How Unusual Was the December 14-15th Windstorm?

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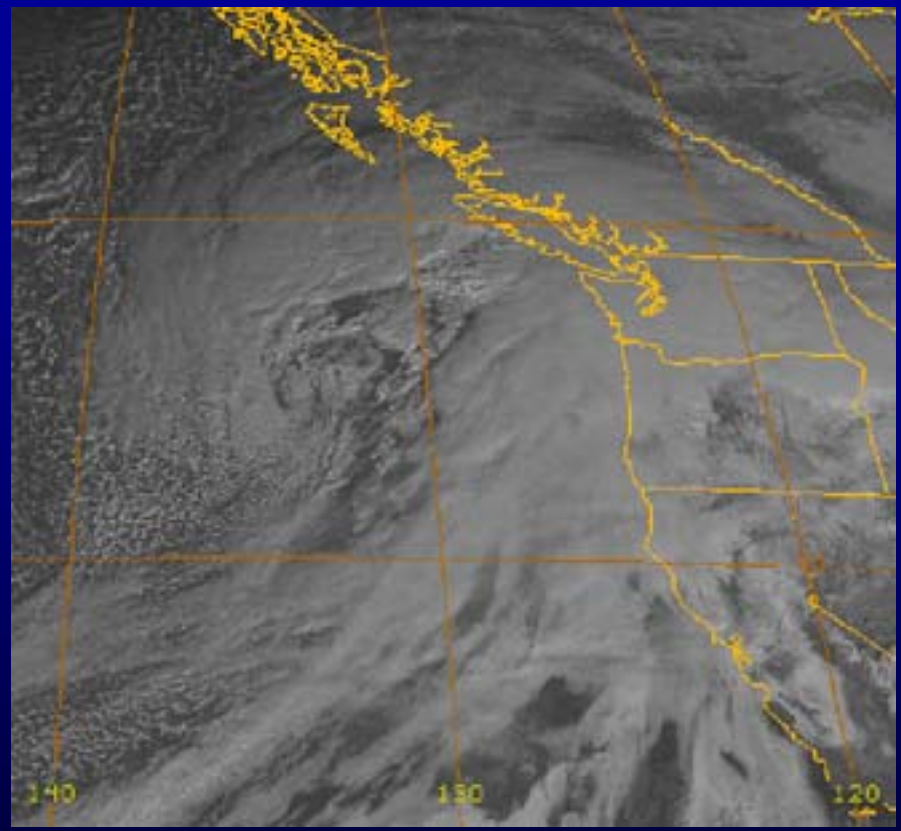
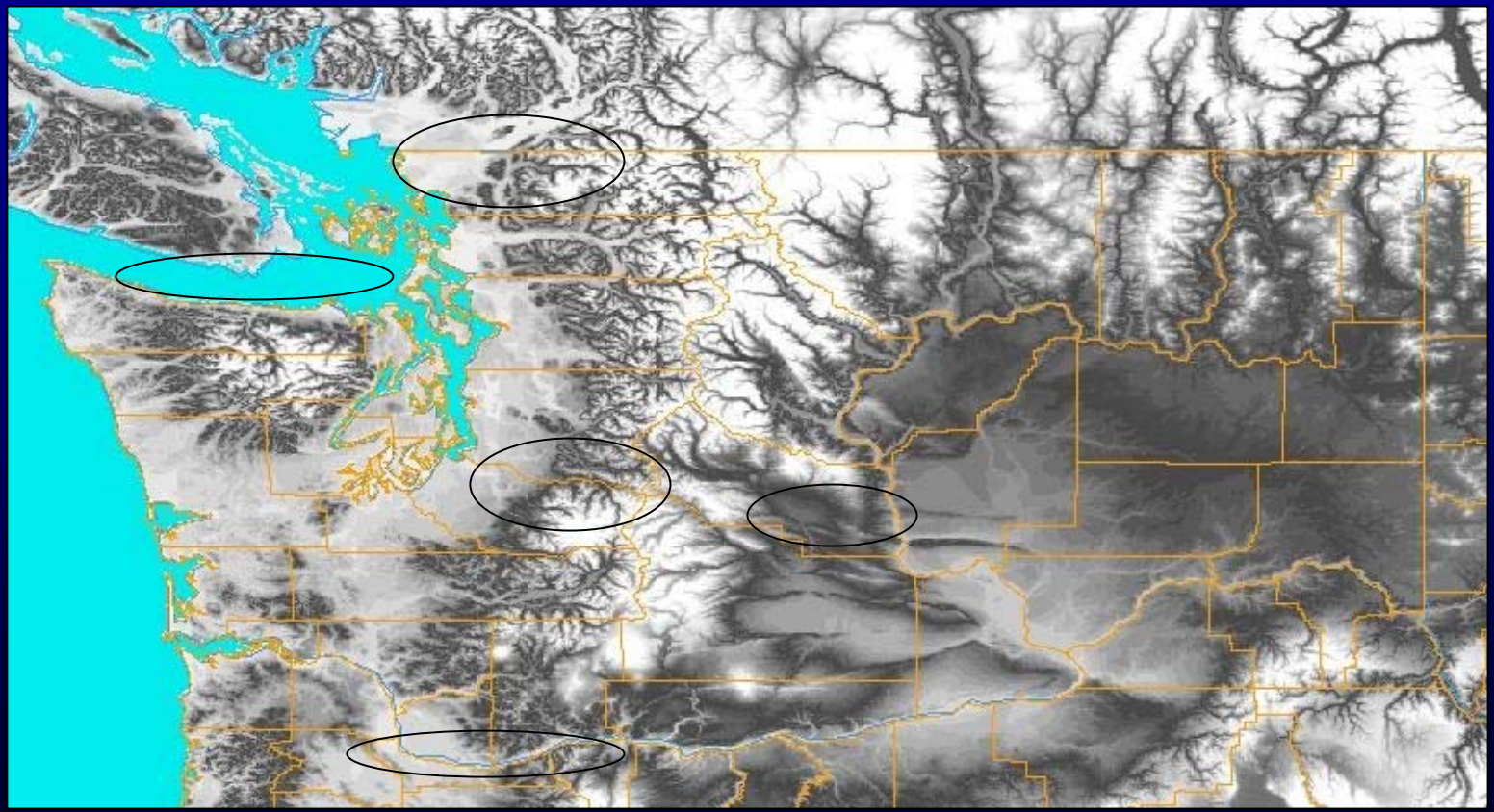


