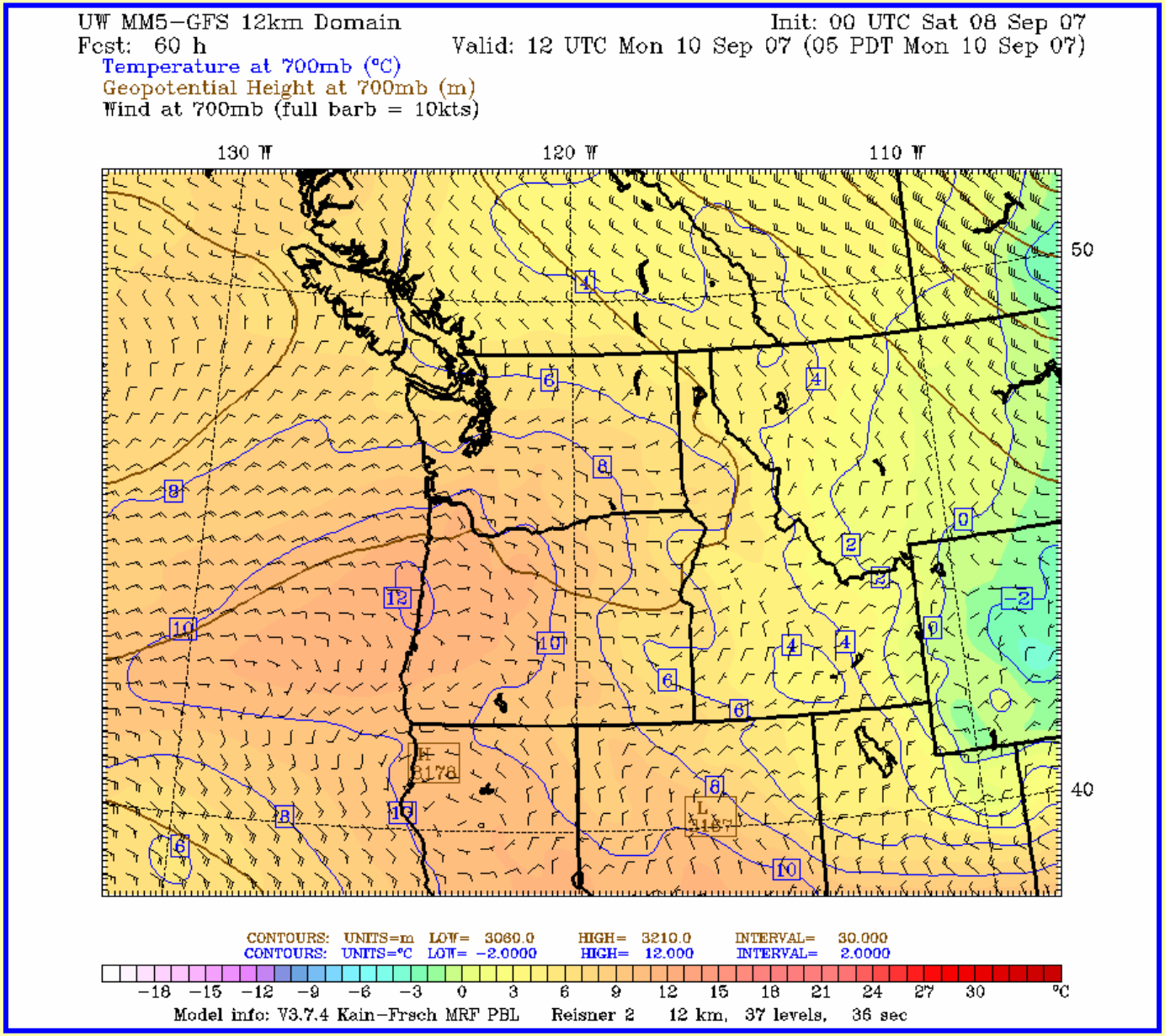
“Truth” for 9/10 4 AM PST



72 Hour Forecast for 9/10 4 AM PST



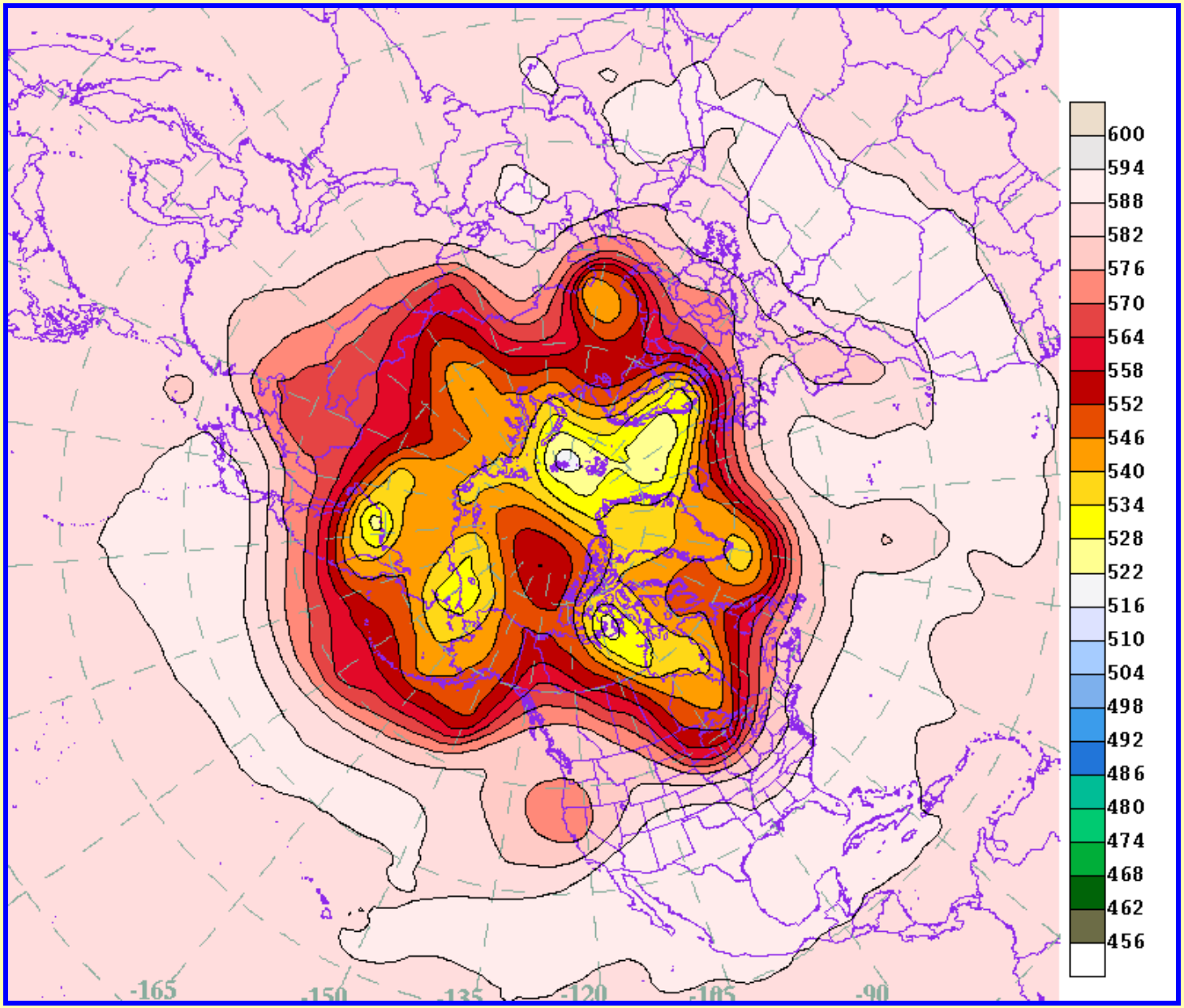
60 Hour Forecast for 9/10 4 AM PST



