Unit 3 Lesson: Snow Depth
Under a Blanket of Snow

Overview

In this lesson, users will download a KML file to open in (free) Google Earth™ software and use it to access and compare snow data for locations in Alaska.

Objectives

The learner will:

- download a KML file and open it in Google Earth; and
- access snow depth data for Alaskan communities in Google Earth; and
- compare and contrast snow depth data for two locations in Alaska.

Materials

- Computer with Internet access
- Google Earth program installed on computer

Background Information

Snow in Alaska:

Weather scientists are interested in many aspects of weather, including snow. Snow data can be collected from satellite or airborne platforms, or at weather stations on the ground.

Most of Alaska is relatively dry, receiving less than 20 inches of precipitation each year. Snowfall makes up a large portion of the total annual precipitation in the state. Far northern Alaska receives precipitation totals typical of a desert, but most of it falls as snow. The southcentral and southeastern coastal areas have far greater precipitation, but less of it falls as snow. The extent and duration of winter snowpack are largely controlled by air temperature.

Snow depth refers to the thickness of the snowpack on the ground at a given time. Snow depth is not equal to snowfall because snow can undergo many changes after it falls to the ground. Melting between snowfall events can result in little to no snow cover. This is common in places where the air temperature fluctuates between below freezing and above freezing.

Climate:

Locations that are under the predominant influence of the ocean have a *maritime climate*. Seawater takes a long time to warm up in the summer, and to cool down in the winter. This moderates the climate of regions near the ocean. Maritime climates usually experience cool summers and mild winters, with a narrow annual range of temperatures. Such regions are fairly humid, with considerable amounts of precipitation.

Regions that are far away from the moderating effect of the ocean have a *continental climate*. Locations that are further inland usually experience hot summers and colder winters. This type of climate is characterized by a large daily and annual temperature range, low humidity, and relatively light and irregular precipitation.

Vocabulary

continental climate:	This climate exists in inland areas where cold air masses settle in during the winter and warm air masses form in summer.
maritime climate:	Maritime climates exist near the coast and have cool summers and warm winters, moderated by the nearby ocean.
snow depth: • *average snow depth*: • *maximum snow depth*:	The total depth of frozen precipitation on the ground. The depth of snow cover recorded in a given location, averaged over time - usually a month or a winter season. The maximum depth of snow cover recorded in a given location for a particular amount of time.
snowfall:	The depth of new snow that has accumulated since the previous day or since the previous observation.
snowpack:	Layers of persistent snow that accumulate on the ground in a given location.

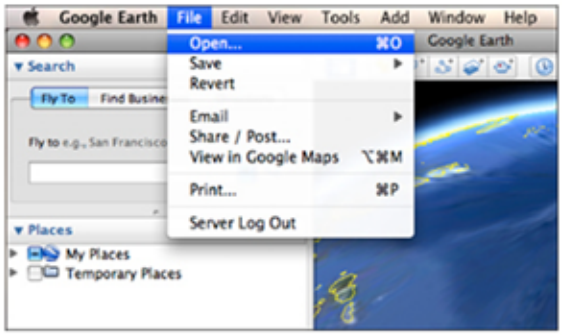
Getting Started

STEP 1. Download Google Earth if it is not already installed on your computer.

- Go to: http://www.google.com/earth/index.html.
- Available for free on PC, Mac, and Linux.
- Download Google Earth to your computer.
- Drag Google Earth to your desktop.

STEP 2. Open the KML File in Google Earth

- Download the Alaska_Weather_Stations.kml file to your computer if it is not already downloaded.
- Double-click Google Earth to start the program.
- Go to the **File** dropdown menu, and select **Open...**



- Navigate to the Alaska_Weather_Stations.kml file and click **Open**.

(NOTE: This should zoom to the extent of the KML file - in this case, the state of Alaska.)

STEP 3. Access Snow Data

- Click on the square box next to **Fairbanks**.
  This opens a balloon with information and links to data and graphs about Fairbanks weather and climate.
- Click on the **Seasonal Snow Depth (1930-2009)** link to reveal graphs of the average seasonal snow depth and the maximum seasonal snow depth recorded at this location.

Fairbanks Climate

Fairbanks is located in the Tanana Valley in the interior of Alaska. It has a distinctly continental climate, with large variation of temperature from winter to summer. There are rolling hills reaching elevations up to 2,000 feet above Fairbanks to the north and east of the city.

Climatological Data - Fairbanks

Precipitation

Snow cover is persistent in Fairbanks, without interruption, from October through April. Snowfalls of 4 inches or more in a day occur only three times during winter. Precipitation normally reaches a minimum in spring, and a maximum in August, when rainfall is common. During summer, thunderstorms occur in Fairbanks on an average of about eight days. Thunderstorms are about three times more frequent over the hills to the north and east of Fairbanks. Precipitation in the uplands around Fairbanks is heavier than it is in the city by roughly 20 to 50 percent.

Seasonal Snowfall (1930-2009)

Seasonal Snow Depth (1930-2009)

Temperature

The climate in Fairbanks is conditioned mainly by the response of the land mass to large changes in solar heat received by the area during the year. The sun is above the horizon from 18 to 21 hours during June and July. During this period, daily average maximum temperatures reach the lower 70s. In contrast, from November to early March, when the period of daylight ranges from 10 to less than 4 hours per day, the lowest temperature readings normally fall below zero quite regularly. Low temperatures of -40 degrees or colder occur each winter. The range of temperatures in summer is comparatively low, from the lower 30s to the mid 90s. In winter, this range is larger, from about 65 below to 45 degrees above. During winter, the surrounding hills are often warmer than Fairbanks, as cold air settles into the valley.

Annual Temperature (1930-2009)

Wind

Blizzard conditions are almost never seen, as winds in Fairbanks are above 20 miles an hour less than 1 percent of the time. The large winter range of temperature reflects the great difference between frigid weather associated with dry northerly airflow from the Arctic to mild temperatures associated with southerly airflow from the Gulf of Alaska, accompanied by chinook winds off the Alaska Range, 80 miles to the south of Fairbanks.

Wind Data (Averages 1971-2000)

Climate Projections

The Scenarios Network for Alaska Planning (SNAP) provides and integrates data on climate change in Alaska. SNAP climate projections run through the year 2100, and are used for community planning. The program serves more than 350 Alaska communities. Local-scale projections of future conditions are not directly available, but can be modeled based on local topography. Projected temperatures and precipitation for Fairbanks are based on three levels of future greenhouse gas emissions.

SNAP Projections - Fairbanks

Climate information and data courtesy of the Alaska Climate Research Center and the National Climate Data Center (NCDC)

63°07'36.36" N 150°55'57.60" W elev 562 m Eye alt 2422.52 km

Answer questions 1-4 on the worksheet.

SNOW DEPTH

- Click **Back to Google Earth** button.

- Click on **Annette.**
- Click on the **Seasonal Snow Depth (1948-2009)** link.

Answer questions 5-11 on the worksheet.