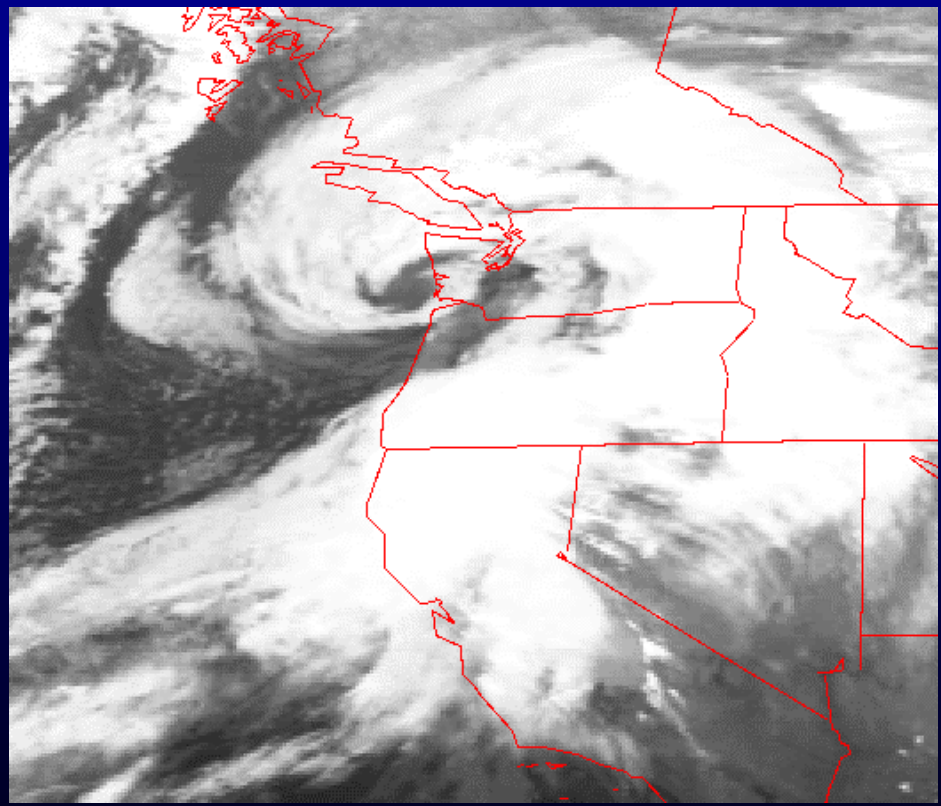
Windstorm 101

Most Strong Winds Over the State are Localized



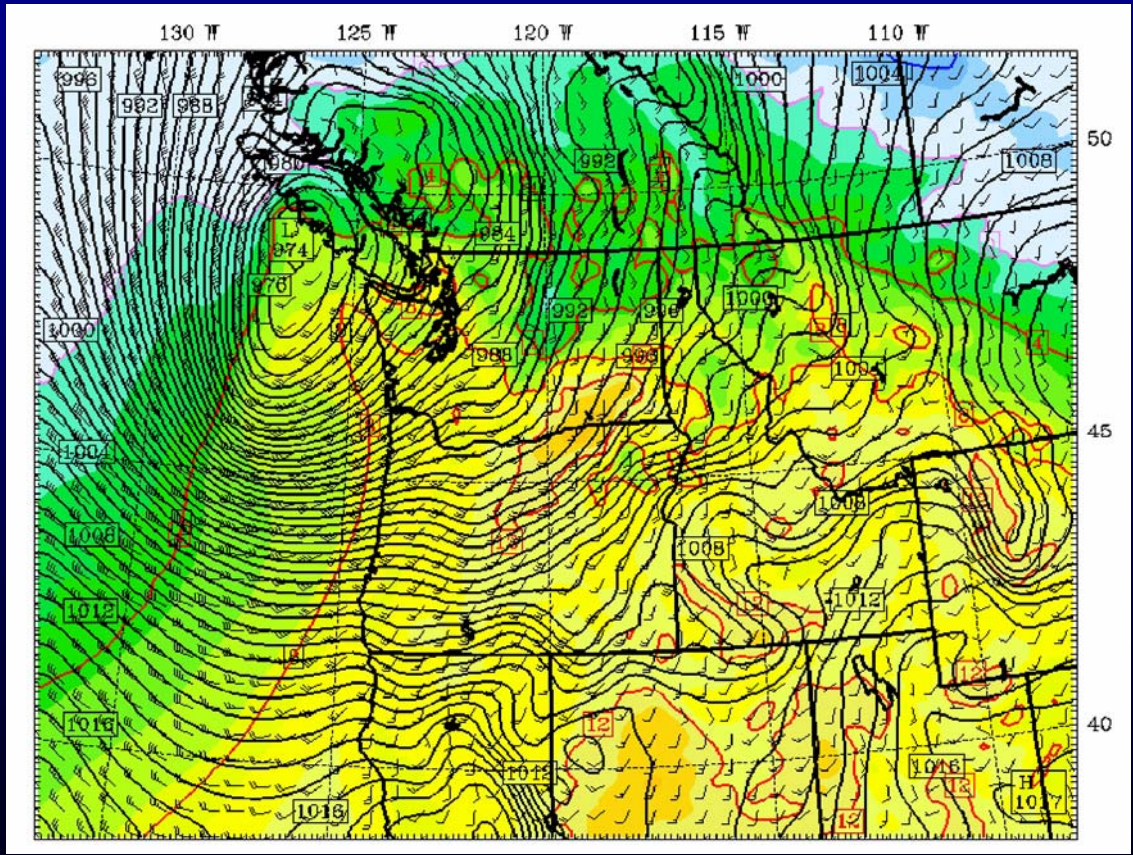
But there is another class of storms that produces extraordinarily strong winds over a broad region: midlatitude cyclones or low centers born over the Pacific Ocean

