Sulfur Dioxide

Sulfur dioxide (SO₂)—a colorless, toxic gas with a sharp odor—is a very water soluble, acidic gas. SO₂ irritates the eyes, nose, and lungs. High concentrations of SO₂ can result in temporary breathing impairment. It is both human-generated and naturally occurring.

SO₂ is a precursor to sulfuric acid, a major constituent of acid rain. It is produced by the combustion of coal, fuel oil, and gasohol (since these fuels contain sulfur), and in the oxidation of naturally occurring sulfur gases, as in volcanic eruptions. Volcanic plumes, rich in ash and SO₂, are a hazard to aviation. SO₂ can be transformed into tiny sulfuric acid particles, called aerosols that can alter the brightness of clouds and precipitation. Some very explosive volcanoes send SO₂ into the atmosphere, where it can form sulfuric acid aerosols that persist for long periods of time and can contribute to climate change.

Instruments like the Ozone Monitoring Instrument (OMI) on NASA’s Aura satellite, track SO₂ in the atmosphere allowing scientists to compare SO₂ emissions around the world from both natural sources and man-made emissions. These measurements are recorded in Dobson units—a unit of measurement of atmospheric columnar density. Just imagine if you could compress all of the SO₂ in the atmosphere into a single layer at the Earth’s surface at a temperature of zero degrees Celsius, one Dobson Unit would be 0.01 millimeters thick. While this may seem small compared to a single layer at the end of May 2011. The images are from

The image above shows concentrations of SO₂ from the Aura satellite, measured by OMI. The measurements shown in this image are average data for the months of July and August from 2004-2006. Test

In early April 2009, La Cumbre Volcano on Isla Fernandina in the Galapagos Islands erupted, producing an ash plume and snow flows. The eruption also produced a substantial plume of sulfur dioxide (SO₂) that extended for weeks of the eruption, over the Pacific Ocean.

The image above was made from data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA’s Aqua satellite. The plume, which is spreading toward the east, is visible on this visible and infrared image of the Earth’s atmosphere. The plume extends from the volcano’s vent, which is located on the island’s east coast, and is visible in both the visible and infrared portions of the image.

The image at left reveals exhaust plumes from a power plant and other sources of pollution in the region around the city of Noril’sk, in Siberia, Russia. These emissions are a major source of pollution in the region, and the city of Noril’sk has been identified as one of the most polluted cities in the world. The plumes are visible in both the visible and infrared portions of the image, and are most pronounced in the infrared channel.

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In the early 2000s, the OMI instrument aboard NASA’s Aura satellite detected high concentrations of SO₂ from the La Cumbre Volcano. The SO₂ plume can be seen clearly in the image, which was acquired on April 10, 2003. The SO₂ plume extended for several weeks, spreading westward over the Pacific Ocean. The SO₂ plume was detected by OMI using a technique called the “lensing” technique, which involves measuring the spectral properties of the SO₂ plume. The SO₂ plume was detected at concentrations of up to 1 Dobson Unit (DU), which is about 0.1 millimeters thick at sea level. This is a significant measurement, as SO₂ is a major component of acid rain and smog, and it can have significant impacts on human and environmental health.

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