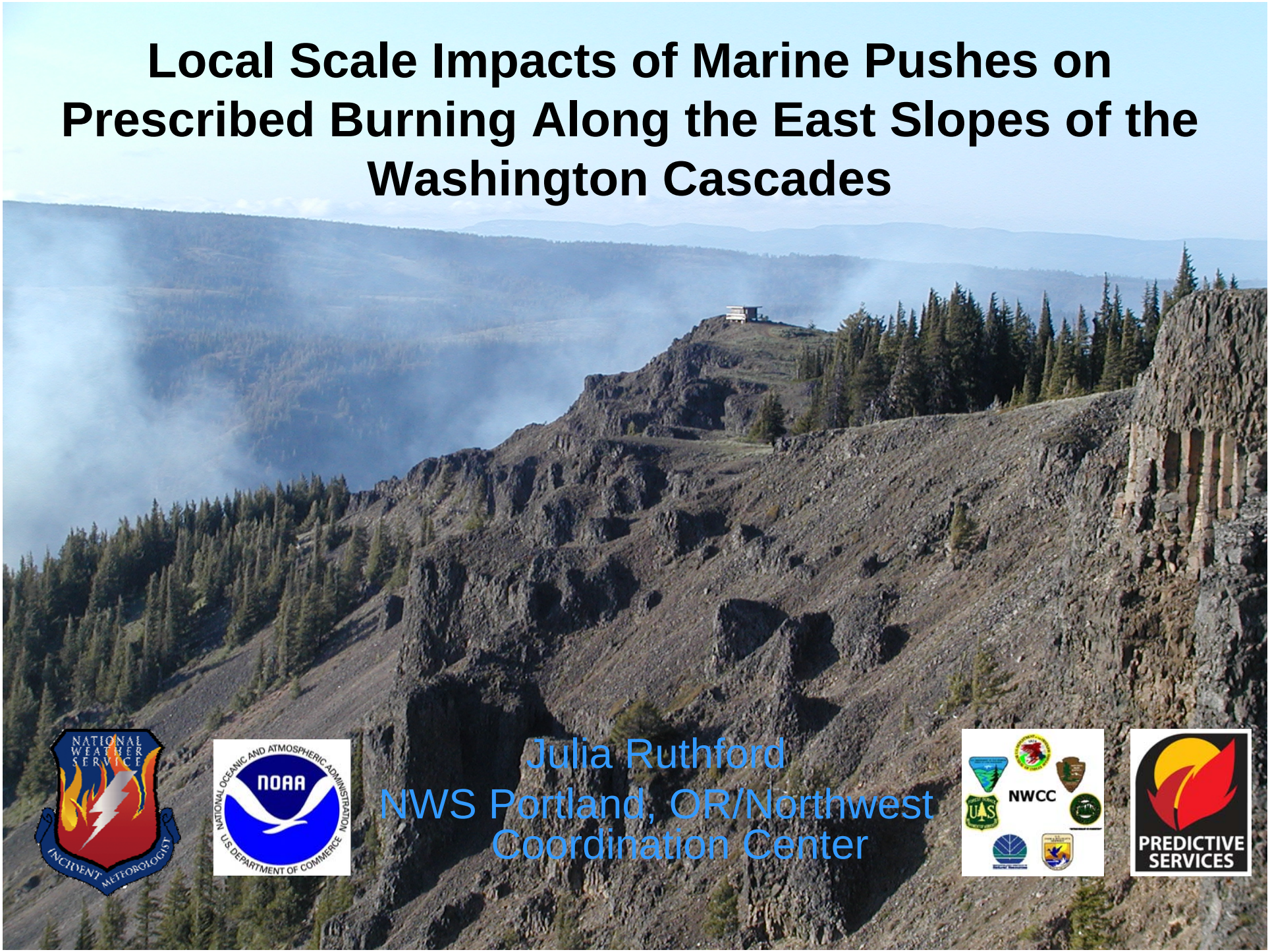
Local Scale Impacts of Marine Pushes on Prescribed Burning Along the East Slopes of the Washington Cascades



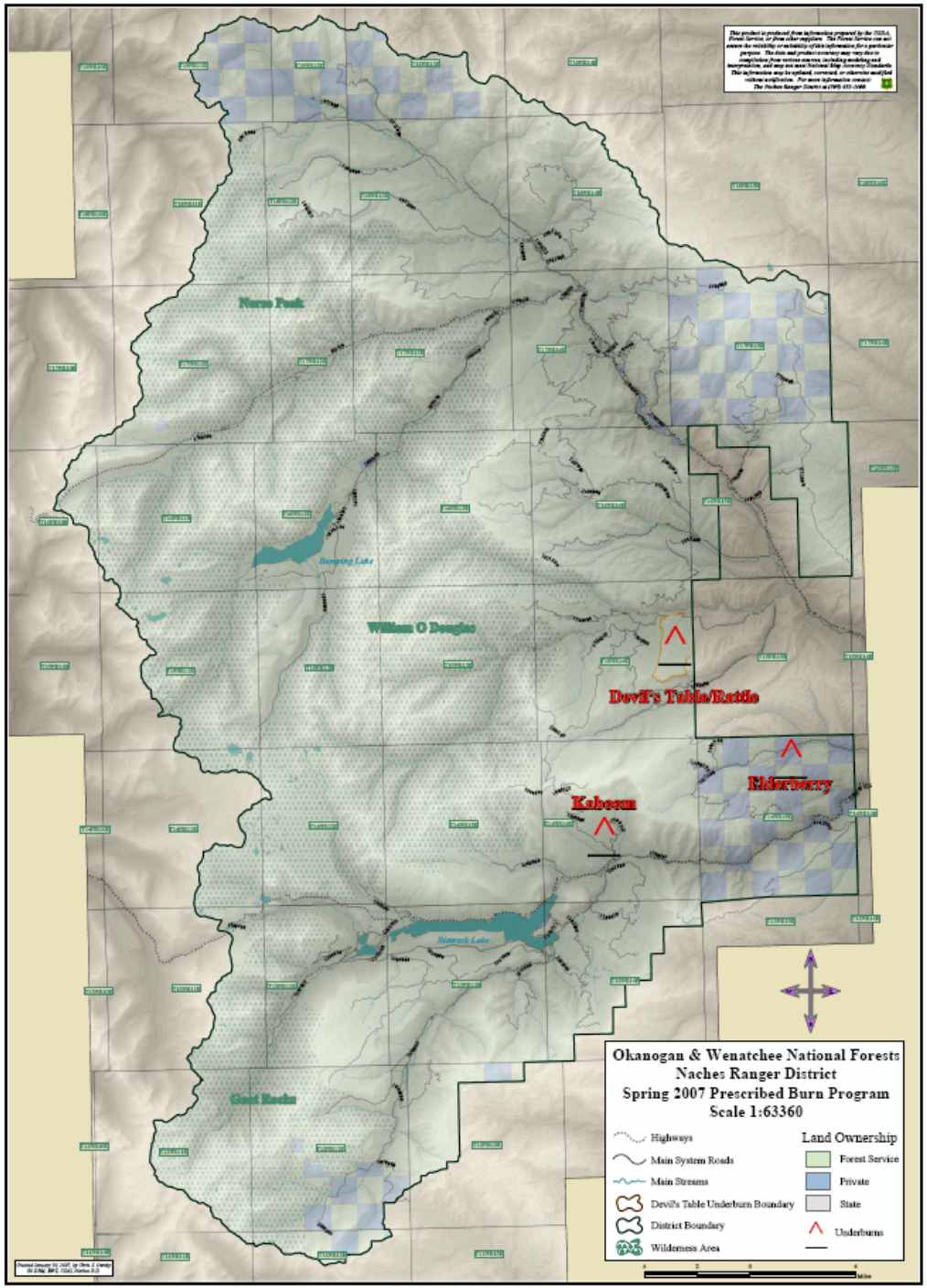
Julia Ruthford
NWS Portland, OR/Northwest Coordination Center

