

Snowfall Relationship between Eaglecrest Ski Area, Juneau Airport, and Juneau Forecast Office

Richard Lam, WFO Juneau, May 2, 2012

Introduction

With an area of 3225 square miles, Juneau is the third largest municipality in the United States. There are three major population centers in Juneau: Mendenhall Valley, Downtown Juneau, and South Douglas. Downtown Juneau and South Douglas are located approximately 10 miles southeast of Mendenhall Valley. Weather regimes vary significantly across the municipality of Juneau. It can be snowing at Eaglecrest Ski Area and within Mendenhall Valley, while it is mixing near the airport and raining in Downtown Juneau and South Douglas. Snowfall amounts vary significantly from location to location. The purpose of this study is to investigate snowfall relationships between Eaglecrest Ski Area, Juneau International Airport, and the Juneau Forecast Office.

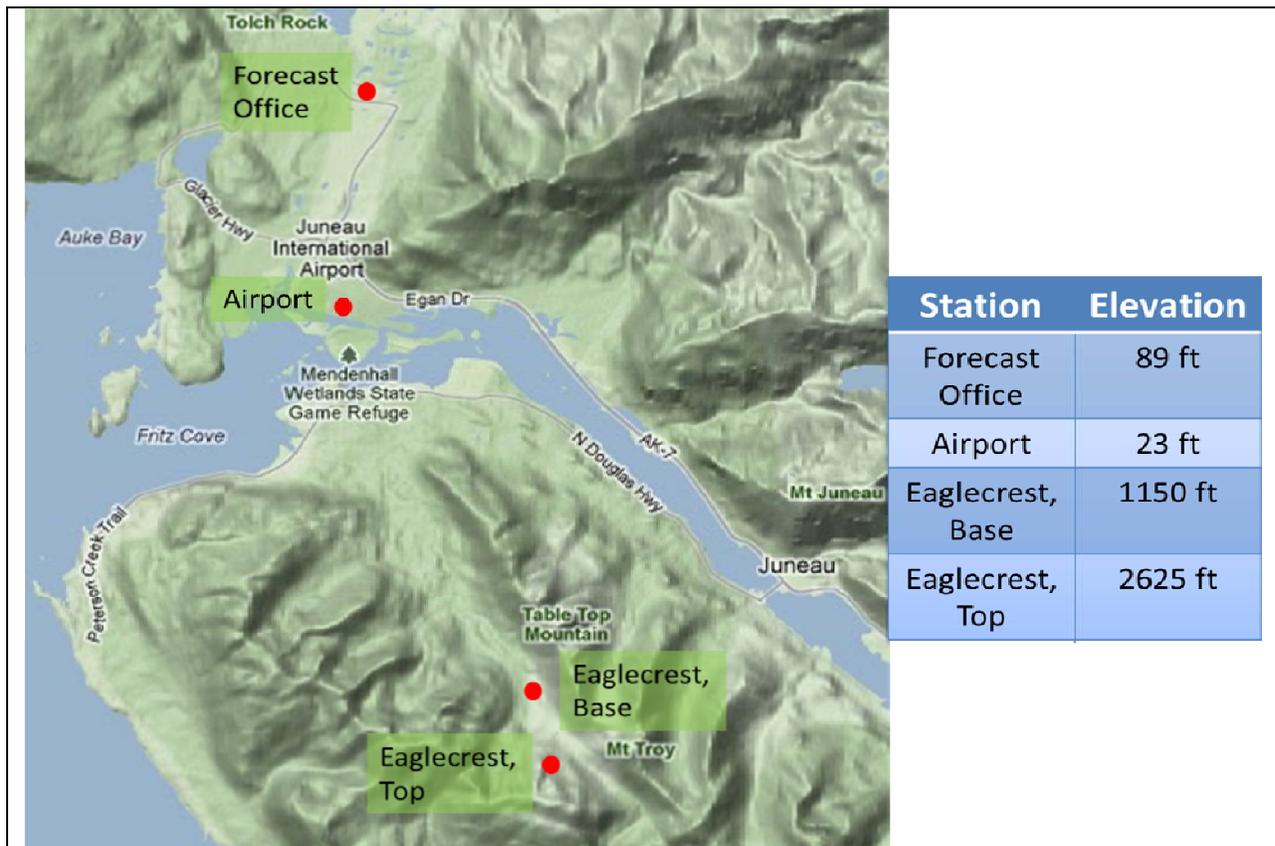


Figure 1: Map showing the four locations and their elevations used in this study. The topography in the Juneau area is complex, with mountain ridges and a few flatlands.