Midlatitude Cyclones

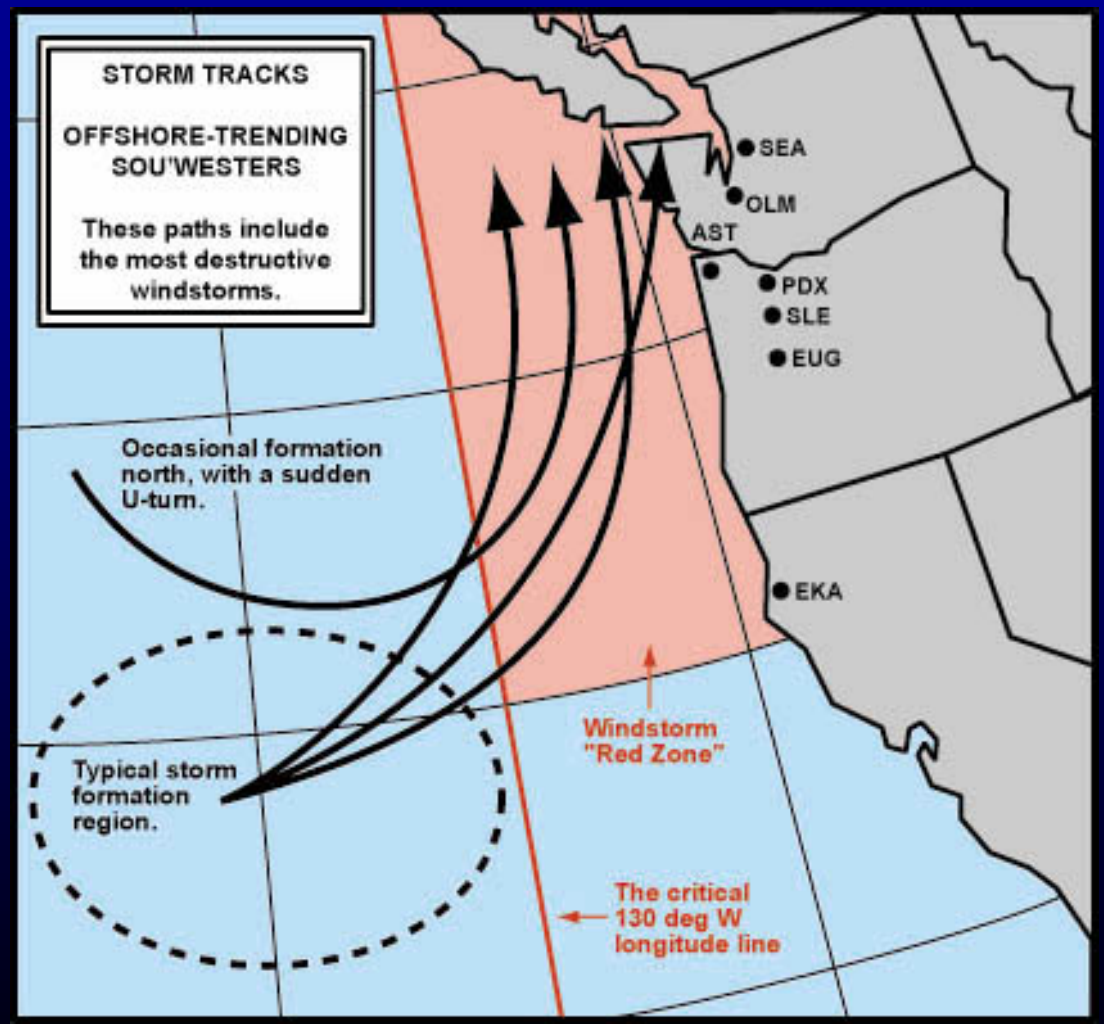


Such storm are associated with deep low centers, with the strongest winds on their southern flanks

Model forecast of sea level pressure of the Dec. 2006 windstorm



Typical Tracks



Terminology

- I will use the “windstorm” as a generic term for strong winds associated with a midlatitude cyclone
- Sustained winds: winds averaged over a minute or two
- Gusts: highest winds over a few seconds during the observing period.

