Mount St. Helens in eruption. Aerial view of upper part of volcano and the eruptive column on MAy 18th, 1980. (USGS photo)

A satellite image shows the eastward spread of the ash plume across Washington state from the May 18th, 1980 eruption of Mount St. Helens, approximately one hour after the initial eruption. (NOAA) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo11)

Ashen clouds from the Mount St. Helens volcano move over Ephrata airport in Washington on Monday, May 19, 1980. (AP Photo/Mike Cash) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo12)

A car is shown submerged in ash in this May 20, 1980 photo from Mount St. Helens eruption in Washington State. (AP Photo) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo13)

A splintered stump is all that remains of a tree that had grown on a now-desolate ridge near the North Fork Toutle River near Mount St. Helens. (USGS/S.W. Kieffer) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo15)

Massive blowdown of trees in the Green River valley seen on June 2, 1980. The flattening of the forest resulted from the May 18 eruption of Mount St. Helens. (USGS/J. DeVine) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo16)

The streets of Yakima, Washington are dark at 3:00 PM after an eruption at Mount St. Helens on May 18, 1980. Light gray volcanic ash covered the streets and passersby wore masks to avoid breathing the ash. (AP Photo) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo31)

On the slopes of Mount St. Helens, colorful ponds dot the debris avalanche, their chemical composition varying wildly and affecting the color of the water. Photo taken on August 8, 1981. (USGS/Lyn Topinka) [#](http://www.boston.com/bigpicture/2010/05/mount_st_helens_30_years_ago.html#photo33)

Mount St. Helens spews smoke and ash skyward as the volcano erupts once more on October 17th, 1980. (AP Photo/Jack Smith)

PUFF and HAZMAP, two tephra dispersal models developed for volcanic hazard mitigation, are used to simulate the climactic 1991 eruption of Mt. Pinatubo. PUFF simulations indicate that the majority of ash was advected away from the source at the level of the tropopause (~ 17 km). Several eruptive pulses injected ash and SO2 gas to higher altitudes (~ 25 30 km), but these pulses represent only a small fraction (~ 1 %) of the total erupted material released during the simulation. Comparison with TOMS images of the SO2 cloud after 71 and 93 h indicate that the SO2 gas originated at an altitude of ~ 25 km near the source and descended to an altitude of ~ 22 km as the cloud moved across the Indian Ocean. HAZMAP simulations indicate that the Pinatubo tephra fall deposit in the South China Sea was formed by an eruption cloud with the majority of the ash concentrated at a height of ~ 17.5 km. Results of this study demonstrate that the largest concentration of distal ash was transported at a level significantly below the maximum eruption column height (~ 40 km) and was thus controlled by atmospheric circulation patterns near the regional tropopause. In contrast, the movement of the SO2 cloud occurred at higher levels, along slightly different trajectories, and may have resulted from gas/particle segregations that took place during intrusion of the Pinatubo umbrella cloud as it moved away from source.

Ash cloud. NOAA weather satellite imagery clearly recorded the rise and dissemination of ash clouds, and at least two distinct major pulses of ash ejection (figure 9). Measurements from the images showed that the cloud from the main explosion initially expanded in all directions, with the bulk of the ejecta moving E. [Measurements from satellite images indicated that the rate of horizontal advance of the cloud front averaged 250 km/hr for the first 13 minutes after the eruption's onset. Horizontal velocity soon decreased, remaining at about 100 km/hr for the first 1,000 km of its dispersal to the ENE.] Portland airport reported wind speeds of only 120 km/hr toward the E at 12 km altitude. The second pulse could be seen on the image returned at 1215. [From an aircraft, D. Swanson observed that] the color of the column [gradually] changed from dark gray to pale gray [between about 1200 and 1220].

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| [http://www.volcano.si.edu/volcanoes/region12/washing/sthelens/12msh09s.jpg](http://www.volcano.si.edu/volcanoes/region12/washing/sthelens/12msh09f.jpg) | Figure 9. Mosaic of four images from NOAA's GOES West geostationary weather satellite, in orbit over the equator at 135°W. All of Washington and Oregon, most of Idaho and parts of Montana, California, Nevada and S Canada are shown. Image times (all 18 May 1980) are: upper left, 0845 (13 minutes after the eruption began), upper right, 0915, lower left, 0945, lower right, 1315. The first three images show the rapid dissemination of the Mt. St. Helens ash cloud after the initial explosion. The last image shows the eruption column from the second major burst, about 1 hour after it was ejected. Ash from earlier activity had spread to the Idaho-Montana border. Courtesy of Arthur Krueger and Andy Horvitz. |

Ash was widely dispersed in the atmosphere because of varying wind directions at different elevations (figure 10). Murray Mitchell reported that ash had made a complete circuit of the globe by 29 May. Most of the tropospheric material had fallen out by mid-June, but a diffuse dust veil remained in the stratosphere from the latitude of Mt. St. Helens N to the polar region. Bernard Mendonça reported that as of 9 June, NOAA's solar radiation and lidar equipment in Hawaii had detected no St. Helens ejecta. Seasonal arctic haze precluded observations from the Barrow, Alaska station. Stratospheric circulation patterns make aerosol movement to the S very unlikely before autumn.

