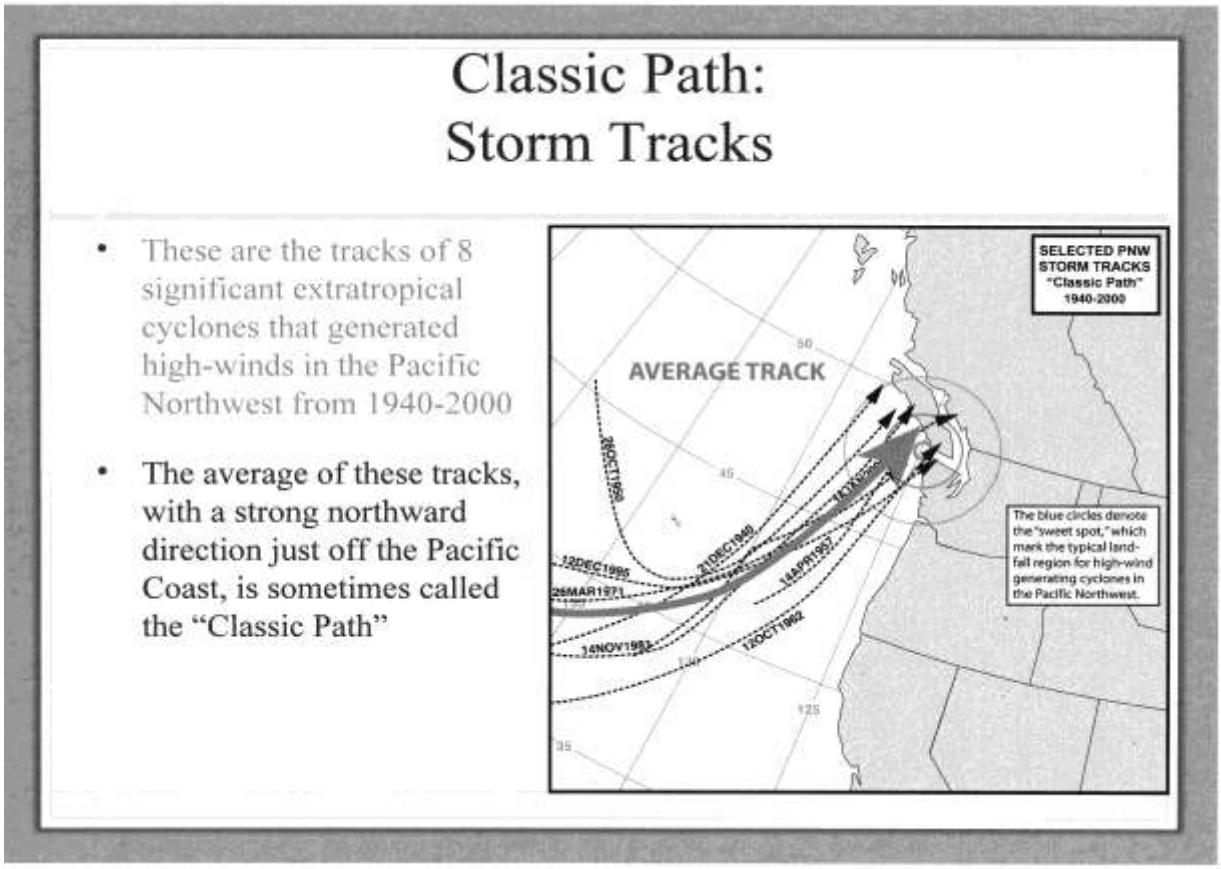


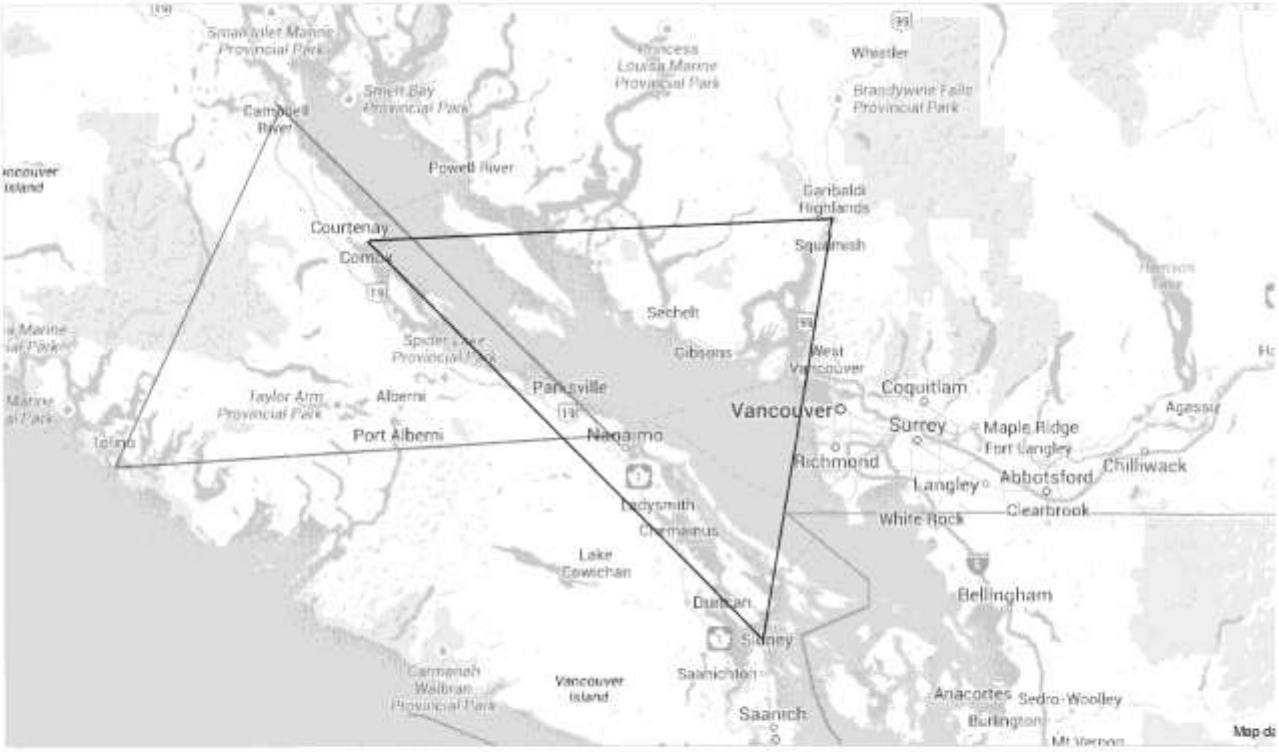
This image is from Wolf Reid, described as the foremost expert on Pacific Northwest storms. He is a climatologist and is currently at UBC. He has studied every storm that has hit since 1940. The image shows the 'classic path'. These weather bombs hit the west coast of Vancouver Island then gain access to Baynes sound via the Alberni Valley and low lying areas around Cameron Lake.

The next page shows the six airports where Wolf examined the data loggers to come up with his conclusions.

The page after that is Wolf's conclusions. Pictures that are referred to are on the homepage of this site.

To see all the details that are visible on the screen, use the "Print" link next to the map.

Google



The storm of December 11th, 2006

Wolf Read is a climatologist who worked for the Office of the Washington State Climatologist and is now a Graduate Research Assistant and PhD candidate at UBC, studying BC's windstorms. Christopher C. Burt, meteorologist and author of the book 'Extreme Weather' refers to Wolf Read as the " foremost authority on historic Pacific Northwest Storms". The graph, showing historic storm tracks is part of his work.

When we contacted Mr. Read, he was in the process of analyzing the well remembered storm of December 11th, 2006 (the attached photos were taken by BC Hydro repair crews).

Wolf Read analyzes the air pressure gradient within the storm, which allows him to estimate associated windspeeds and directions. Here are some excerpts from his analysis:

.....We see the pressure slope shift from ENE to E then suddenly S in a rather classic fashion for these storms. Interestingly, Tofino has a major pressure surge with this storm, with a jump of 9.0 hPa in the single hour ending 00:00 UTC (4:00 pm PST). This contributed to the sudden shift of isobaric orientation. And such an extreme pressure change supports unusually high winds.....

