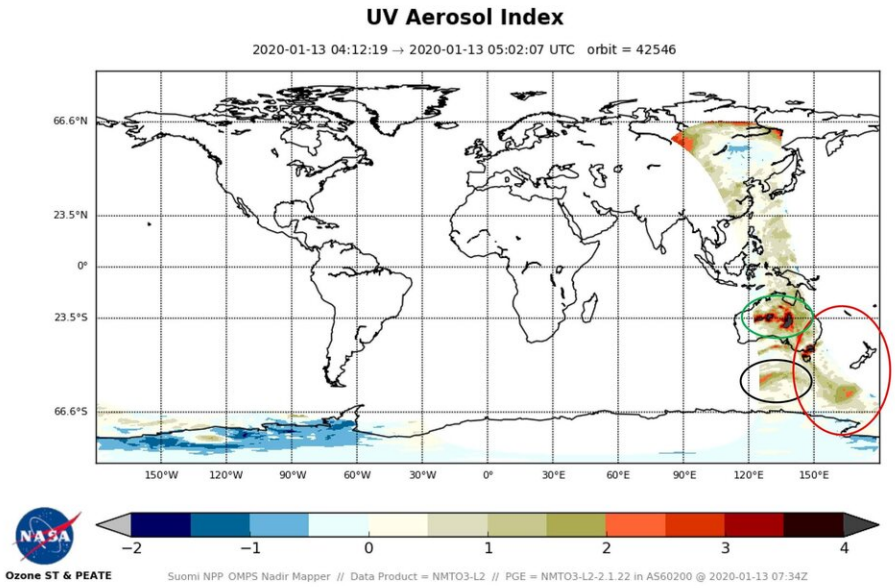
From smoke going round the world to aerosol levels, NASA observes Australia's bushfires

January 14 2020, by Lynn Jenner



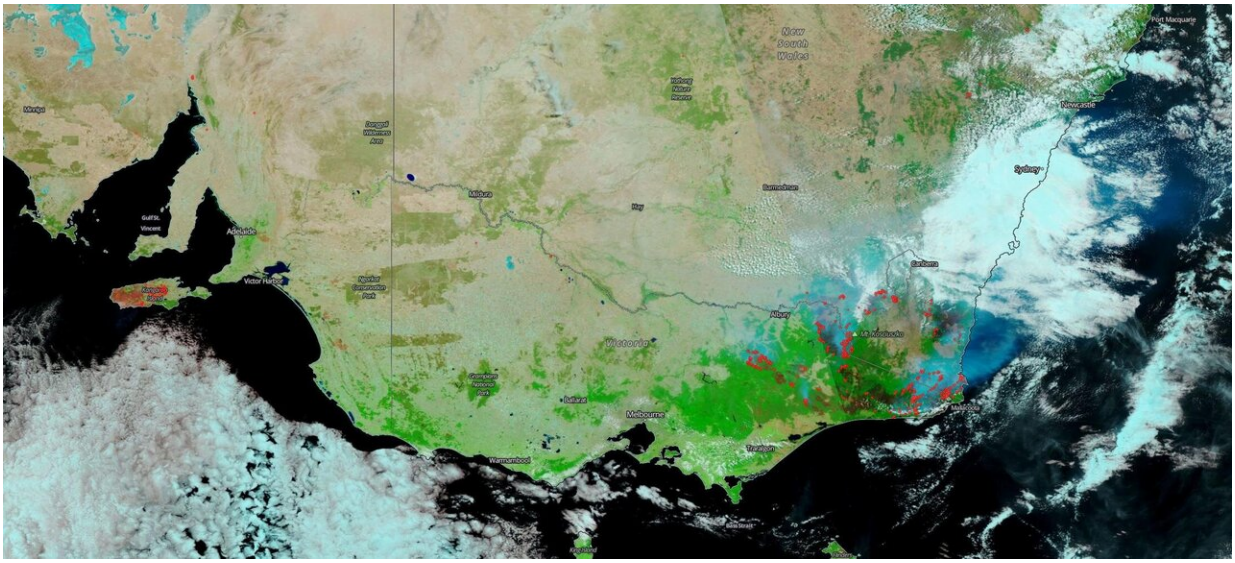
This image of the UV aerosol index from the Suomi NPP satellite OMPS Nadir Mapper instrument showing a "close-up" from Jan. 13, 2020 (specifically orbit 42546). The image reveals that the smoke has now made its all the way back to eastern Australia (black circle). The red circle shows "newly formed" (or current) smoke that has just been emitted from the fires. The green circle shows the dust from an intense dust storm. Credit: NASA/Colin Seftor

