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June Gloom

"June Gloom" is also the title of songs by The Like, Brad Laner, and The Ditty Bops.

June Gloom is a southern California term for a weather pattern that results in cloudy, overcast skies with cool temperatures during the late spring and early summer, most commonly in the month of June. Low-altitude stratus clouds are formed over the ocean, then transported over the coastal regions by the wind. The overcast skies often are accompanied by fog and drizzle, though usually not rain.

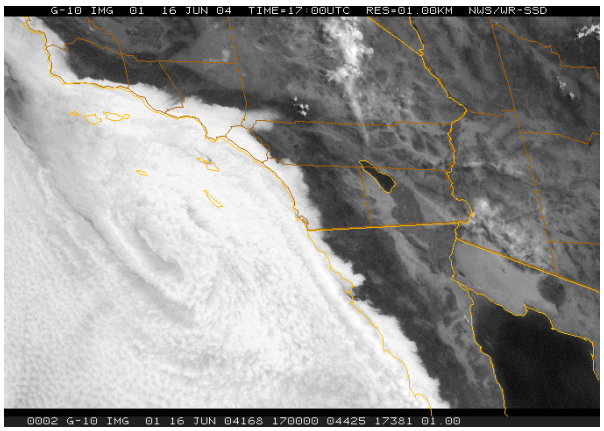
June Gloom conditions prevailing at Seal Beach in late morning, June 2013.

June Gloom in southern California is caused by the marine layer effect common to the West Coast, and is enhanced by the Catalina eddy local to southern California. May and June together are usually the cloudiest months in coastal Southern California. June Gloom has other colloquial names if the same weather pattern occurs in May, July, or August. June Gloom is stronger in years associated with a La Niña, and weaker or nonexistent in years with an El Niño. This weather pattern occurs in other parts of the world where climates and conditions are similar.

Scientists study the cloud fields that make up June Gloom to increase understanding of cloud behavior at the onset of drizzle and precipitation.

Phenomenon

A typical June Gloom morning consists of marine stratus clouds covering the coast of southern California, extending a varying distance inland depending on the strength of the June Gloom effect that day. The clouds, which are formed by the marine layer, move in at night, usually after midnight, and typically dissipate in the late morning, giving way to clear, sunny skies. During a heavy June Gloom season, the condition may persist into the afternoon, or even all day during an exceptionally strong event. Often, the air is saturated with moisture, and fog also develops, along with frequent light mist and occasional drizzle. Fog and drizzle normally are found near the furthest inland extent of the gloom, where the cloud deck is closest to the ground. By late morning to early afternoon, solar heating usually is sufficient to evaporate the clouds, and the sun emerges. The phenomenon forms earliest and lasts longest at the coast, with weaker effects as it moves further inland. When the marine layer is strong and deep, clouds can fill the Los Angeles Basin and spill over into the San



Satellite image of clouds over the ocean and along the coast of southern California, showing a distinct Catalina eddy.

Fernando Valley and San Gabriel Valley, even extending into the Santa Clarita Valley on exceptionally strong June Gloom mornings. If the condition is not as strong, the Basin may be filled while the valleys may be clear. It is not uncommon for motorists to drive over the Sepulveda Pass from the clear, sunny San Fernando Valley and plunge into a cloudy, fog-filled Los Angeles. On a weak June Gloom morning, the clouds and fog may only be present within a mile or two of the coastline, affecting only the beach cities.

The months of May and June are typically the cloudiest months of the year in coastal southern California, having only 59% and 58% sunny days, respectively, on average.[1] The number of days in May and June that are "gloomy" vary from year to year. Anomalies in sea surface temperature can be used to forecast the number and intensity of June Gloom days. Years with warmer ocean temperatures, referred to as El Niño, may result in fewer gray days in May and June.[2] Cooler ocean temperatures, associated with La Niña, usually foretell a more gray period.

June Gloom has been reported by some Californians to bring on symptoms consistent with seasonal affective disorder, although this is not well-supported by evidence. However, the normally-very-sunny Los Angeles climate also is home to people who thrive during the brief seasonal respite the gloom provides from the unending sunshine and clear skies.