.....Right at 00:00 UTC, the gradient reaches its maximum of a phenomenal 13.1 hPa/100 km. This corresponds to a geostrophic wind of around 341 km/h, or 85-136 km/h for 25-40% of Mg. By all accounts this points to a very unusual storm. The pressure slope at this time is 144°, strongly supported southeasterly ageostrophic winds, such as up the Georgia Strait or Baynes Sound. All this points to historic-magnitude wind speeds at the surface in the vicinity. I have done this type of analysis for many strong storms. Pressure gradients above 10.0 hPa/100 km are very rare, especially east of the Island (inside the first line of mountainous country). Some storms of history have not even reached this level. The infamous 14-15 Dec 2006 storm did surpass 10.0 hPa/100 km in some regions, but produced a maximum gradient of 12.2 hPa/100 km in the most ideal coastal location over Western Washington--not even to the magnitude seen with YYJ-YQQ-WSK on 11 Dec 2006 inside the Insular Mountain ranges.

.....In any event, both station triads indicate a significant windstorm for 11 Dec 2006. The pressure data support wind speeds in excess of ~23 knots over Baynes Sound. I would not be surprised if the winds reached at least 45-50 knots over the water, and 55-60 knots is not out of the question given the gradient magnitude (I think Comox may be a good indicator of the actual wind magnitude in Baynes Sound for this event given the SE wind support). This also fits with observations of wind damage on Denman Island.....

Wolf Read's work paints quite a different picture than BCF's consultant in the following:

Adjusting the Comox Airport and Chrome Island measured winds using equations (1)-(4), we obtain an estimate of the winds at the Baynes Sound BCFT sites during the December 11th, 2006 storm. The results are plotted below in Figure 1.8. The results show good agreement through the Dec 11th event with wind speeds peaking at about 13 m/s (26 knots).

The consultant used partly malfunctioning automated wind gauges and dimisses human observations (from the ferry crew or the lighthouse keeper at Chrome Island) as inacurate.

Here are some of Wolf's initial comments:

1) The anemometers they used are a good model (R. M. Young). It is interesting that they had problems with the instruments getting stuck. I wonder if they were old units or were installed improperly. They might have needed a calibration check. Thus, all the data may be invalidated.

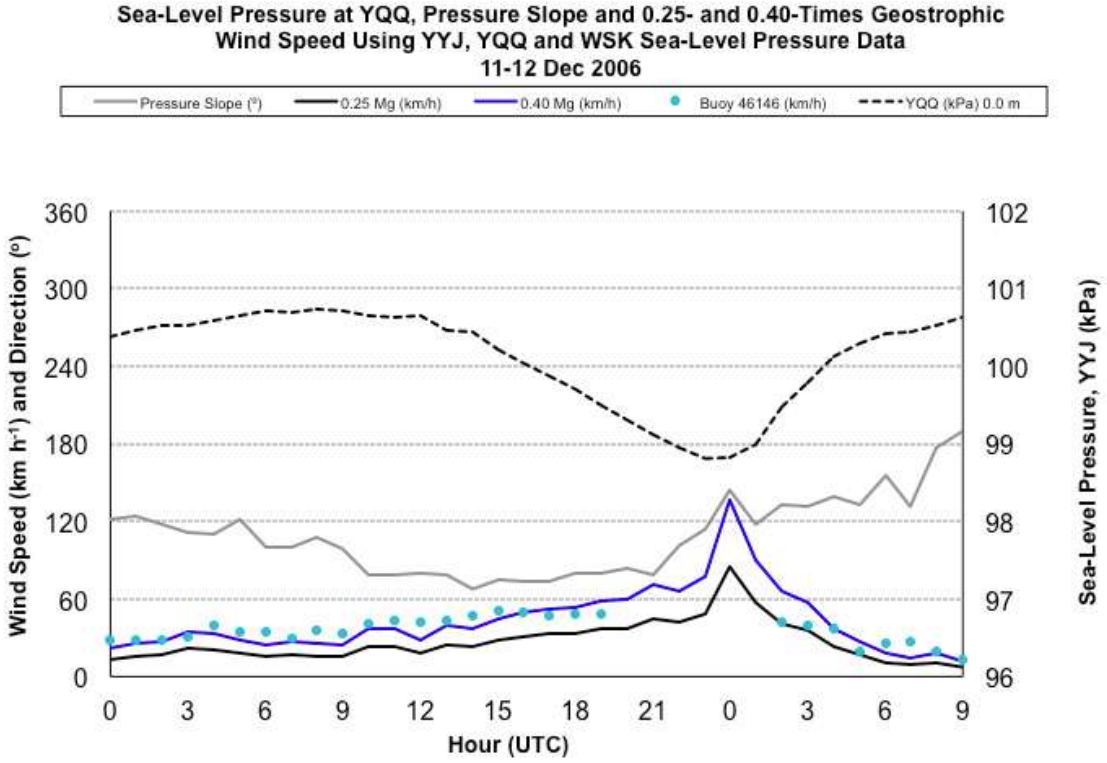
2) They used a non-standard 6-minute averaging period for wind. Longer averaging periods typically result in a lower wind speed report. In other words, for a given run of wind, a 2-minute average speed will almost certainly be higher than the 6-minute average speed, perhaps by 5-10%. This explains in part the rather low numbers yielded by the study. I wonder why they did not just do a 2-min average to match what is reported at places like Comox?