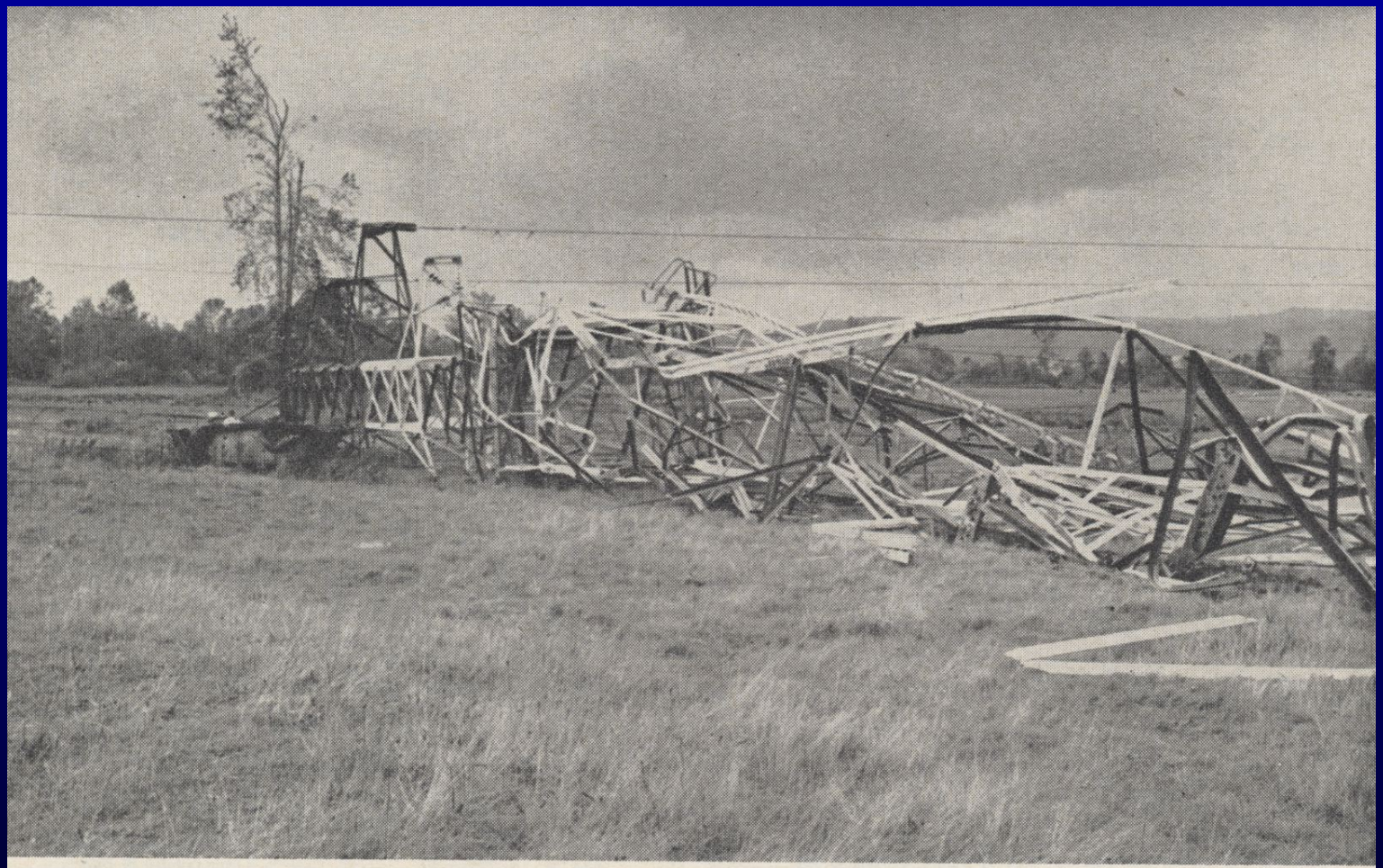
Northwest Windstorm Climatology

- We get cyclone-type windstorms every year, but intensity varies substantially.
- Over the interior west of the Cascades (non-coastal), such storms bring winds:
  - Exceeding 40 mph several times a year
  - Exceeding 50 mph once or twice a year.
  - Exceeding 60 mph roughly once per year or every other year.
  - Exceeding 70 mph roughly once a decade
  - Exceeding 100 mph roughly once every 50-100 years

The Most Extreme Northwest Windstorm: The Columbus Day Windstorm of 12 October 1962

The Big One

- The Columbus Day Storm was the most damaging windstorm to strike the Pacific Northwest in 150 years.
- An extensive area, stretching from northern California to southern British Columbia experienced hurricane-force winds, massive treefalls, and power outages.
- In Oregon and Washington, 46 died and 317 required hospitalization as a result of the storm.
- Fifteen billion board feet of timber worth 750 million $ were downed, 53,000 homes were damaged, thousands of utility poles were toppled, part of the roof of Portland's Multnomah stadium was torn off, and the twin 520 ft steel towers that carried the main power lines of Portland were crumpled.
- At the height of the storm approximately one million homes were without power in the two states, and total damage was conservatively estimated at a quarter of a billion (1962) dollars.



The toppled tower carrying 115,000-volt cables at Barlow Point, two miles west of Longview Bridge on the Columbia River. Bonneville Power Administration photo.