Naches Multi-Day Burn Pilot Project

April 23rd to May 24th, 2007

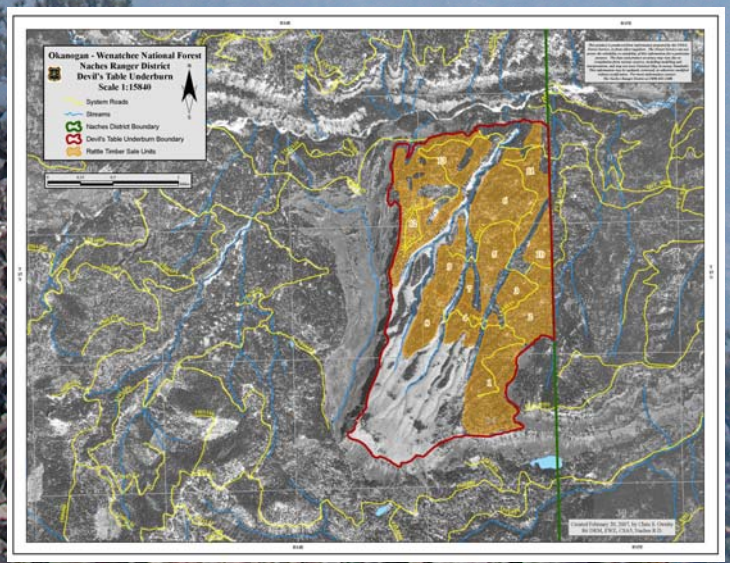
Many Thanks and Acknowledgements to all involved with the Naches Pilot Project including: the Naches Ranger District, Okanogan Wenatchee National Forest, Washington DNR Smoke Management, the AirFire and FERA teams from the Pacific Wildland Fire Sciences Laboratory, NWS Spokane, State of Washington Department of Ecology, Yakima Regional Clean Air Authority.

Especially Jim Bailey, Dave Grant, Miriam Rorig and the Spokane NWS forecasters for many interesting weather and local effect discussions and input.


Norse Peak
William O Douglas
Devil's Table/Rattle
Elderberry
Kaboom
Giant Rocks
Okanogan & Wenatchee National Forests
Naches Ranger District
Spring 2007 Prescribed Burn Program
Scale 1:63360
Highways
Main System Roads
Main Streams
Devil's Table Underburn Boundary
District Boundary
Wilderness Area
Land Ownership
Forest Service
Private
State
Underburns

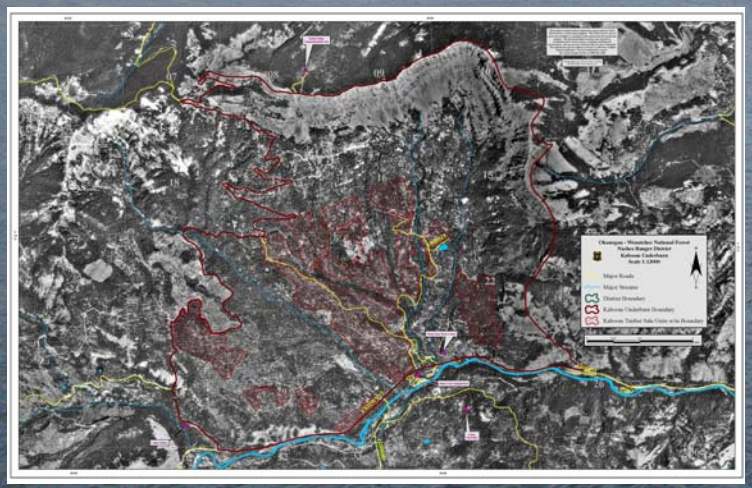
Many Unique Local Effects with Westerly Flow

Table Top Inversion



Comparison of Two Marine Push Days and their Operational Impacts on the Kaboom Underburn

Looking only at pressure difference across the Cascades they appear similar….