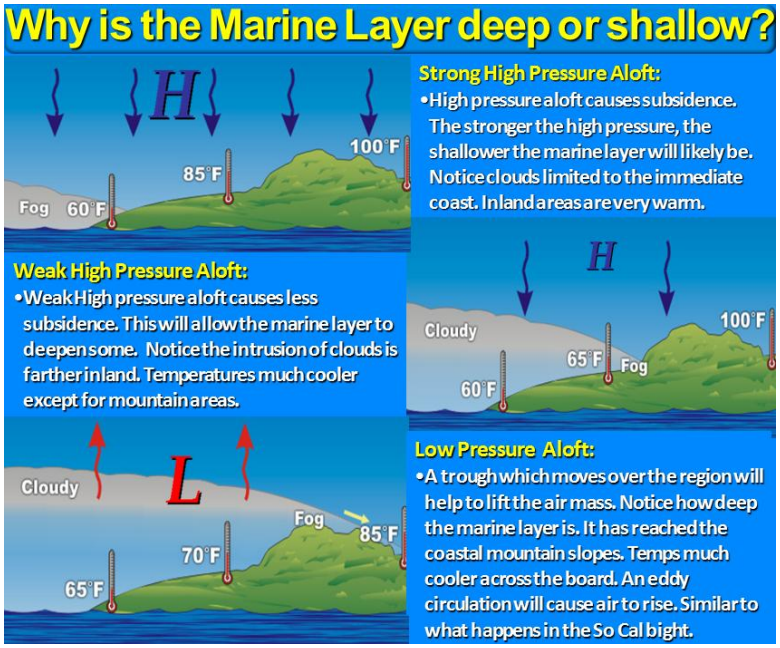
June Gloom has other names in southern California if it occurs in other months. These include *May Gray* if it begins early, and *No-sky July* or *Fogust* if it continues past June. In the early 20th century, this phenomenon was sometimes known as the *high fog*. A long June Gloom season, extending late into the summer, is known as *Summer Bummer*. The negative effects of a long June Gloom on the coastal California tourism industry is often reported in the local news media. The phenomenon can be especially disorienting to visitors from inland areas who, coming from the summer heat, would not expect cool temperatures and clouds and fog at the beach.

Formation

The marine layer clouds, which consist of low-altitude stratus, form over the nearby ocean, and are transported over the coastal areas by the region's prevailing westerly winds. The sheet-like stratus clouds are almost uniformly horizontal, covering large areas but having relatively shallow depth of 500 to 2,000 metres (1,600 to 6,600 ft). These clouds begin to form when wind mixes moisture from the ocean surface into the air. The air cools and expands as it is moved upward, and this cooling increases the relative humidity. When the relative humidity reaches 100%, the water vapor condenses into liquid water droplets and the clouds begin to form.

A weak, shallow layer of clouds hovering over the coast of California, typical of the dissipation of the marine layer later in the day.

An inversion layer is crucial to the formation of the marine stratus that produce June Gloom. Compression and warming of air sinking out of the North Pacific High-pressure system (which is strongest during the summer) meets with the rising, cooling air from the sea surface, producing a very stable layer of air that caps the cool air from rising any further. The strength of this subsidence inversion affects the strength of the marine layer, and how long it will take the clouds to dissipate. Additionally, the cool ocean water of the California Current, which flows out of the cold Gulf of Alaska, enhances the contrast between the cool air below the inversion layer and the warm air above it. A stronger inversion layer – one with a greater difference in temperature between the air above and the air below – often results in more and deeper marine layer clouds that persist longer into the day. Upwelling of colder-than-normal ocean water, associated with a La Niña, can strengthen this effect even more.



Once this marine layer has formed, the prevailing westerly winds advect the clouds over the coastal lands. The extent of inland advection is limited by southern California's coastal mountain ranges. The winds will continue to push the cloud layer onshore until they encounter mountains at or above the altitude of the clouds themselves, with the mountains then preventing any further inland progress of the marine layer. The foothill regions of these mountains experience some of the thickest fog and drizzle, as they are essentially in the clouds at this point.