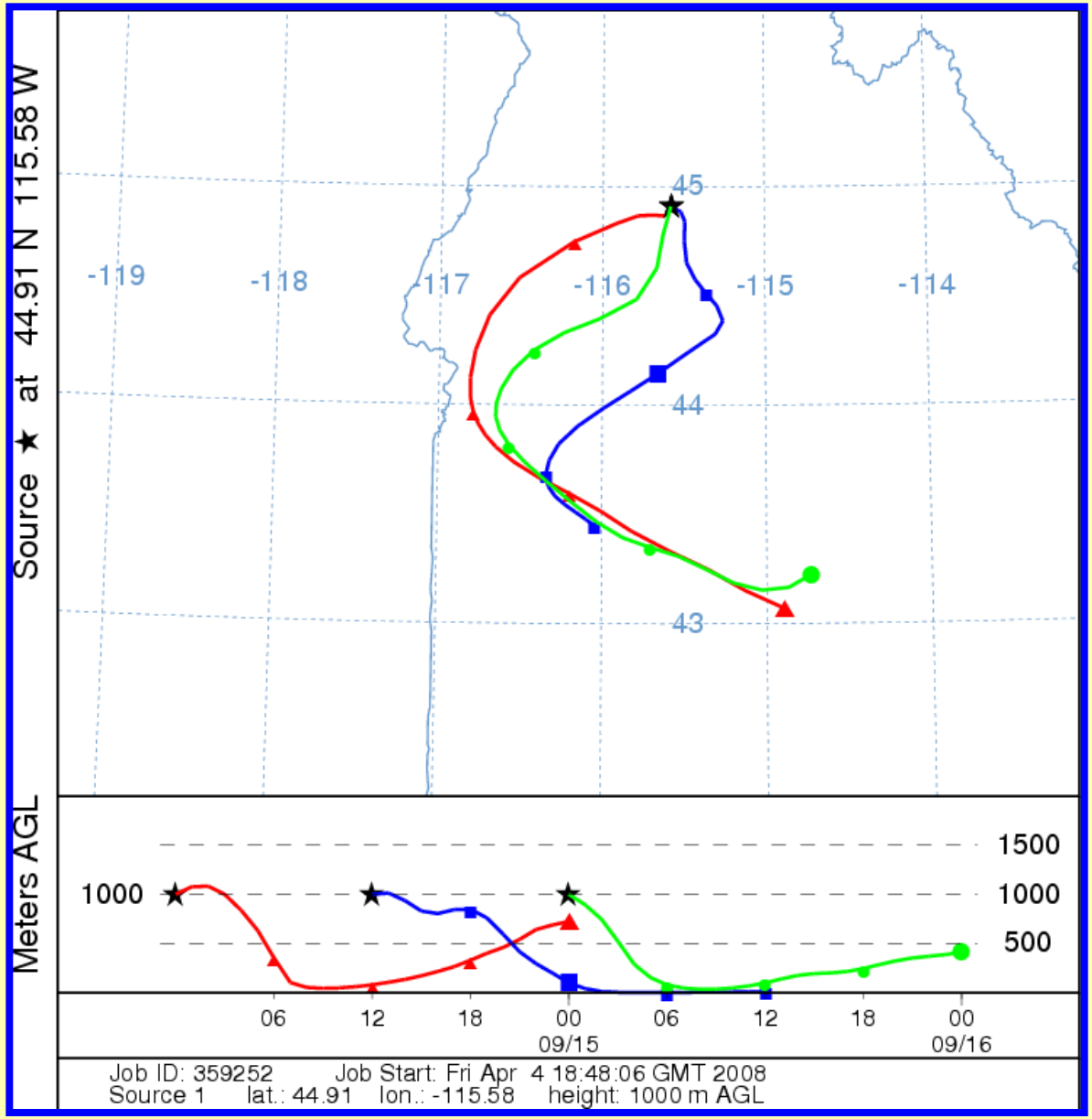
How good was the forecast?

- **Example of the reprieve forecast**
  - **9/10 4 AM PST**
- **700 mb wind up to 72 hours in forecast**
- **Large scale forecast was adequate 2+ days in advance**
  - **Not always the case but often**
  - **Problem is the mesoscale forecast and boundary layer physics**