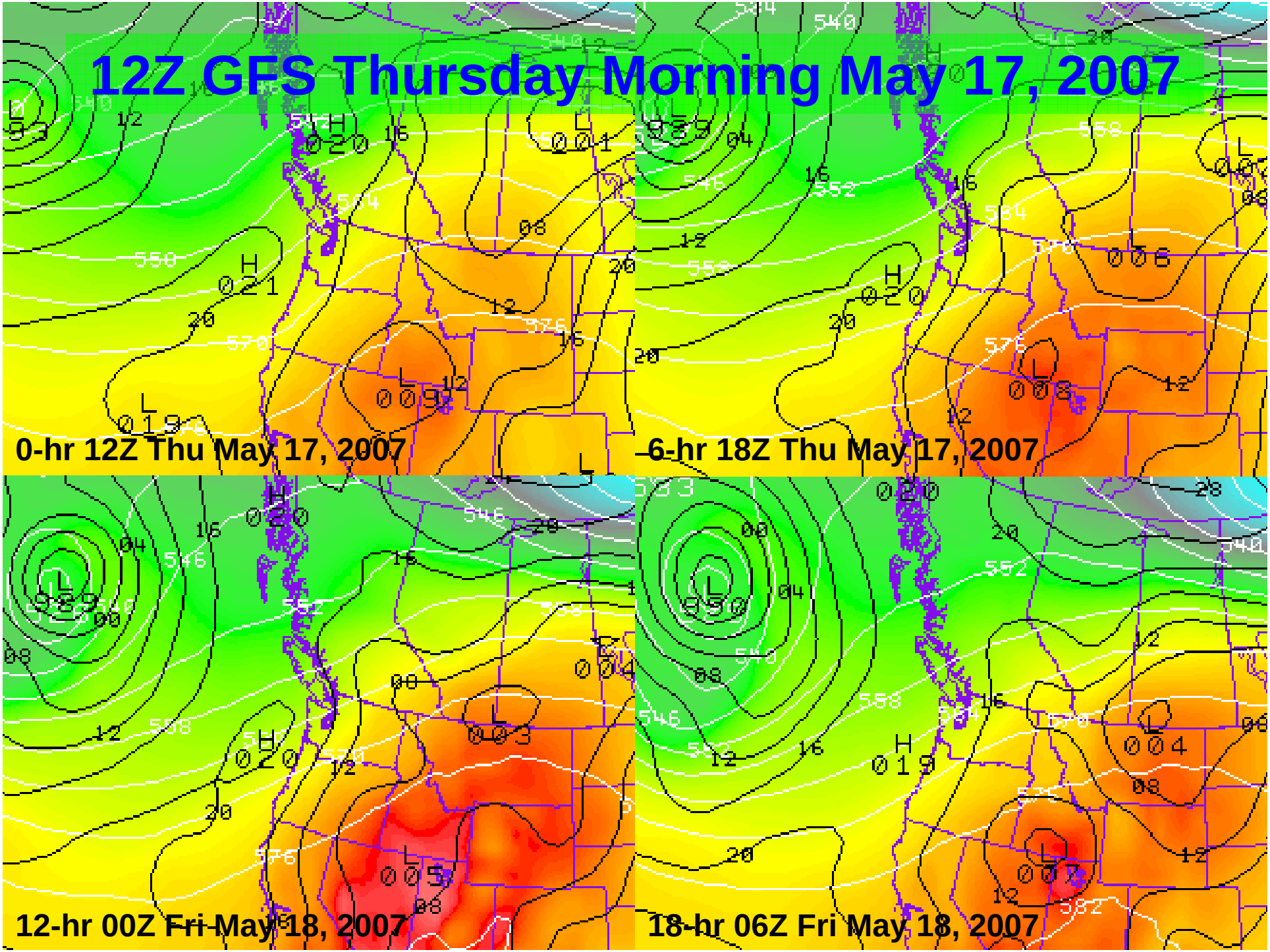


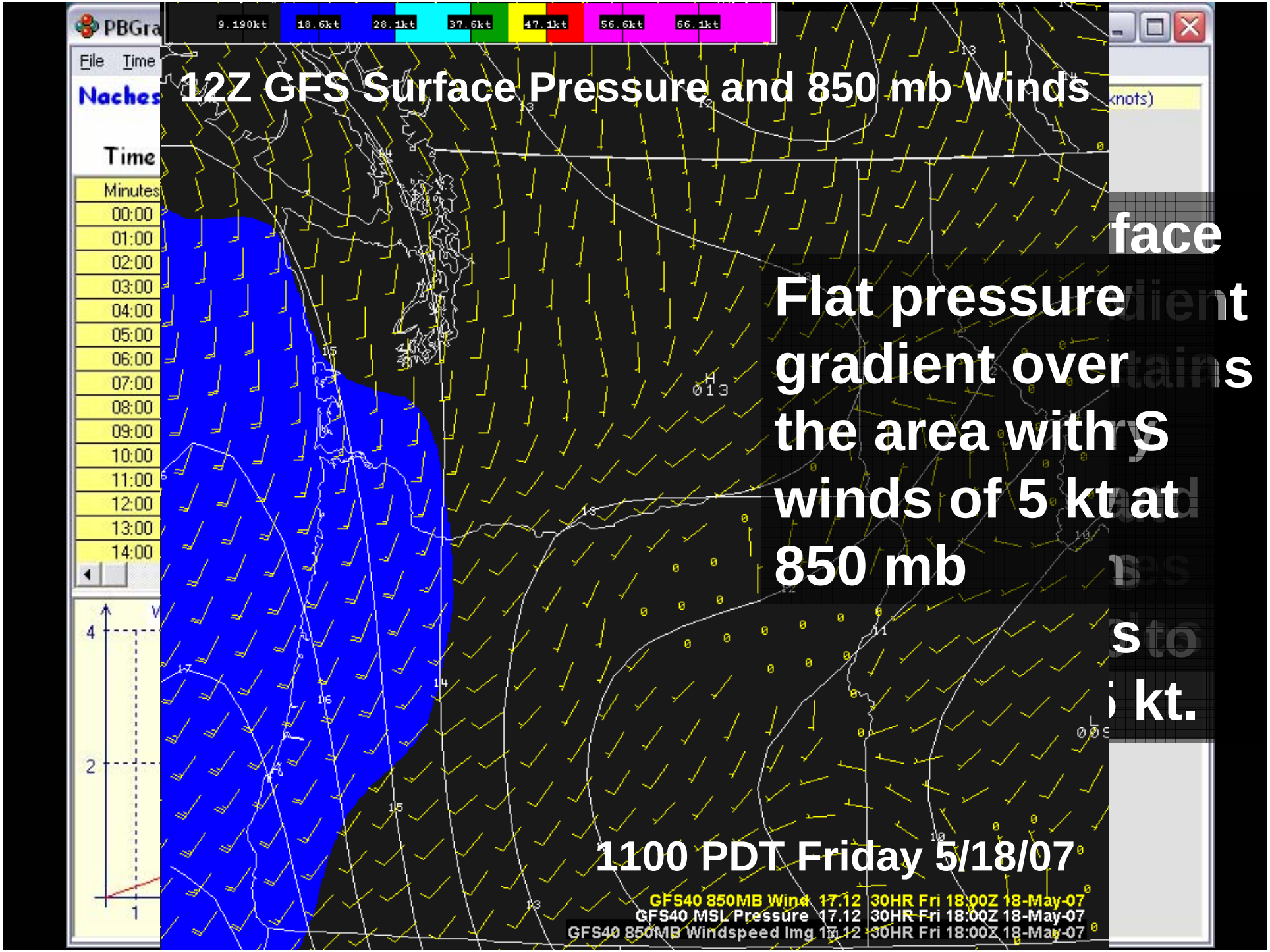

1616 May 17, 2007

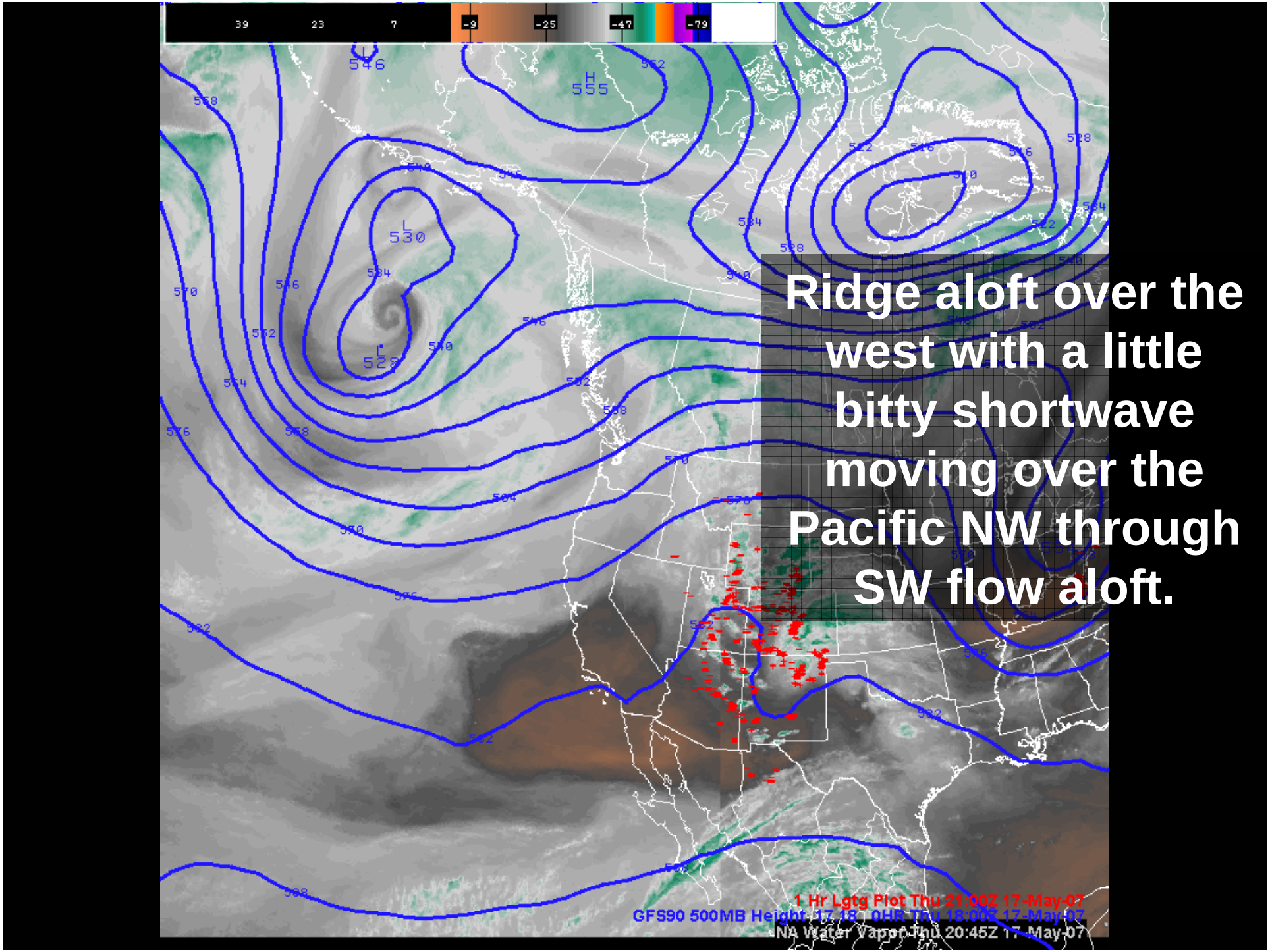

1638 May 17, 2007

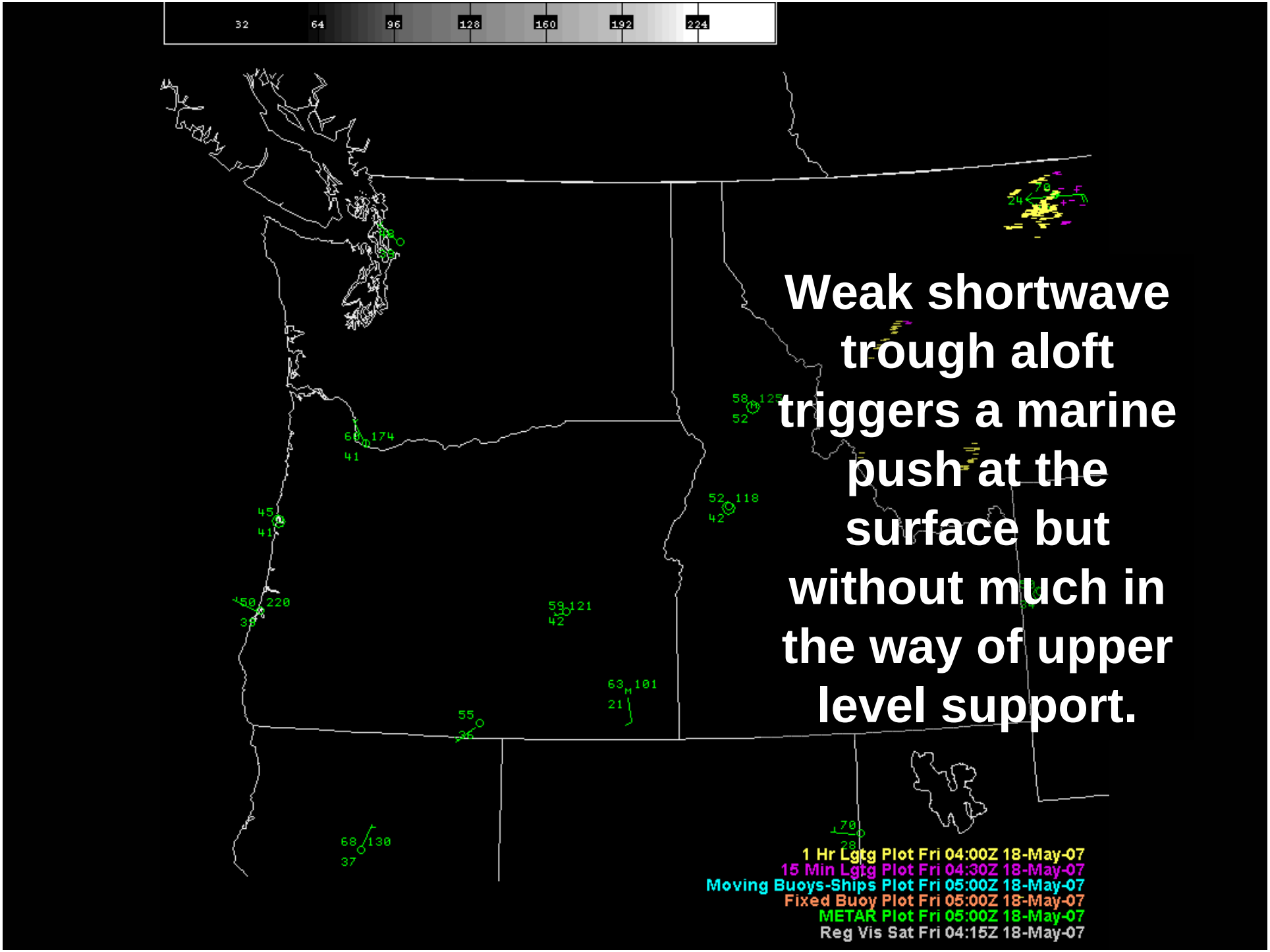
May 17, 2007 – Kaboom Underburn

12Z GFS Thursday Morning May 17, 2007




12Z GFS Surface Pressure and 850 mb Winds
9.190kt
18.6kt
28.1kt
37.6kt
47.1kt
56.6kt
66.1kt
Flat pressure gradient over the area with S winds of 5 kt at 850 mb
1100 PDT Friday 5/18/07
GFS40 850MB Wind 17.12 30HR Fri 18:00Z 18-May-07
GFS40 MSL Pressure 17.12 30HR Fri 18:00Z 18-May-07
GFS40 850MB Windspeed Img 17.12 30HR Fri 18:00Z 18-May-07