Columbus Day 1962: At Cape Blanco there were 150 mph winds with gusts to 179! Strongest winds on bluffs and windward slopes of coastal orography

Columbus Day 1962

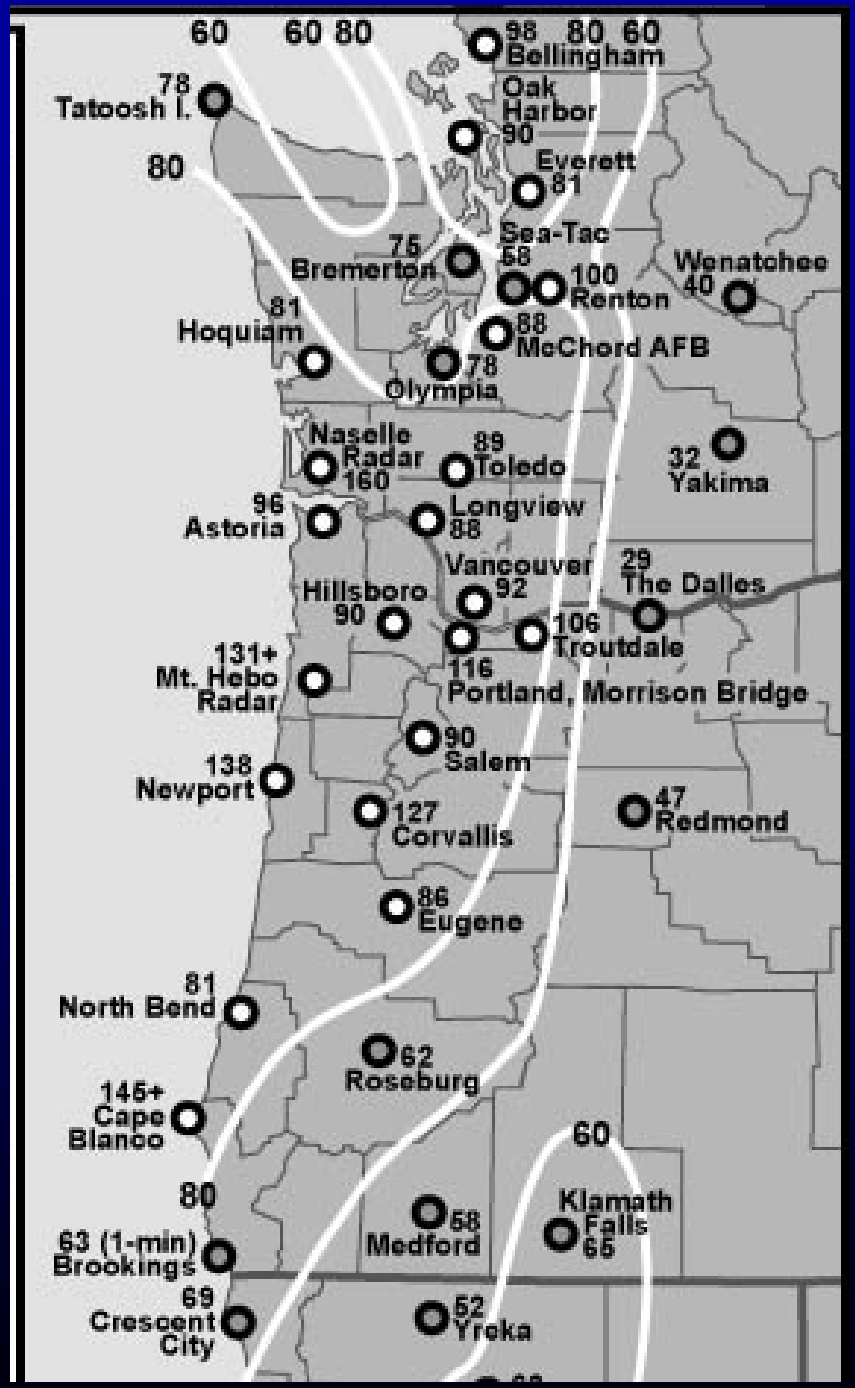
- Over coastal regions and the offshore waters the winds gusted well over 100 mph, with 60-90 mph gusts over the western interiors of Oregon and Washington.
- At the Naselle radar site in the coastal mountains of southwest Washington gusts reached 160 mph, and a 131 mph gust was observed at Oregon's Mount Hebo Air Force Station.
- Away from the coast, winds gusted to 116 mph at Portland's Morrison Street Bridge, 90 mph in Salem OR, 100 mph at Renton WA, 80 mph at Whidbey Island Naval Air Station, 80 mph at Paine Field, 113 mph in Bellingham, 88 mph in Tacoma, 89 mph at Toledo WA, and 83 mph at West Point in Seattle.