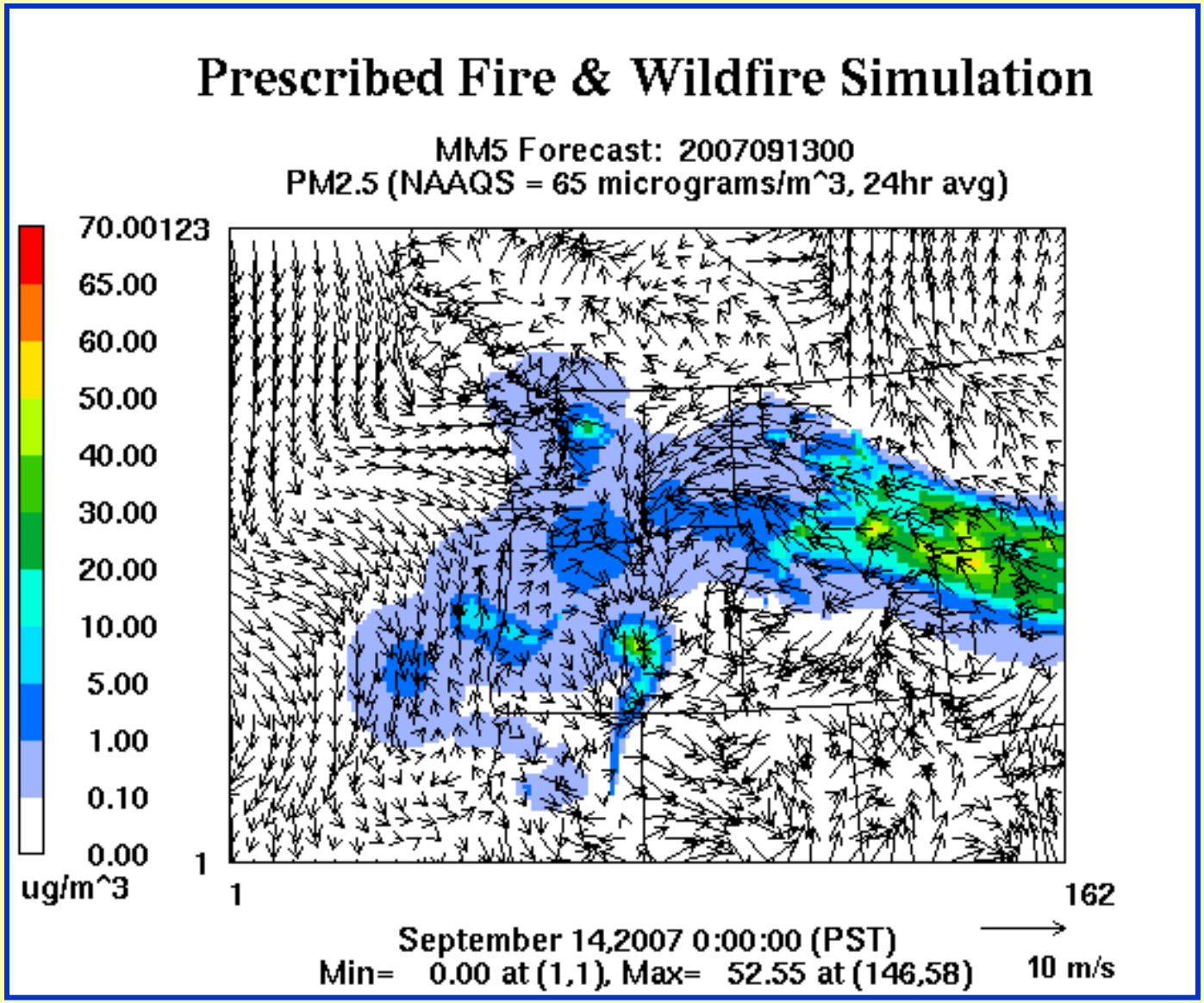
2nd Hit: *Sept 13-15*



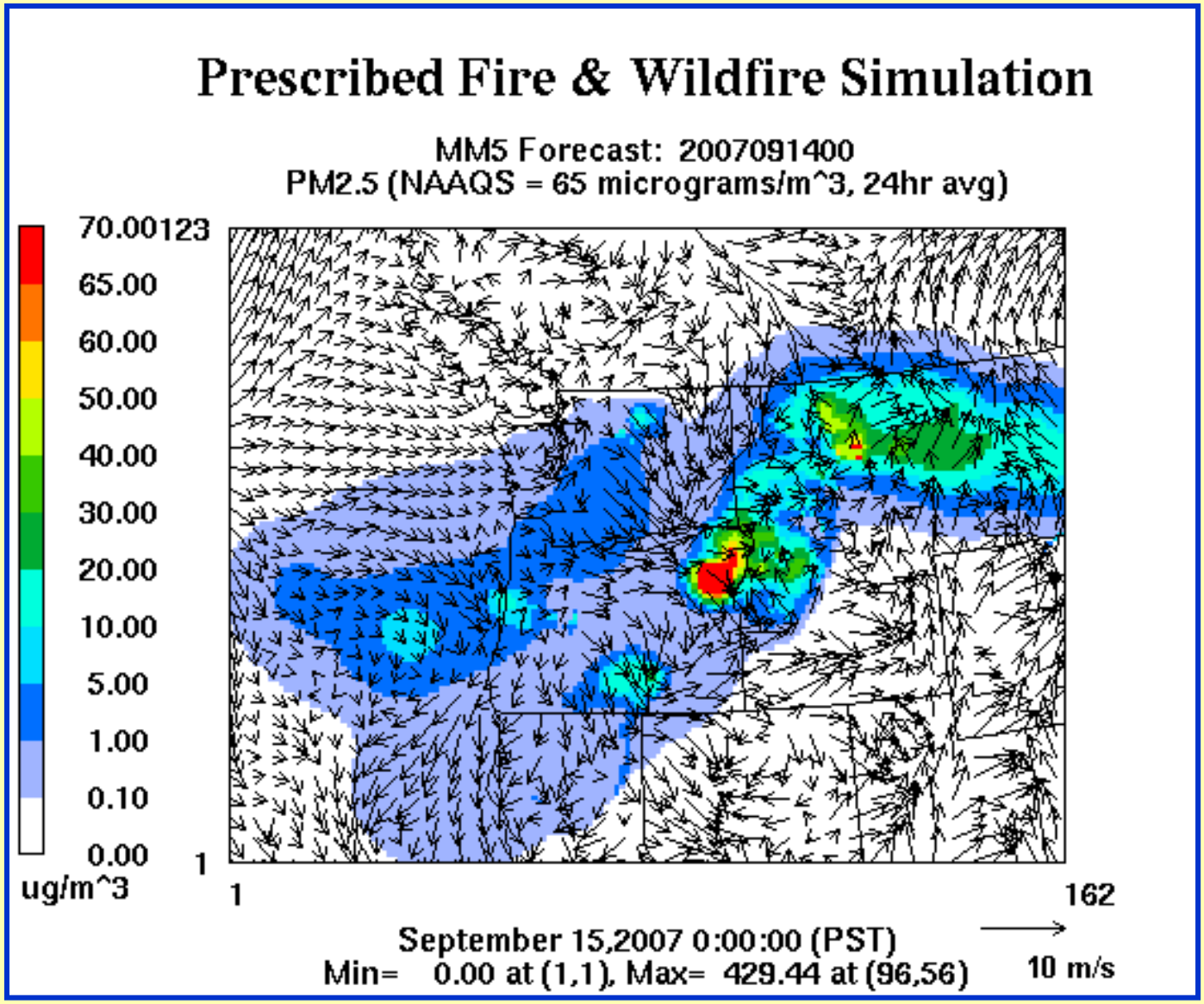
2nd Hit: *Sept 13-15*



2nd Hit: *Sept 14, 12 AM*



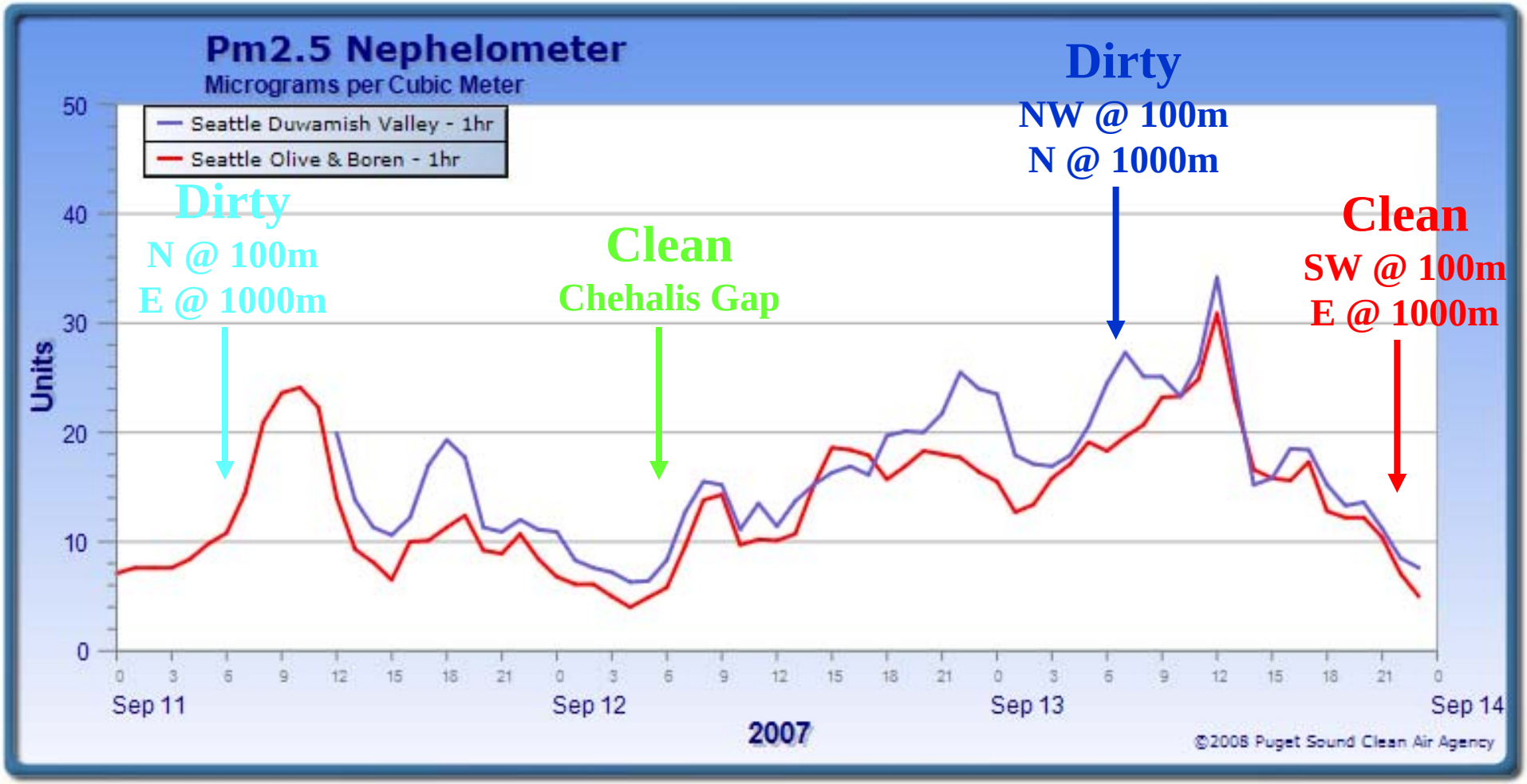
2nd Hit: *Sept 15, 12 AM*



