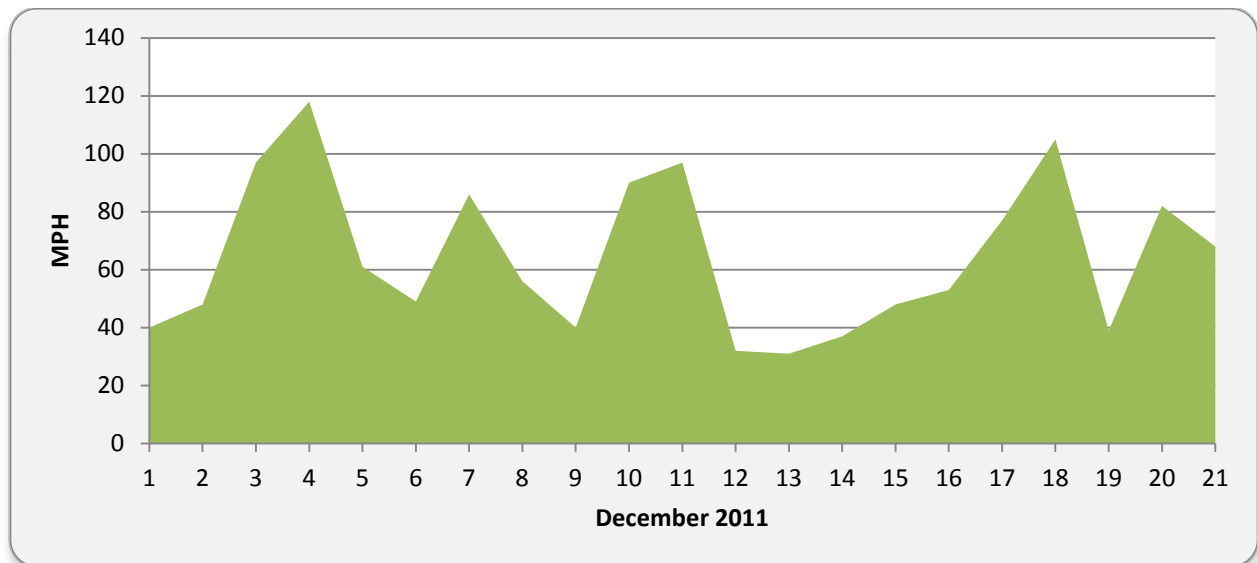


## Windy, Wet and Wild- December 2011

John Papineau & Emily Niebuhr, NWS-Anchorage

December 2011 will go down in local weather lore as one of the windiest months on record. Although strong southeast-to-south winds are fairly common during the October through May period in northern Cook Inlet, the number of such events from December 3 through December 21, 2011 is, thankfully, uncommon. The figure below shows the daily maximum wind gusts at Glen Alps (2400 ft) for the first 21 days of December. There have been five high wind events (downslope windstorms) during this 21 day period. Four of the five wind events were Chinooks- that is the strong winds reached east Anchorage and at times extended across to Cook Inlet.



The general scenario for strong downslope winds in northern Cook Inlet is high pressure over the northeastern Gulf of Alaska (Cordova to Yakutat) with lower pressure to the west. The December events have occurred as a low pressure systems moved onshore from a region extending from Bristol Bay to the Kenai Peninsula. Typically, as a downslope windstorm develops, the wind over the lee side of the mountains descends and accelerates; in so doing the air warms and dries. Hence during most of these of events there is little snow or rain but air temperatures rise dramatically. Air temperatures across Anchorage frequently rise into the upper 40's and lower 50's during these events but drop quickly once the wind speeds diminish.

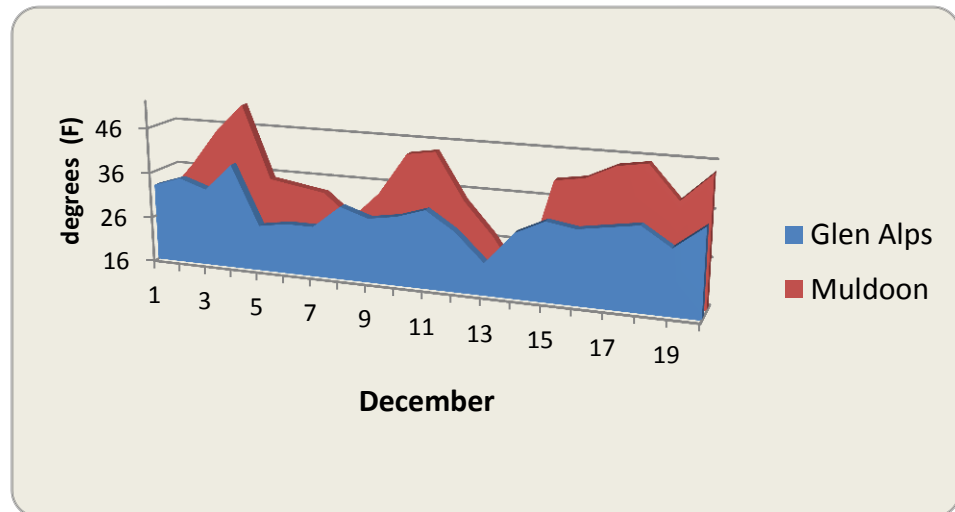
Due to the local topography, other strong winds (for example, gorge or gap winds) occur in conjunction with downslope winds events. In Turnagain Arm, for example, wind speeds vary throughout its length depending on the orientation of the pressure field: however, the western exit area, which is near McHugh Creek, typically maintains the strongest winds. This occurs

because a localized region of lower pressure forms to the lee of the western Chugach during a downslope windstorm. The already strong winds within Turnagain Arm experience an additional acceleration as they exit into the region of lower pressure. This is clearly evident if one compares the wind speeds at McHugh Creek with those at Bird Point.