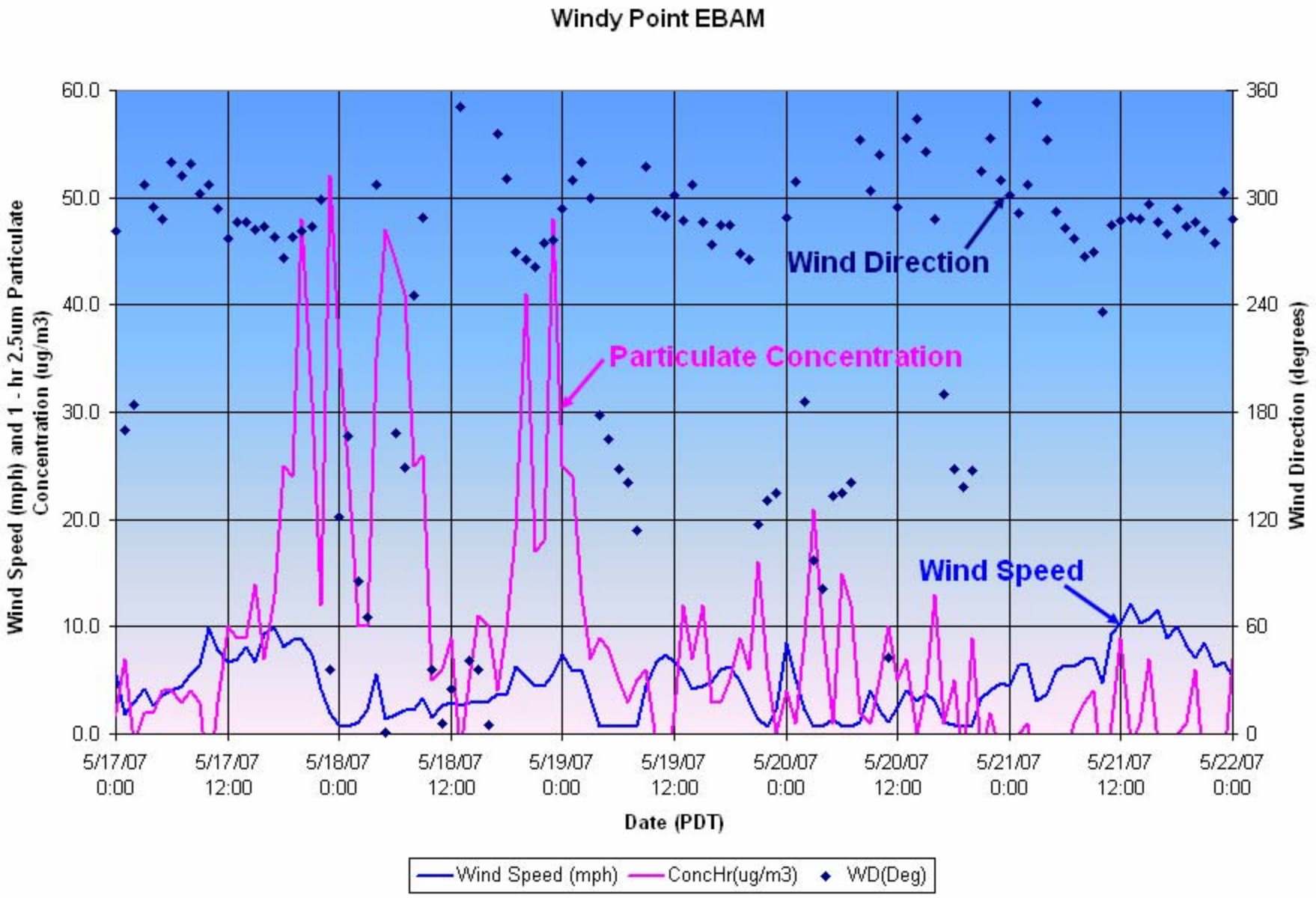

Ridge aloft over the west with a little bitty shortwave moving over the Pacific NW through SW flow aloft.
1 Hr Ltg Plot Thu 21:00Z 17-May-07
GFS90 500MB Height 17,18 , 0HR Thu 18:00Z 17-May-07
NA Water Vapor Thu 20:45Z 17-May-07


32
64
96
128
160
192
224
Weak shortwave trough aloft triggers a marine push at the surface but without much in the way of upper level support.
1 Hr Lgtg Plot Fri 04:00Z 18-May-07
15 Min Lgtg Plot Fri 04:30Z 18-May-07
Moving Buoys-Ships Plot Fri 05:00Z 18-May-07
Fixed Buoy Plot Fri 05:00Z 18-May-07
METAR Plot Fri 05:00Z 18-May-07
Reg Vis Sat Fri 04:15Z 18-May-07

Summary of the Pattern

- This pattern will provide good thermal and mechanical mixing for smoke dispersion in the afternoon however stability will rapidly increasing in the evening with inversions forming overnight.
- Westerly winds diminish through the evening and become light overnight allowing residual smoke to accumulate in inversions.
- This could be a good pattern for burning if care is taken about when to stop ignition and the tonnage burned does not include a lot of material that would be smoldering overnight.