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| [http://www.volcano.si.edu/volcanoes/region12/washing/sthelens/12msh10s.png](http://www.volcano.si.edu/volcanoes/region12/washing/sthelens/12msh10f.png) | Figure 10. Paths traveled over North America by 18 May 1980 Mt. St. Helens ash at 3, 9, 16, and 18 km altitudes. Tick marks along each line show position of ash cloud front at that altitude every 24 hours, at noon GMT (0550 local time at Mt. St. Helens). The date at each tick mark is indicated. For clarity, the 18 km path is shown as a dashed line. The 21 May cloud from at 9 km altitude is just off the map to the E. Data provided by NOAA's Air Resources Laboratory. |

NOAA GOES West view

Western U.S., 6 minutes after Mount St. Helens eruption   [View image](http://content.lib.washington.edu/cdm4/results.php?&CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CISOBOX3=WAS1292+&CISOFIELD3=CISOSEARCHALL&CISOOP4=none&CISOBOX4=&CISOFIELD4=CISOSEARCHALL&CISOROOT=/wastate&t=a)May 18, 1980GOES-West image, 8:45 a.m. PDT, May 18, 1980. Ash cloud is visible in southwest Washington State, south of Puget Sound.

Western U.S., 1 hour, 6 minutes after Mount St. Helens eruption   [View image](http://content.lib.washington.edu/cdm4/results.php?&CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CISOBOX3=WAS1293+&CISOFIELD3=CISOSEARCHALL&CISOOP4=none&CISOBOX4=&CISOFIELD4=CISOSEARCHALL&CISOROOT=/wastate&t=a)May 18, 1980GOES-West image, 9:45 a.m. PDT, May 18, 1980. Ash cloud is visible in southwest Washington State, expanding eastward.

Western U.S., 3 hours, 36 minutes after Mount St. Helens eruption   [View image](http://content.lib.washington.edu/cdm4/results.php?&CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CISOBOX3=WAS1294+&CISOFIELD3=CISOSEARCHALL&CISOOP4=none&CISOBOX4=&CISOFIELD4=CISOSEARCHALL&CISOROOT=/wastate&t=a)May 18, 1980GOES-West image, 12:15 p.m. PDT, May 18, 1980. Ash cloud continues to move eastward through Washington and southward into eastern Oregon. Cloud begins to move into Idaho.

Western U.S., 6 hours, 36 minutes after Mount St. Helens eruption   [View image](http://content.lib.washington.edu/cdm4/results.php?&CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CISOBOX3=WAS1295+&CISOFIELD3=CISOSEARCHALL&CISOOP4=none&CISOBOX4=&CISOFIELD4=CISOSEARCHALL&CISOROOT=/wastate&t=a)May 18, 1980GOES-West image, 3:15 p.m. PDT, May 18, 1980. Ash cloud now obscures most of Washington. It has moved out of eastern Oregon, now obscuring northern and central Idaho, and is moving into western Montana.

Western U.S., 26 hours, 36 minutes after Mount St. Helens eruption   [View image](http://content.lib.washington.edu/cdm4/results.php?&CISOOP1=all&CISOBOX1=&CISOFIELD1=CISOSEARCHALL&CISOOP2=exact&CISOBOX2=&CISOFIELD2=CISOSEARCHALL&CISOOP3=any&CISOBOX3=WAS1296+&CISOFIELD3=CISOSEARCHALL&CISOOP4=none&CISOBOX4=&CISOFIELD4=CISOSEARCHALL&CISOROOT=/wastate&t=a)May 19, 1980GOES-West image, 11:15 a.m. PDT, May 19, 1980. Ash cloud has moved eastward and covers most of South Dakota, Nebraska, Kansas, and Oklahoma.

At 1545Z on May 18, 1980, GOES-3 took this visible image of the Pacific Northwest showing the massive eruption of Mount St. Helens in the western part of the Cascade range. A large pyroclastic plume of smoke and ash can be seen in the center of the image, taken two hours after the eruption began.**Copyright:**National Oceanic and Atmospheric Administration (NOAA)