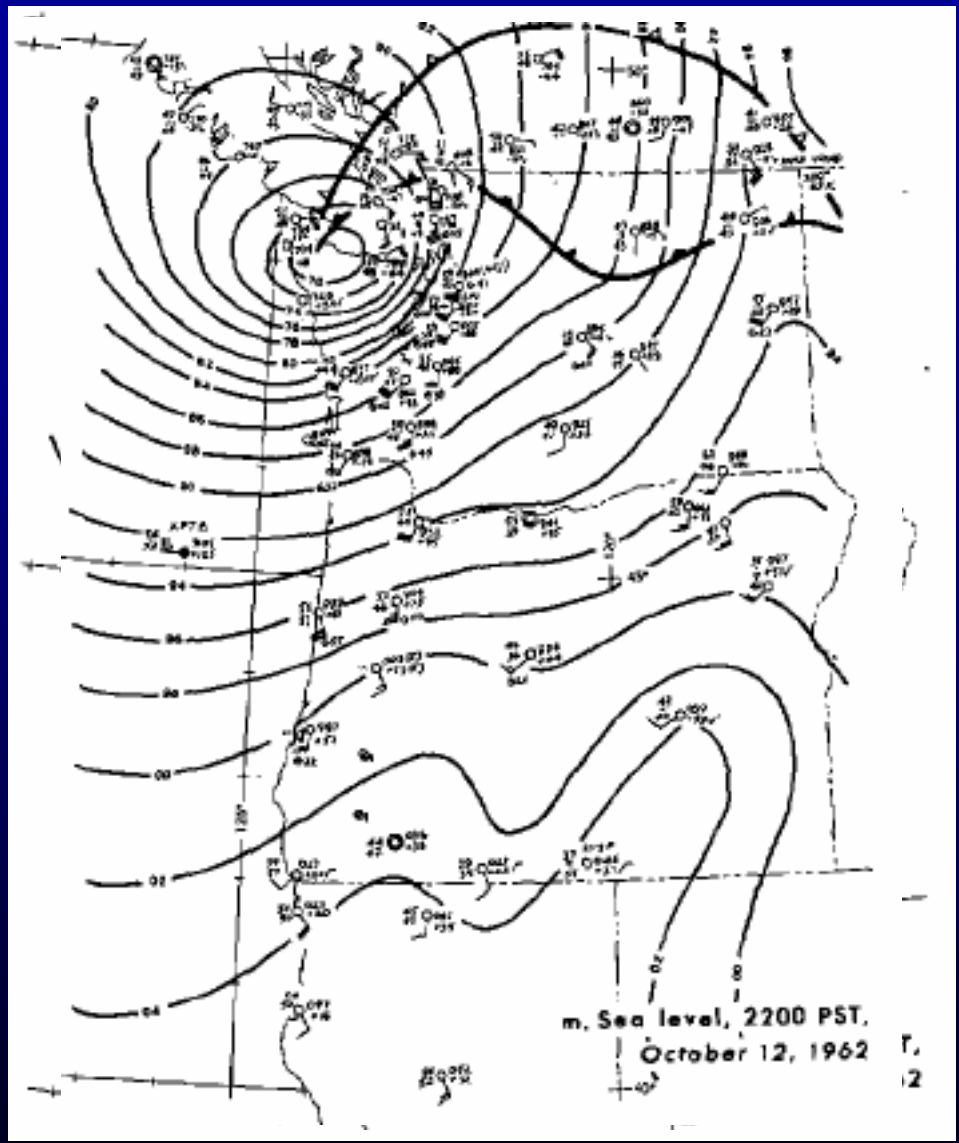
Max Winds (mph)

Columbus Day Storm 1962

Courtesy of Wolf Read

http://oregonstate.edu/~readw/




m. Sea level, 2200 PST,
October 12, 1962

So What About the December 2006 Event? How does it compare?

Bottom Line

- In terms of winds, the December 2006 event was a once in decade storm, comparable to the last major windstorm event--the Inauguration Day Storm of January 20, 1993.

Wind Comparison

Location	1993 Wind Speed	2006 Wind Speed
Tacoma	62	**69**
Renton	**74**	51
Sea–Tac Airport	64	**69**
Boeing Field	**70**	56
West Point Light	60	**70**
Univ. of WA	**69**	55
Everett-Paine Field	**67**	66
Smith Island	52	**76**
Bellingham	**59**	55

Table 1: Comparison of wind speeds (mph) between the 1993 Inauguration Day Storm and the 2006 December 15 event.

Some 2006 Winds

- Winds gusted to 90 mph along the coast, 80 mph in the eastern Strait of Juan de Fuca, and 70 mph over the Puget Sound lowlands.
- Some of the strongest winds occurred at Tatoosh Island (78 mph), Destruction Island (81 mph), and Ocean Shores (73 mph) on the Washington Coast, Smith Island (76 mph) and Padilla Bay near Burlington (85 mph) in the eastern Strait, and Poulsbo (74 mph), the Hood Canal Bridge (74 mph), Point Robinson (71 mph) and West Point (70 mph) over or near Puget Sound.
- In the Cascades, winds reached 100 mph at Sunrise on Mt. Rainier and 113 mph at Chinook Pass.

But why was the damage so much greater in 2006?

- Nearly twice the households lost power during the 2006 event (than 1993) and more roads were blocked.

East Mercer Way

Probable Reason 1: Soil Saturation

- The two-month period preceding the windstorm was extraordinarily wet over the entire Northwest.
- Many locations received 200% or more of normal rainfall and a number of observing sites broke their *all-time* precipitation records for November. Some, such as Seattle-Tacoma Airport exceeded their all-time record precipitation for <u>any</u> month.

Soil Saturation

- Precipitation then turned relatively light until 13 December, when moderate rains returned.
- On the day preceding the storm, heavy rain struck most locations west of the Cascades, with some places receiving extraordinarily heavy 1-hr totals (around 1 inch) that probably exceeded the all-time records for such a short period.
- In short, the regional soils were completely saturated before the December 14-15th windstorm, with antecedent precipitation amounts that entered the record books.
- It is well known that saturated soils lose their adhesion and thus their ability to hold tree roots. Furthermore, many species of Northwest trees, such as the Douglas Fir, are shallow-rooted and thus were particularly vulnerable to uprooting.