NASA scientists using data from its NOAA/NASA Suomi NPP satellite,

has traced the movement of the smoke coming off the Australian fires across the globe showing that it has circumnavigated the Earth. In an image created from data gathered by the Ozone Mapping and Profiler Suite (OMPS) Nadir Mapper on Suomi NPP, a black circle shows the smoke which had been traced from its origins coming back to the eastern region of Australia after having traveled around the world. Suomi NPP carries carry five science instruments and is the first satellite mission to address the challenge of acquiring a wide range of land, ocean, and atmospheric measurements for Earth system science while simultaneously preparing to address operational requirements for weather forecasting. Suomi NPP also represents the gateway to the creation of a U.S. climate monitoring system, collecting both climate and operational weather data and continuing key data records that are critical for global change science.

NASA's satellite instruments are often the first to detect wildfires burning in remote regions, and the locations of new fires are sent directly to land managers worldwide within hours of the satellite overpass. Together, NASA instruments detect actively burning fires, track the transport of smoke from fires, provide information for fire management, and map the extent of changes to ecosystems, based on the extent and severity of burn scars. NASA has a fleet of Earth-observing instruments, many of which contribute to our understanding of fire in the Earth system. Satellites in orbit around the poles provide observations of the entire planet several times per day, whereas satellites in a geostationary orbit provide coarse-resolution imagery of fires, smoke and clouds every five to 15 minutes.

NASA satellites can show the movement of the smoke across the globe as evidenced above, but other instruments found onboard can give scientists, firefighters, health experts, local government, and others information about what is happening on the ground in real-time.



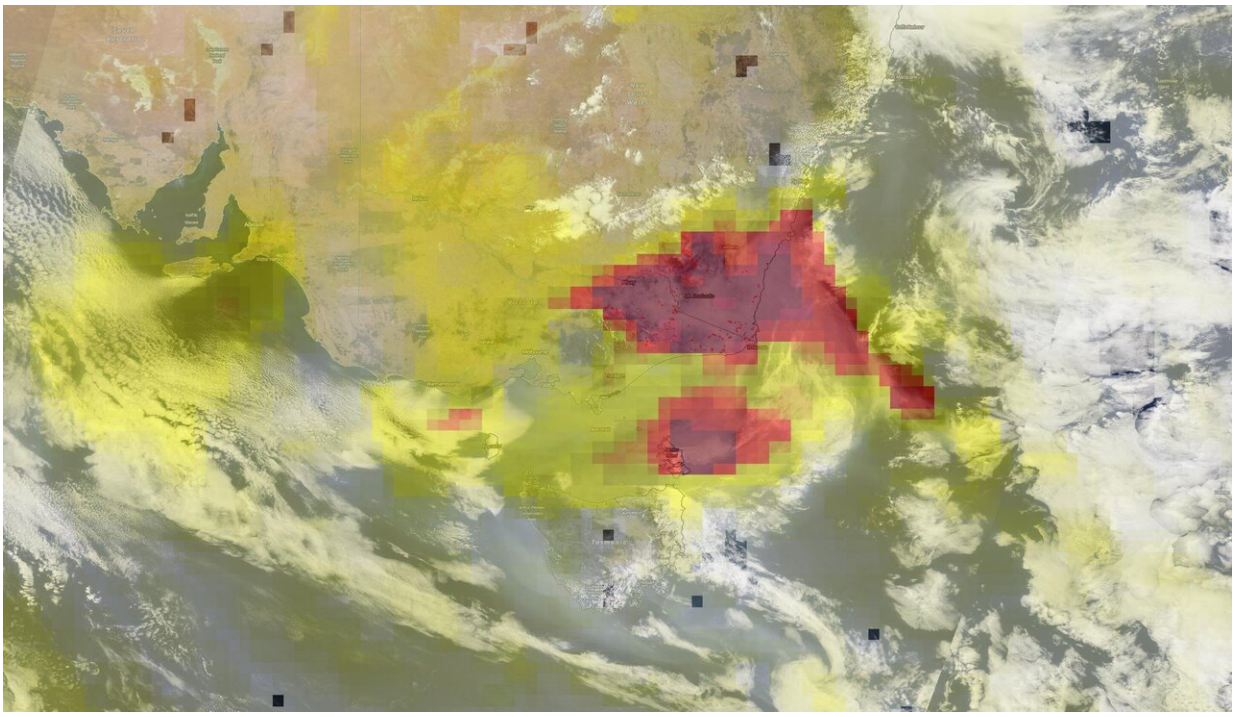
This image was taken on Jan. 13, 2020 by NOAA/NASA's Suomi NPP satellite. The image shows the fires in eastern Australia and using the VIIRS (Visible Infrared Imaging Radiometer Suite) several reflective bands have been introduced into the image to highlight areas that have been burned as well as smoke and clouds coming off the fire affected areas. Burned areas or fire-affected areas are characterized by deposits of charcoal and ash, removal of vegetation and/or the alteration of vegetation structure. Areas unaffected by fire will appear bright green. Clouds comprised of small water droplets scatter light equally in both the visible and will appear white. These clouds are usually lower to the ground and warmer. High and cold clouds are comprised of ice crystals and will appear turquoise. On the left edge of the image, Kangaroo Island can be seen. Credit: NASA's Worldview