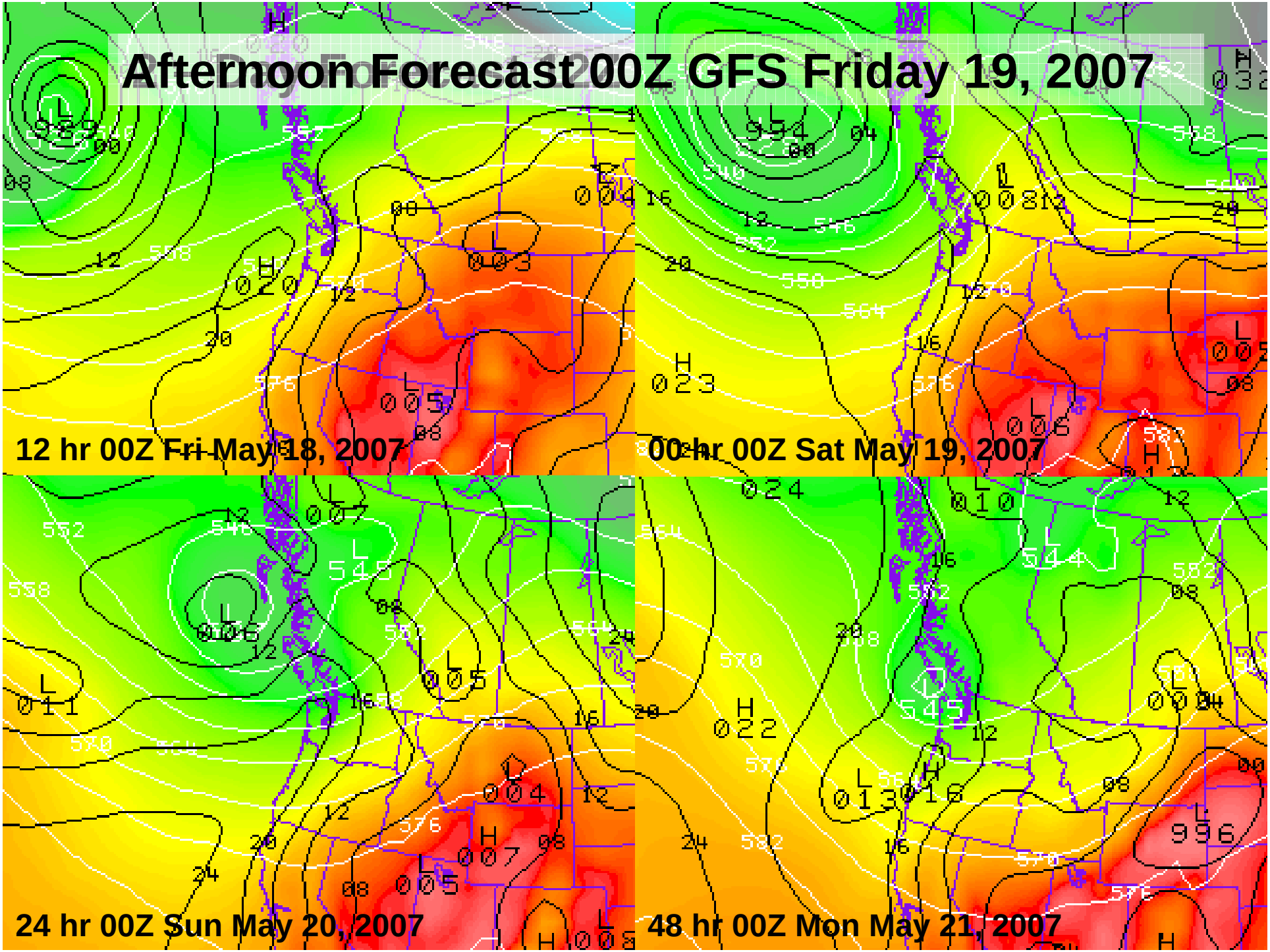

1913 May 17, 2007

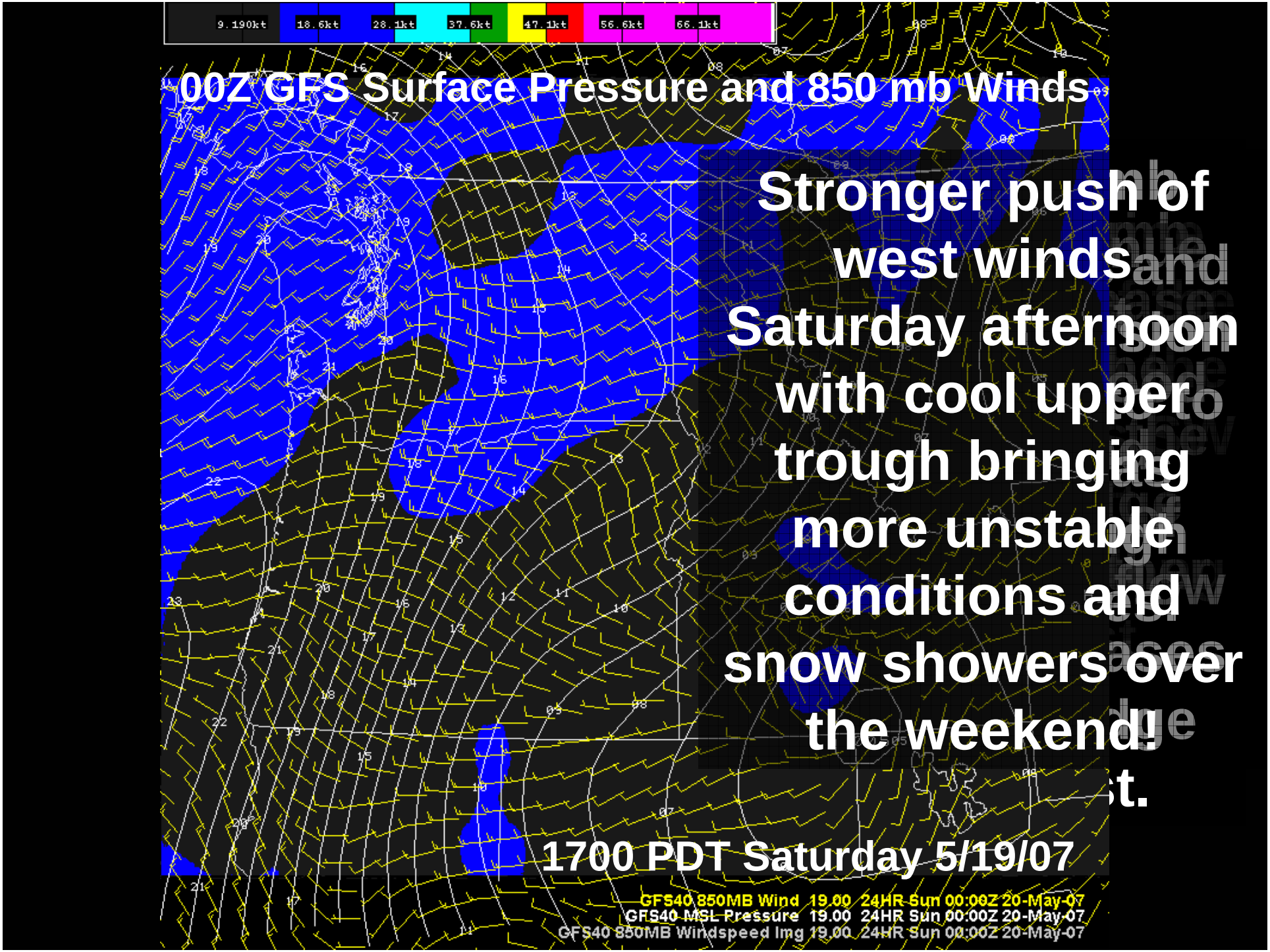

Windy Point EBAM
Wind Speed (mph) and 1 - hr 2.5um Particulate Concentration (ug/m3)
Wind Direction (degrees)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
360
300
240
180
120
60
0
Wind Direction
Particulate Concentration
Wind Speed
5/17/07 0:00
5/17/07 12:00
5/18/07 0:00
5/18/07 12:00
5/19/07 0:00
5/19/07 12:00
5/20/07 0:00
5/20/07 12:00
5/21/07 0:00