Reason 2: Land Use

- Another contributor to increased damage in 2006 was surely the construction of homes in areas that were previously forested.
- Typically, builders clear sufficient land for the home and gardens, but leave some tall trees on the property as a scenic backdrop.
- Such large openings in a forest provide entry for strong wind gusts that can topple trees that had previously enjoyed protection.
- Many of the newer developments on the east side of Puget Sound sustained substantial damage from such newly exposed trees.

Redmond Ridge

Forecasting These Storms

- The prediction of these storms has improved immensely over the past decade.
- Starting with the 1993 Inauguration Day Storm, most--but not all--of the large events have been forecast skillfully.
- The forecast for the 2006 event was excellent, indicating the threat roughly a week in advance.

The Seattle Times
seattletimes.com

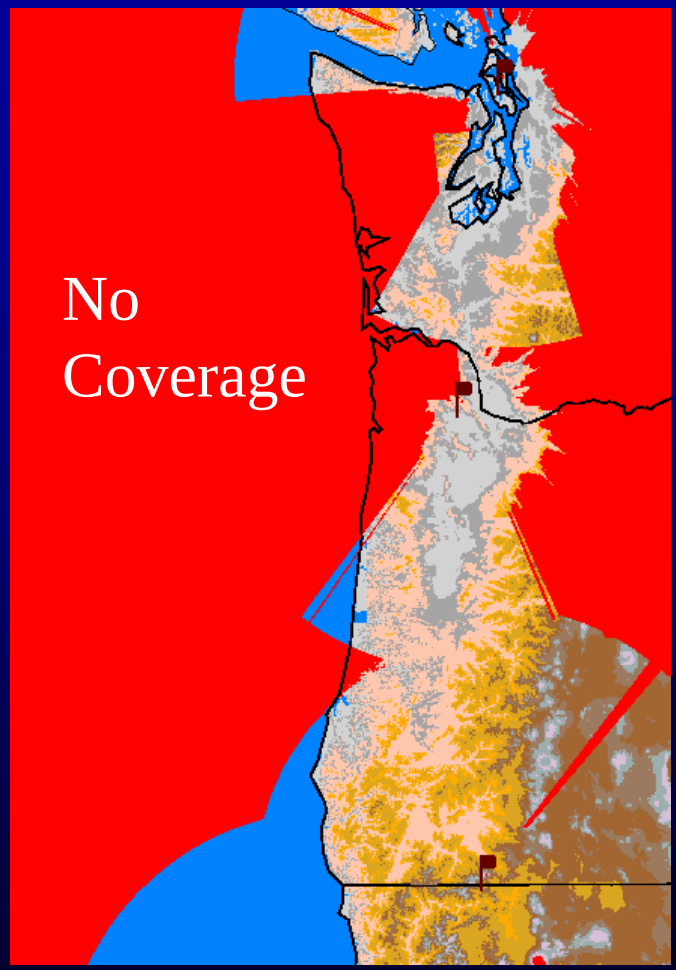
Thursday, December 14, 2006 - 12:00 AM

Fierce windstorm headed our way

By Sandi Doughton
Seattle Times staff reporter

Lack of a Coastal Weather Radar

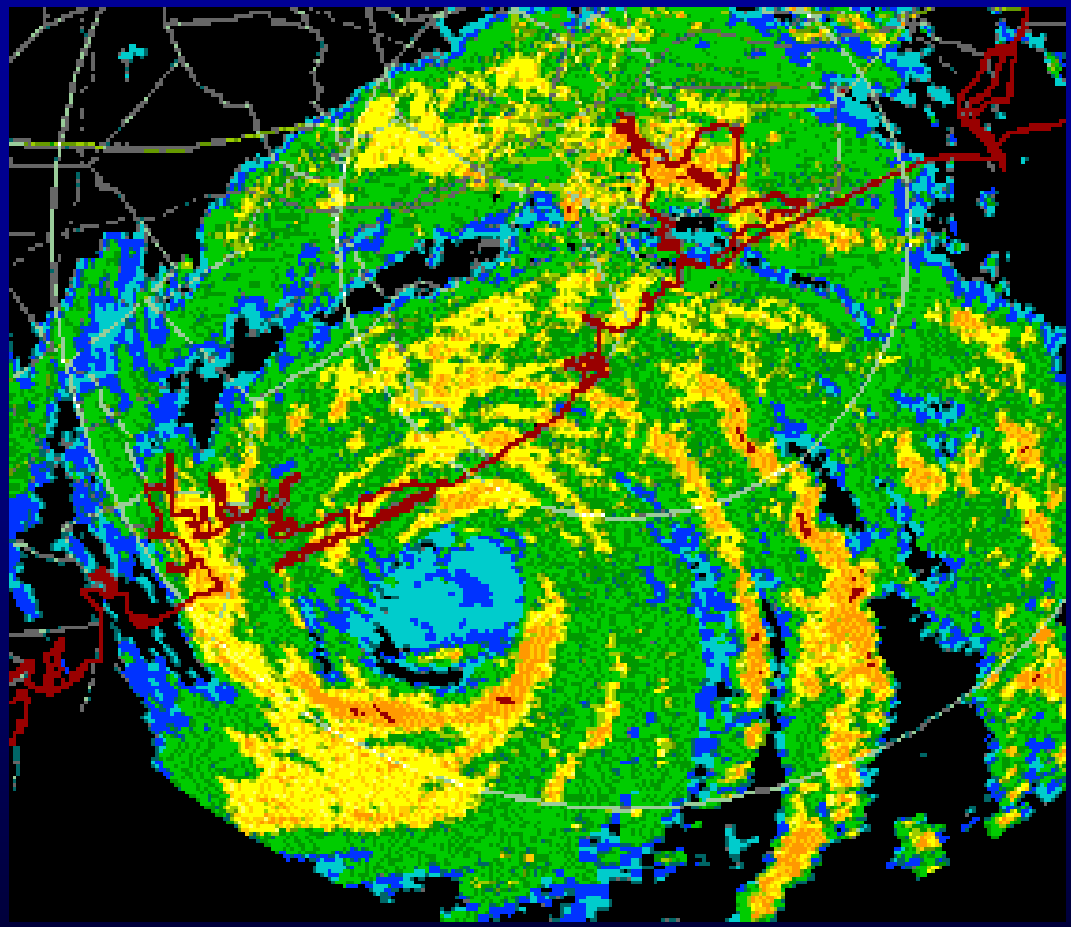
- The Northwest has the worst coastal weather radar coverage in the nation.
- Often can't see the details of windstorms before they make landfall. Seriously impacts short-term forecasts.
- If the computer models are wrong, a coastal radar would allow National Weather Service forecasters to give crucial 0-9 hr warnings.