With regard to the December windstorms there were a number of atypical characteristics to several of these events which are noted below.

**Dec 3-4** event was notable for the 118 mph wind gust at Glen Alps which is about as high as any since the wind sensor has been installed. More remarkable was the copious amounts of rain that was embedded within the storm system. The majority of rain, on the order of several inches, fell on the Hillside, with much lighter amounts in west Anchorage (0.17"). Typically during downslope windstorms the air as it moves across the Chugach Mountains from Prince William Sound dries out as it descends the western slopes of the mountains. In this case the air which originated

over the North Pacific held so much moisture that there was little drying as it moved down the Hillside. Air temperatures rose into the lower 50's on the east side of town, as seen in the figure to the right, which displays the



daily maximum temperatures in Muldoon and Glen Alps. Keep in mind that typical max temperatures for this time of year are in the teens and lower 20's. Early on the morning of the 4<sup>th</sup> the winds in the exit region of Turnagain Arm were the highest reported in the short history of this wind sensor: sustained winds were on the order of 80 mph, with a peak gust in the 90 mph range. This was also the time that the pressure field over northern Cook Inlet weakened and the winds from Turnagain Arm moved into south and west Anchorage. At Ted Stevens International Airport sustained winds during this period were on the order of 30 mph, with gusts from 55-60 mph.

**Dec 7** was the only strong wind event which did not reach east Anchorage or the lower Hillside at least near the surface of the ground. In this case the pressure field was oriented so that it favored northerly surface winds across Anchorage. We generally find that if there is lower

pressure in southern Cook Inlet with higher pressure in the Susitna Valley and northern Cook Inlet, the resulting north winds at sea-level typically 'shield' most if not all of town from the strong southeast winds. This also holds true for Turnagain Arm winds- they only move into south and west Anchorage when the pressure field in northern Cook Inlet is weak.

**Dec 11-12** event produced east winds on the order of 70-85 mph in east Anchorage and the lower Hillside in conjunction with a peak wind of 97 mph at Glen Alps. There was plenty of tree damage in the Muldoon area as well as on the Hillside. It is interesting to note that air temperatures in the Muldoon area rose from 21° to 43° two and one-half hours later as the wind speeds increased. In addition, at the beginning of the event there were significant amounts of rain or snow (above 500 ft) across town, which diminished during the period of peak winds. Blizzard conditions existed on the upper Hillside as snow mixed with the diminishing but strong winds. A notable aspect of this event was the abrupt dissipation of the winds on the Hillside. From 9:30 pm to midnight on the 11<sup>th</sup> wind gusts at Glen Alps went from 88 mph to less than 10 mph! This was most likely in response to the passage of a strong weather front that had moved onshore. As the windstorm subsided the snow began; when it was over 10-20 inches had been deposited over a large area. The occurrence of a major snowstorm on the heels of a downslope windstorm is not unheard of, but is nevertheless fairly uncommon.

**Dec 17-18** was event number four, and it generated gusts over 100 mph at Glen Alps with gusts in the 50 mph range in east Anchorage. Light snow or rain also occurred across the area. Maximum temperatures were in the mid-40's.

**Dec 20-21** peak winds of 82 mph were observed at Glen Alps during the afternoon hours of Dec 20<sup>th</sup> with some light snow occurring as the windstorm diminished overnight. Southeast winds extended across Anchorage as the pressure field favored southerly flow within Cook Inlet. Peak winds in east Anchorage were in the mid-50 mph range, with air temperatures in the lower 40's.

The rapid succession of these storms as well as the occurrence of significant amounts of snow and rain have made this December one to remember or forget depending on one's experiences over the past two and half weeks with fallen trees, extended power outages,



damaged roofs, blown down signs and icy roads. Air passengers experience “bumpy” rides in and out of Anchorage forcing some commercial flights to divert to Fairbanks. There were also a number of reports of motorists who became stranded at various locales on the Kenai Peninsula due to challenging driving conditions.



In one sense generic downslope windstorms are fairly easy to predict as they have a unique signature- however there are a number of finer details that still elude forecasters. First is the whether or not the area of strong winds will descend the western Chugach down to the base of the mountains and across to Cook Inlet. To date we have not been able to zero in on exactly what in the

atmosphere controls this. Driving around the Hillside and east Anchorage for example, one can see that tree damage varies from event to event, in response to the localized areas that experience the brunt of the winds. Second, as noted above, the vast majority of downslope windstorms are dry, attempting to forecast uncommon snow and rain in conjunction with these wind events needs more refinement.

Until Next Time...

*john.papineau@noaa.gov*

*emily.niebuhr@noaa.gov*

*For more information on Anchorage downslope wind events and Turnagain Arm winds see:*

1. [http://pafc.arh.noaa.gov/papers/anc\\_downslope.doc](http://pafc.arh.noaa.gov/papers/anc_downslope.doc)
2. [http://pafc.arh.noaa.gov/papers/turnagain\\_winds.doc](http://pafc.arh.noaa.gov/papers/turnagain_winds.doc)