



UV Exposure Has Increased But Now Stabilized

by Adam Voiland Greenbelt MD (SPX) Mar 19, 2010 NASA scientists analyzing 30 years of satellite data have found that the amount of ultraviolet (UV) radiation reaching Earth's surface has increased markedly over the last three decades. Most of the increase has occurred in the mid-and-high latitudes, and there's been little or no increase in tropical regions.

The new analysis shows, for 32.5 degrees - a line that runs through central Texas in the



The primary culprit: decreasing levels of example, that at one line of latitude - stratospheric ozone, a colorless gas that acts as Earth's natural sunscreen by shielding the surface from damaging UV radiation.

northern hemisphere and the country of Uruguay in the southern hemisphere, 305 nanometer UV levels have gone up by some 6 percent on average since 1979

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The finding reinforces previous observations that show UV levels are stabilizing after countries began signing an international treaty that limited the emissions of ozone-depleting gases in 1987. The study also shows that increased cloudiness in the southern hemisphere over the 30-year period has impacted UV.

Jay Herman, a scientist at NASA's Goddard Space Flight Center in Greenbelt, Md., stitched together data from several earth observing satellites - including NASA's Aura satellite, NOAA weather satellites, and commercial satellites - to draw his conclusions. The results were published in the Journal of Geophysical Research in February.

"Overall, we're still not where we'd like to be with ozone, but we're on the right track," said Jay Herman. "We do still see an increase in UV on a 30-year timescale, but it's moderate, it could have been worse, and it appears to have leveled off."

In the tropics, the increase has been minimal, but in the mid-latitudes it has been more obvious. During the summer, for example, UV has increased by more than 20 percent in Patagonia and the southern portions of South America. It has risen by nearly 10 percent in Buenos Aires, a city that's about the same distance from the equator as Little Rock, Ark. At Washington, D.C.'s latitude - about 35 degrees north - UV has increased by about 9 percent since 1979.

The southern hemisphere tends to have more UV exposure because of the ozone hole, a seasonal depletion of the ozone layer centered on the South Pole. There are also fewer particles of air pollution - which help block UV - due to the comparatively small numbers of people who live in the southern hemisphere.

Despite the overall increases, there are clear signs that ultraviolet radiation levels are on the verge of falling. Herman's analysis, which is in agreement with a World Meteorological Report published in recent years, shows that decreases in ozone and corresponding increases in UV irradiance leveled off in the mid-nineties.

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The Many Sides of Radiation

Shorter ultraviolet wavelengths of light contain more <u>energy</u> than the infrared or visible portions of sunlight that reach Earth's surface. Because of this, UV photons can break atmospheric chemical bonds and cause complex health effects.

Longer wavelengths (from 320 to 400 nanometers) - called UV-A - cause sunburn and cataracts. Yet, UV-A can also improve health by spurring the production of Vitamin D, a substance that's critical for calcium absorption in bones and that helps stave off a variety of chronic diseases.

UV-B, which has slightly shorter wavelengths (from 320 to 290 nanometers), damages \underline{DNA} by tangling and distorting its ladder-like structure, causing a range of health problems such as skin cancer and diseases affecting the immune system.

As part of his study, Herman developed a mathematical technique to quantify the biological impacts of UV exposure. He examined and calculated how changing levels of ozone and ultraviolet irradiance affect life. For Greenbelt, Md., for example, he calculated that a 7 percent increase in UV yielded a 4.4 percent increase in the damage to skin, a 4.8 percent increase in damage to DNA, a 5 percent increase in Vitamin D production, and less than a percent of increase in plant growth.

"If you go to the beach these days, you're at slightly higher risk of getting skin cancer (without protection)," Herman said, though he noted the risk would have been even greater in the absence of regulations on ozone-depleting substances.

Last year, one of Herman's Goddard colleagues, Paul Newman, published a study showing that the ozone hole likely would have become a year-round fixture and UV radiation would increase 650 percent by 2065 in mid-latitude cities if not for the Montreal Protocol, an international treaty signed in 1987 that limited the amount of ozone-depleting gases countries could emit.

Clouds and Hemispheric Dimming

In addition to analyzing ozone and ultraviolet trends, Herman also used satellite data to study whether changes in cloudiness have affected UV trends. To his surprise, he found that increased cloudiness in the southern hemisphere produced a dimming effect that increased the shielding from UV compared to previous years.

In the higher latitudes especially, he detected a slight reduction - typically of 2 to 4 percent - in the amount of UV passing through the atmosphere and reaching the surface due to clouds. "It's not a large amount, but it's intriguing," Herman said. "We aren't sure what's behind it yet."

Vitali Fioletov, a Canadian scientist and member of the World Meteorological Organization's advisory group on ultraviolet radiation, agreed that Herman's findings about cloudiness warrant additional investigation. "I found the cloud effects on the global scale to be the most interesting aspect of the study," he said. "This isn't something you could see without satellites."

Herman synthesized measurements from the Total Ozone Mapping Spectrometer (TOMS) aboard Nimbus 7 and Earth Probe, the Ozone Monitoring Instrument (OMI) on NASA's Aura satellite, NASA's Sea-Viewing Wide Field-of-view sensor (SeaWiFS) on the commercial SeaStar satellite, and the <u>Solar</u> Backscatter Ultraviolet Instrument (SBUV) on several polar orbiting NOAA weather satellites.

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Something in the air in **Mexico City -- less** pollution

Mexico City (AFP) March 17, 2010 Long famous as one of the world's most polluted megalopolises, gritty Mexico City is beginning to see the fruits of years of clean-up efforts and to breathe somewhat cleaner air, experts say. "The pollution



problem is still there, but it is a fact that we have been fighting pollution for more than 20 years and the improvement is undeniable," said Gustavo Alanis, with the NGO Mexican Center f ... read more



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