The marine layer clouds of a June Gloom day usually are at their maximum at dawn, when the surface air is at a minimum temperature and the temperature difference in the inversion layer is at its maximum. The air beneath the inversion base being at its coolest also makes it likely that it will be saturated with a relative humidity of 100%.

A sea breeze, which is caused by the temperature and pressure difference between warm areas inland and the cool air over the ocean, often develops on warm summer days as well, increasing the on-shore flow pattern and maintaining a constant flow of marine stratus clouds onto the coastal areas.

A strong low pressure system passing over southern California will produce the deepest and most extensive June Gloom marine layer. The marine layer effect is weakened when a weak high pressure system is in place over the region, and the marine layer will be very weak or nonexistent when there is a strong high-pressure system affecting southern California. The National Weather Service graphic on the right explains the effects of atmospheric conditions upon the marine layer and local weather conditions in more detail.

Similar Weather Elsewhere In The World

The condition is prevalent in many parts of the world where an offshore marine layer of stratus or stratocumulus clouds is common, such as the western coasts of continents—particularly off Peru, Namibia, Western Australia, atlantic Sahara and Northern California, particularly San Francisco. Such cloud systems are persistent year-round off the coast; in certain seasons they move ashore and create the cloudy, cool effect on land.[3] These places typically are located in a Mediterranean climate (Köppen climate classification *Csa*), but the effect occurs in other climate zones as well, where conditions are favorable. San Francisco has fog throughout much of the year, common through some of Northern California. Central California also has areas with cooler weather as the result of the fog through much of the year.

Pacific Northwest

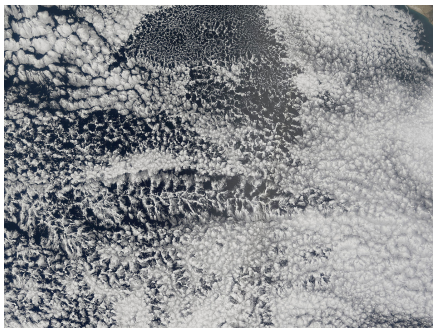
A similar phenomenon can occur in the Pacific Northwest between May and early July, though the phrase "June Gloom" is not nearly as commonly heard as it is in California. In the Pacific Northwest, it is often referred to as "June-uary". As locations east of the Cascade Mountains rapidly heat up in late spring, the resultant pressure gradient pulls cool marine air onshore, over the coastal mountains, and into the Willamette Valley of Oregon, as well as the non-coastal parts of southwestern Washington. At night the already cool and moist marine layer becomes even

cooler, fueling the formation of low clouds. During late spring and early summer, it is quite common for cities like Portland to be completely overcast in the morning and remain as such until early afternoon, at which time the clouds dissipate and the sky becomes mostly clear.

As summer progresses, the marine layer typically gets shallower and has some difficulty crossing the Coast Range. While stratus cloud decks can occasionally reach the interior valleys in July and August, they are very often confined to the coastline during this time.

Actinoform clouds and drizzle prediction

Researchers have discovered that the cloud fields forming June Gloom and related phenomena from other west-coast marine-influenced climates are excellent places to find and study actinoform clouds. These clouds have been found to be present more often than expected in common stratocumulus layers. These clouds are persistent year-round off the coast, but are only drawn inland during June Gloom events and related phenomena elsewhere in the world. Observations suggest that when marine stratus is present alone, drizzle is minimized. However, scientists believe that the presence of actinoform clouds within the marine stratus is indicative of an increase in drizzle and the onset of precipitation. Observation and computer modeling have shown that the shape of the cloud fields actually rearrange themselves when the clouds start to rain.



Actinoform clouds imaged by the MODIS instrument on board the Terra satellite.

References

[1] San Diego Union Tribune, June 8, 2004 (http://www.signonsandiego.com/uniontrib/20040608/news_1m8gloom.html)

[2] San Diego Union Tribune, May 7, 2010 (http://www.signonsandiego.com/news/2010/may/07/whither-our-weather-it-depends-on-whether/)

[3] USA Today, June 1, 2009 (http://www.usatoday.com/weather/news/2009-06-01-june-gloom-midwest-storms_N.htm)

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