So, too, air quality during events such as devastating bushfires is another serious concern to address and NASA satellites are able to help in this area as well.

The OMPS (Ozone Mapper and Profiler Suite of instruments) Aerosol

Index layer on Suomi NPP is able to indicate the presence of ultraviolet (UV)-absorbing particles in the air (aerosols) such as desert dust and, in this case, soot particles in the atmosphere; it is related to both the thickness of the aerosol layer located in the atmosphere and to the height of the layer. The Aerosol Index is a unitless range from =5.00, where 5.0 (dark red) indicates heavy concentrations of aerosols that could reduce visibility or impact human health. The Aerosol Index layer is useful for identifying and tracking the long-range transport of volcanic ash from volcanic eruptions, smoke from wildfires or biomass burning events and dust from desert dust storms, even tracking over clouds and areas of snow and ice.

Aerosols absorb and scatter incoming sunlight, which reduces visibility and increases the optical depth. Aerosols have an effect on human health, weather and the climate. Aerosols are produced from many events including pollution from factories, smoke from fires, dust from dust storms, sea salts, and volcanic ash and smog. Aerosols compromise human health when inhaled by people with asthma or other respiratory illnesses. Aerosols also have an affect on the weather and climate by cooling or warming the earth, helping or preventing clouds from forming. The image below shows a huge area directly above the bushfires that is spewing extreme amounts of aerosols into the atmosphere creating a health hazard not only for residents in the area, but also for those affected when wind patterns carry that smoke on jet streams.



This Suomi NPP image from Jan. 14, 2020 using the OMPS instrument shows heavy concentrations of aerosols over the areas still on fire in eastern Australia. Credit: NASA Worldview

NOAA meteorologists incorporate Suomi NPP data into their weather prediction models to produce forecasts and warnings that help emergency responders anticipate, monitor and react to many types of natural disasters, including the bushfires plaguing Australia currently. Suomi NPP serves as an important link between the current generation of Earth-observing satellites and the next generation of climate and weather satellites. It observes the Earth's surface twice every 24-hour day, once in daylight and once at night. In its orbit Suomi NPP flies 512 miles (824 kilometers) above the surface in a polar orbit, circling the planet about 14 times a day. The satellite sends its data once an orbit to the ground station in Svalbard, Norway and continuously to local direct broadcast users. The data collected by Suomi NPP can help save lives.

?NASA's Earth Observing System Data and Information System (EOSDIS) Worldview application provides the capability to interactively browse over 700 global, full-resolution satellite imagery layers and then download the underlying data. Many of the available imagery layers are updated within three hours of observation, essentially showing the entire Earth as it looks "right now." This satellite image was collected on Actively burning fires, detected by thermal bands, are shown as red points. Image Courtesy: NASA Worldview, Earth Observing System Data and Information System (EOSDIS).

Provided by NASA's Goddard Space Flight Center

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