NWS Doppler Radar Coverage

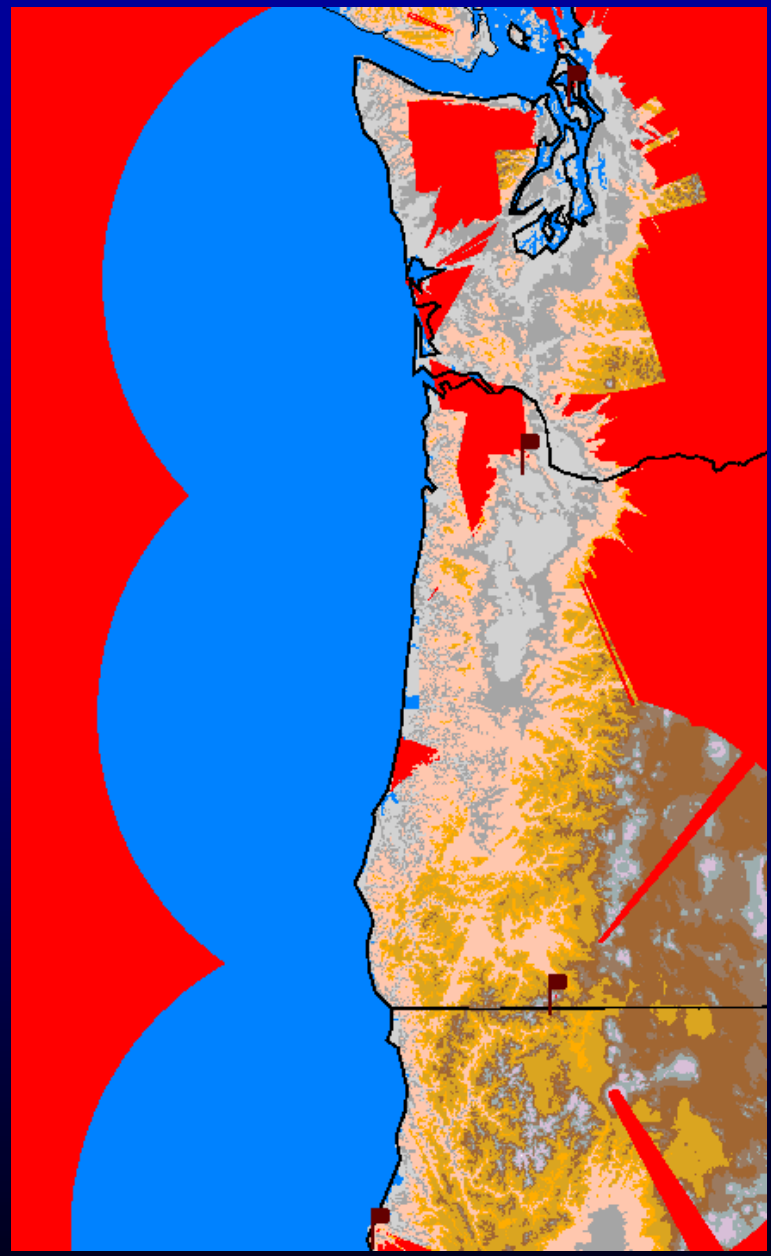
In contrast..

- The complete coastal radar coverage over the eastern U.S. allows them to follow major storms… such as hurricanes… as they approach the coast and provide last minute warnings.
- The Northwest lacks such protection.



Hurricane Hugo Approaching the Atlantic Coast

- At least one, and hopefully two coastal weather radars are needed.
- Cost about $4 million each, plus installation.
- Could save millions of dollars for a single storm.
- Contact your Senators and Congressmen/women!



With Two New Radars

Summary

- The December 2006 windstorm had winds that occur roughly once in ten years.
- Extraordinarily unusual rainfall preceded it, which enhanced the loss of trees.
- Land use and opening up of forested regions contributed to tree falls.