BlueSky Animation

Forecasting Challenge:

Seattle 9/11-9/13



Forecasting Challenges

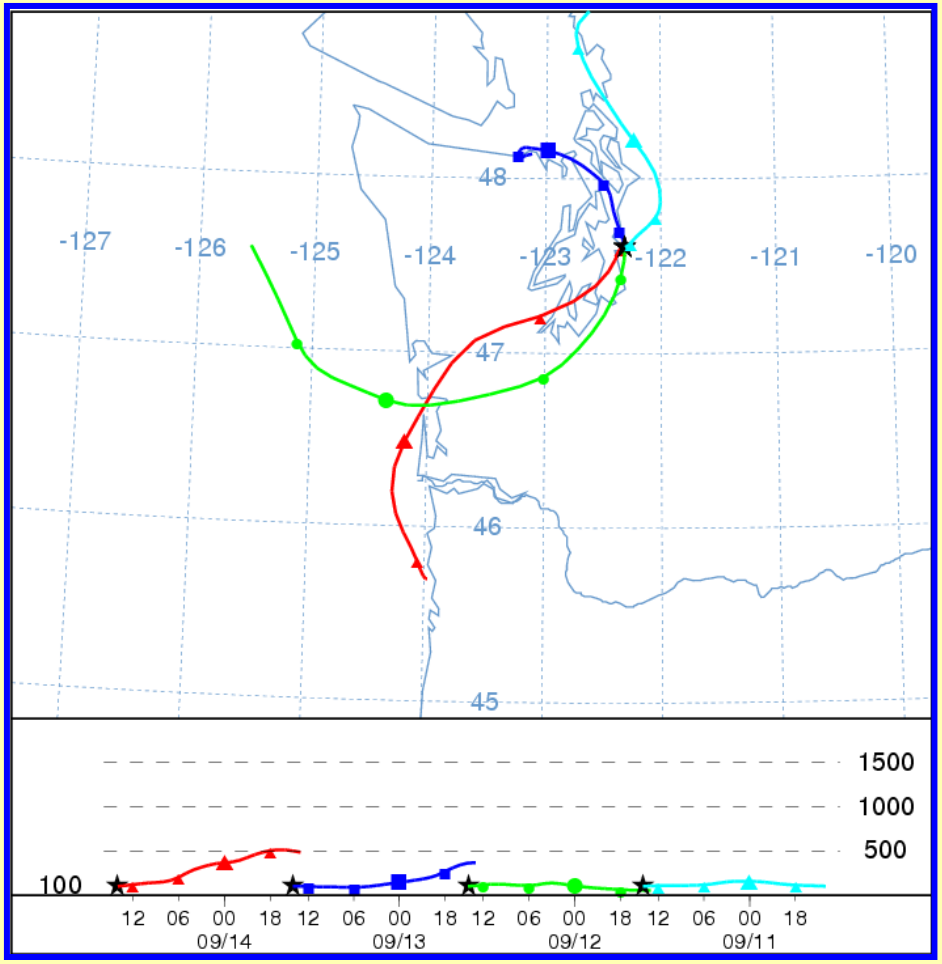
- **Boundary layer physics**
  - **Mixing pollution from above**
  - **Mixing clean air from above**
- **Mesoscale wind patterns**
  - **Sea breeze**
  - **Columbia River gap flow**
  - **Nighttime drainage flows**
- **Important to understand strengths / weaknesses**
  - **Takes experience**