Data

Using xmclimate software, the snowfall records for these four locations are obtained. Note that Eaglecrest only reports snowfall once per day (rather than reporting 6-hour snowfall four times per day) on days that the ski resort is operating (i.e. Thursday through Monday during the winter, and daily during winter break and spring break vacations). Thus, snowfall data when Eaglecrest is not operating is not included in the study. Also, Eaglecrest is a COOP site, and the snowfall observations are reported in the morning. On the other hand, snowfall observations for the airport and the forecast office are reported at midnight. Thus, there are offsets in the time period where snowfall observations are taken between Eaglecrest and stations in the Valley. Figures 2 through 5 below illustrate the surrounding environments of these four stations.



Figure 2: Eaglecrest (top) under cloudy skies in late March.



Figure 3: Eaglecrest (bottom) during the summer.



Figure 4: Juneau Airport under a rare, but mostly sunny day in September.



Figure 5: Juneau NWS Forecast Office in January after 40 inches of snowfall in 10 days.

Snowfall data is then compared to see if any relationships between these stations can be found.

Results

Some interesting patterns are found in this study. Snowfall at the Juneau Forecast Office is very similar to that at the airport. The top of Eaglecrest receives significantly more snow than the three other locations in this study.

When the top of Eaglecrest receives 20 inches or more of snowfall, the base of Eaglecrest receives around 4 inches of snow, while Mendenhall Valley receives around 1 to 1.5 inches of snow. The Mendenhall Valley receives the highest amounts of snow (around 3 to 3.5 inches) when the top of Eaglecrest receives 10 to 15 inches of snow. The base of Eaglecrest receives the highest amounts of snow (around 5 to 6 inches) when the top of Eaglecrest receives around 10 to 20 inches of snow. When the top of Eaglecrest receives 2 to 10 inches of snow, the base of Eaglecrest generally receives around 3 to 4.5 inches of snow while the Valley receives around 1.5 to 2 inches of new snow. When the top of Eaglecrest receives less than 2 inches of snow, the three other locations generally receive less than 1 inch of new snow.

Eaglecrest, Top	Eaglecrest, Base	Airport	Forecast Office
20+''	3.8''	1.0''	1.3''
15-19.9''	5.3''	1.9''	1.8''
10-14.9''	5.7''	3.3''	3.2''
6-9.9''	4.6''	1.8''	1.5''
2-5.9''	2.8''	1.7''	1.8''
0-1.9''	1.1''	0.3''	0.5''

Discussion

The top of Eaglecrest receives more snow than the three other locations, as this is attributed to elevation. While it may be raining at sea level with temperatures in the upper 30s, temperatures are well below freezing at the summit of Eaglecrest such that all precipitation there will fall as snow. In addition, the terrain in Eaglecrest area will further enhance rising motion and thus higher rates of precipitation.

It is interesting to note that Mendenhall Valley receives the most snowfall when the top of Eaglecrest receives 10 to 15 inches of snow. According to the findings in this study, Mendenhall Valley does not receive as much snow when the top of Eaglecrest receives more than 20 inches of snow. This may suggest that favorable forcing for heavy snow accumulation can be localized. This is especially true with Conditional Symmetric Instability (CSI) banding. CSI banding are mesoscale features, and they can cause locally heavy snowfall amounts while surrounding areas may only receive light snowfall. It will be nice to have radar coverage to investigate CSI bandings in Juneau area.

With snowfall observations at Eaglecrest Ski Resort, forecasters can see variations in snow accumulation due to elevation. It will be nice to have additional snowfall observations on other major peaks in Juneau, such as Thunder Mountain, Mount McGinnis, Mount Roberts, and Sheep Mountain. This will provide forecasters a spatial distribution of snowfall accumulations across the municipality of Juneau.