5/21/07 12:00
5/22/07 0:00
Date (PDT)
Wind Speed (mph)
ConcHr(ug/m3)
WD(Deg)

May 18, 2007 – Kaboom Underburn

…is one example of the value that can be added by identifying windows for good burning *(i.e. fuels right, weather right, dispersion right)* with enough lead time to allow land managers to allocate the necessary resources to successfully accomplish the burn.

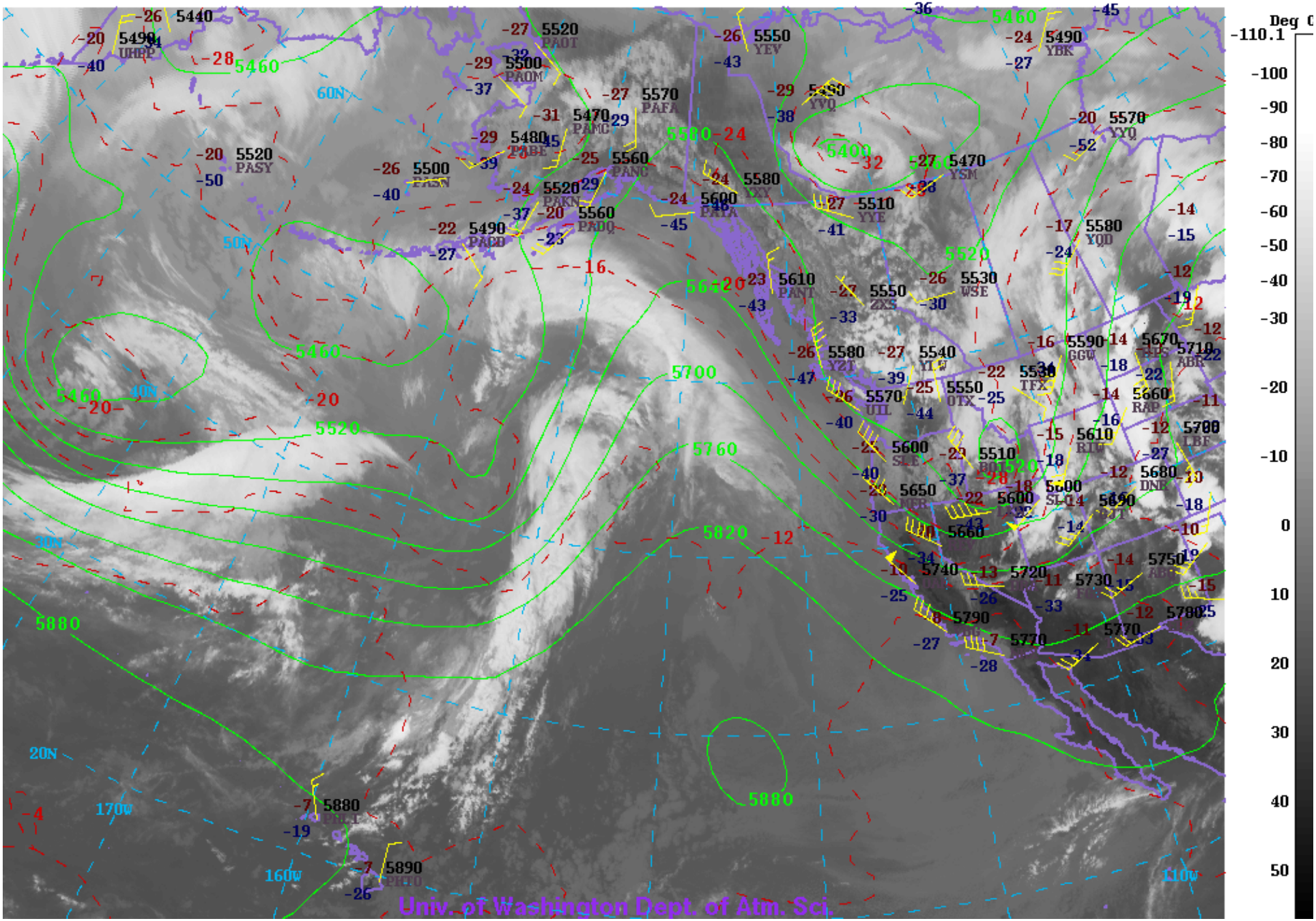
Afternoon Forecast 00Z GFS Friday 19, 2007