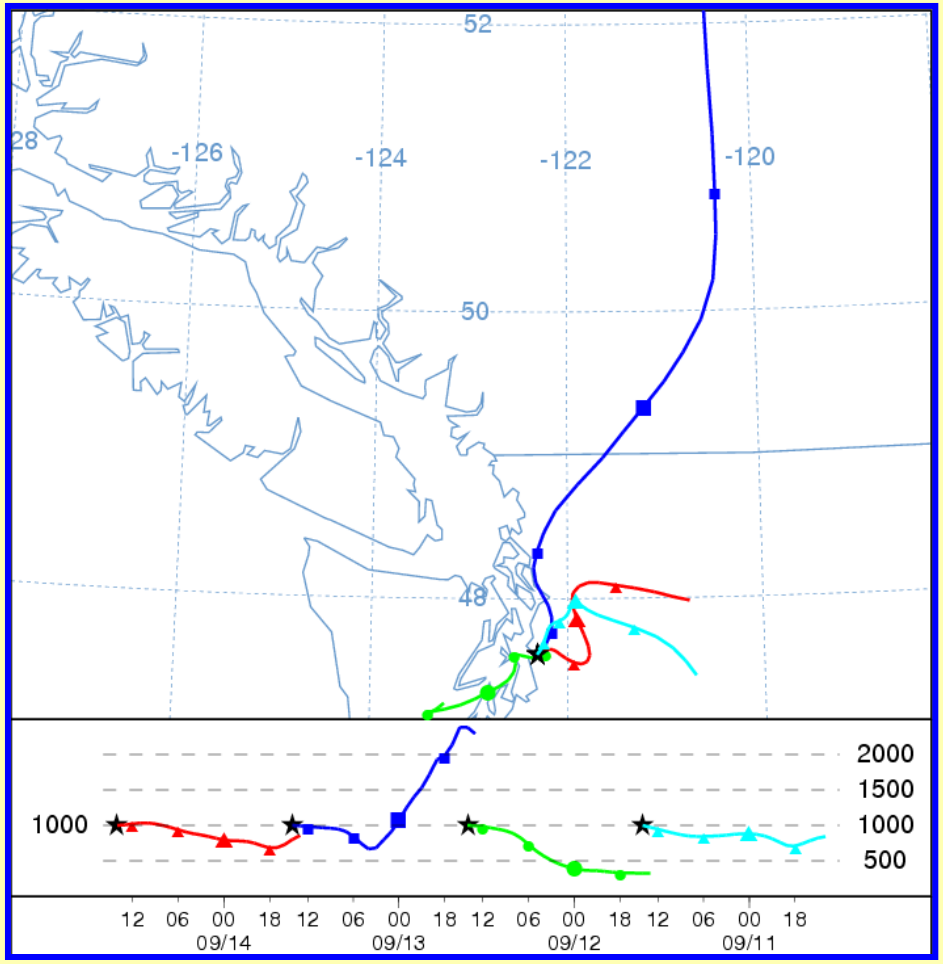
Conclusion

- **We all own the smoke**
- **It can end up anywhere**
- **Meteorological forecast tools are useful but have a limit**
- **An effective management plan combines real-time decisions and long-term strategies**