3) Their 100-year storm magnitude of 16.5 m/s, or 32 knots, does seem low. Accounting for the 6-min vs. 2-min difference (or 6-min vs the 1-min that was employed before the automated 78D anemometers were put into operation), this could be bumped up to around 35 knots, which is still kind of low. From my experience with winds just south of Denman Island, say at Victoria, Vancouver and Abbotsford, stations that have a solid wind record going back over a half-century, computing the 100-year storm results in an estimate of about 90-100 km/h. Call it 50 knots. The key historic event that approached this magnitude is the Columbus Day Storm (AKA Typhoon Freda).

4) Their choice of Comox over the lighthouse station for regression analysis of the Denman Island wind data seems fine to me. However, and I repeat, it would have made more sense to have recorded 2-minute observations that are comparable to the Comox data. Also, even when factoring in the 6-min averaging period, the Denman numbers do seem low, and again I question the validity of the entire dataset based on their having anemometer problems. And, such a regression analysis, especially for extreme winds, is fraught with peril. There is much randomness to surface wind, mainly due to turbulence near the ground, making an estimate from regression rough at best. This is especially true during an extreme storm, where surface winds can vary considerably over small spatial scales.

Based on my analysis, for the Georgia Strait region as a whole, the 12 Mar 2012 windstorm had more punch than the 11 Dec 2006 event. The 2012 extratropical cyclone landed near Solander Island with 962 hPa (mb) central pressure vs. about 980 hPa for the 2006 storm. Also, the 2012 storm landed at near peak intensity, while the 2006 storm had begun to degrade as it slowly drifted ashore. Peak gusts at official (public) Georgia Strait stations were generally higher during the 2012 storm than the 2006 event. That being said, each storm tends to bring its own local effects and certain areas can be slammed while others do not receive as significant a gale. In the case of the 11 Dec 2006 storm, the region around Abbotsford received one of the strongest windstorms in recent memory, with a peak gust far in excess of the 12 Mar 2012 storm

(59 kt vs. 34 kt), and also above the infamous 14-15 Dec 2006 "Hanukkah Eve" tempest, which is one of the reasons why I have chosen to study the event in detail. Another example is the New Year's Day storm in 1997, a fairly strong gale in many areas that brought a focused extreme wind event to the Cathedral Grove area, causing much destruction to the forest. It appears that Denman Island may have received special treatment during the 11 Dec 2006 storm much as did Abbotsford.



This shows the level of detail Wolf Reid went into to examine the December 11th storm of 2006. The 0 hour UTC time corresponds to our 4 PM storm that day. The merging of the upper level gradient and the surface gradients created the waterspouts reported off Chrome Island.

Just to remind you, Ferries consultants say the wind was 21 knots at this hour.

Next is Canada's top weather stories of 2006 from Environment Canada with a report by BC Hydro.

The storm of December 11th lacked the rains of November, but its bluster crippled an already fragile power grid. Wind gusts were 96 km/hr strong, enough to blow over 2 planes at the Victoria airport. Anything not fixed or tied down became airborne. On December 13th, another powerful storm with hurricane force winds once again walloped the SouthWest. It brought down more trees and power lines – some repaired only a day before. Bc Hydro called for reinforcements from Alberta and Yukon to relieve workers who had been putting in 16 hour days non stop for three and a half weeks.

August 2013