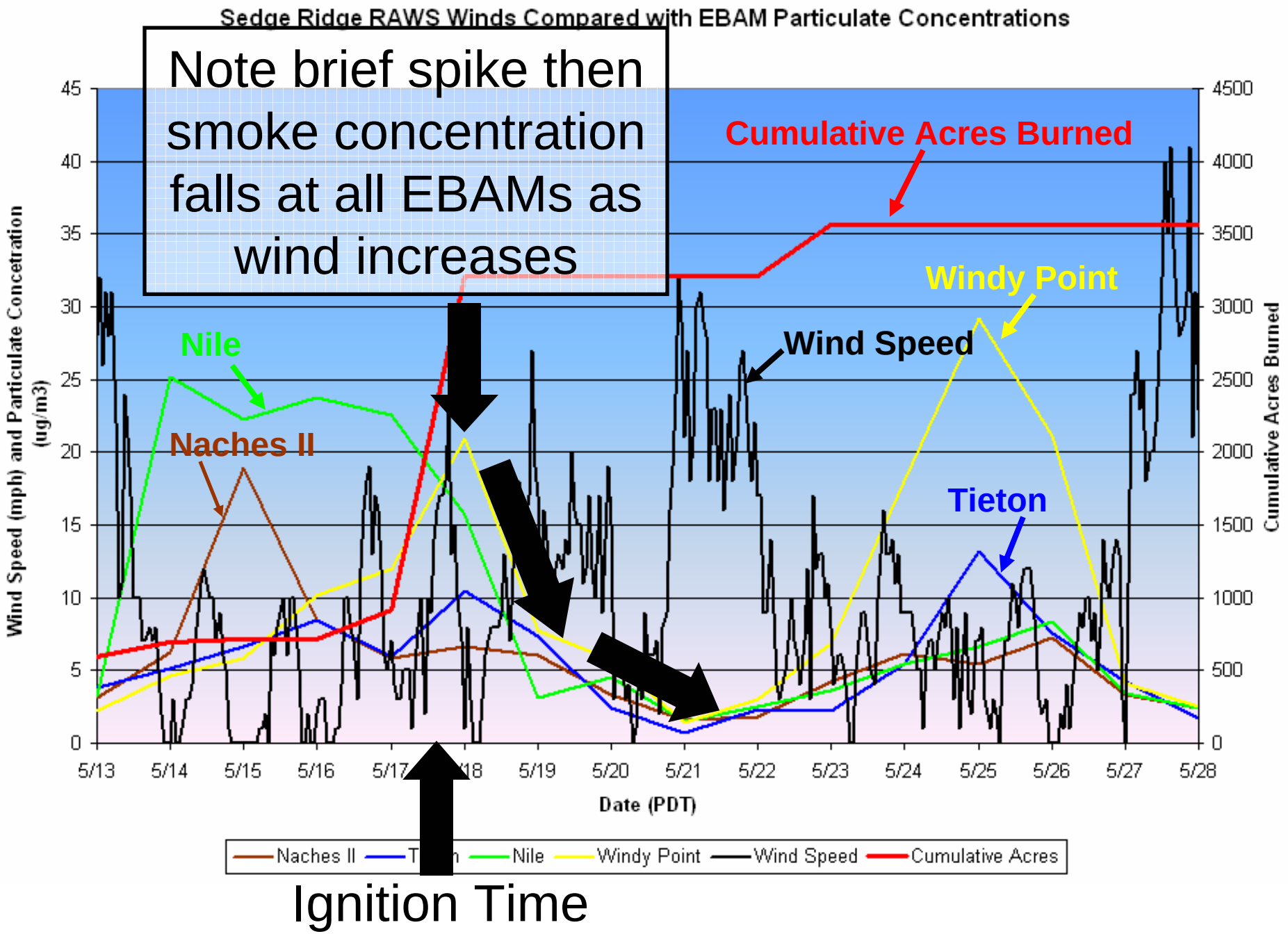



9.190kt
18.6kt
28.1kt
37.6kt
47.1kt
56.6kt
66.1kt
00Z GFS Surface Pressure and 850 mb Winds
Stronger push of west winds Saturday afternoon with cool upper trough bringing more unstable conditions and snow showers over the weekend!
1700 PDT Saturday 5/19/07
GFS40 850MB Wind 19.00 24HR Sun 00:00Z 20-May-07
GFS40 MSL Pressure 19.00 24HR Sun 00:00Z 20-May-07
GFS40 850MB Windspeed Img 19.00 24HR Sun 00:00Z 20-May-07

Univ. of Washington Dept. of Atm. Sci.

00Z Tue 22 May 2007 500 mb Obs and GFS Analysis




Sedge Ridge RAWS Winds Compared with EBAM Particulate Concentrations
Note brief spike then smoke concentration falls at all EBAMs as wind increases
Cumulative Acres Burned
Windy Point
Wind Speed
Nile
Naches II
Tieton
Wind Speed (mph) and Particulate Concetration (ug/m3)
Cumulative Acres Burned
Date (PDT)
5/13
5/14
5/15
5/16
5/17
5/18
5/19
5/20
5/21
5/22
5/23
5/24
5/25
5/26
5/27
5/28
Naches II
Nile
Windy Point
Wind Speed
Cumulative Acres
Ignition Time


2003 May 18, 2007

Summary of the Pattern

❄This pattern is a break down of the upper level ridge (a critical fire weather pattern in the summer) with a strong marine push and upper level trough moving in behind it.

❄It is an excellent pattern to burn under with great dispersion and even some mopup snow showers.

❄The pattern however can bring strong west winds so use caution!

Summary of the Pattern

- With adequate resources very large units could be burned with little impact on air sheds.
- The best window is just prior to the breakdown of the ridge (the last 12 or so hours under the influence of the ridge)
- It is a common pattern in the spring and can often be forecast with 3 to 5 days of lead time.

So…Where to Go From Here?

❄Many more westerly flow days to analyze.

❄Examine a spectrum of cases to see how different strength marine pushes impact local winds, stability and dispersion.

❄Identify key synoptic controlling factors (what distinguishes marine pushes from one and other?).

❄Define marine push types and build a climatology of frequency during prescribed burning season.

Questions?