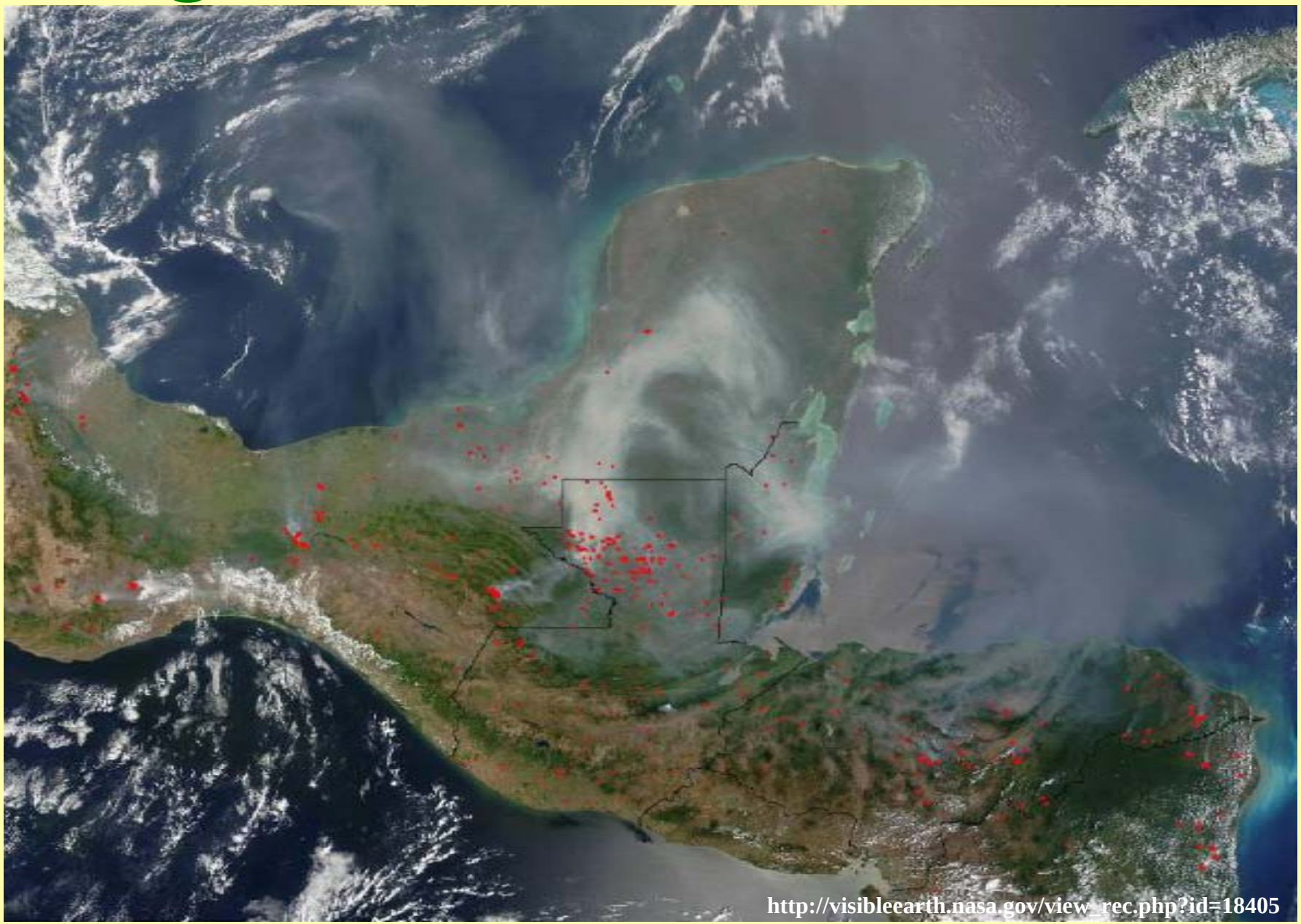
Forecasting Challenge:

Seattle 9/11-9/13





Agricultural Fires *March 20, 2003*



Smoke from Space