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Ozone layer viewpoints: from observation to public protection

8th October 2019



The ozone layer is an important part of Earth's atmosphere, and vital for our health as it helps filter out potentially damaging UV radiation coming from the Sun. The Copernicus Atmosphere Monitoring Service (CAMS) provides up-to-date reports on state of the ozone layer. In this article, we will hear from scientists and users of CAMS data to find out how they are using this valuable information:

Antje Inness is a senior scientist at CAMS. She works on satellite observations of reactive gases such as ozone, nitrogen dioxide, and carbon monoxide.

Matt Tully works for the **Bureau of Meteorology** (BOM), Australia's national weather, climate and water agency. BOM uses CAMS ozone data to inform their UV forecast, which is then provided to the public.

Craig Sinclair leads Australia's **Prevention Division** for Cancer Council Victoria; an independent, not-for-profit organisation that plays a leading role in reducing the impact of all cancers on all people. As UV is a major cause of skin cancer, understanding the role of the ozone layer in blocking UV can contribute to protecting the public. CAMS data helps Cancer Council Victoria to do just that.

Antje Inness, CAMS



What impact does the ozone hole have on our lives?

Ozone in Earth's stratosphere protects us from damaging UV radiation. If stratospheric ozone is depleted then more of this radiation can reach the surface – bad news, because it can harm all living things.

What is the current status of the ozone hole?

The evolution of the ozone layer was particularly interesting this year as we experienced a minor **sudden stratospheric warming** over the South Pole in late August. This is an event when temperatures high up in the atmosphere rise rapidly, and is usually related to a lessening of the ozone hole. This means that the 2019 ozone hole is smaller than usual. In 2002, a major stratospheric warming occurred and the polar vortex - a huge expanse of swirling cold air - actually split in two. It will be interesting to see how 2019 progresses. In the longer term, I am hopeful that the ozone layer will eventually recover, over several decades.

I think that the ozone hole should serve as a reminder that humans can do great damage to the planet. It is also a success story because people actually came together, listened to scientists and did something to stop ozone depletion getting worse. It would be great if this could also happen to combat climate change!

How do you use CAMS data to monitor Earth's ozone layer?

We use CAMS data to produce the best possible ozone forecasts. To do this, we run data from satellites through the CAMS data assimilation system. This is a process by which we use a combination of observations and mathematical models to analyse the data.

The ozone data we use come from several instruments on board satellites, such as **TROPOMI**, **OMI**, **GOME-2B**, **SBUV-2**, **OMPS**, and crucially **MLS** – vital because MLS data help us to get a good vertical representation of the ozone hole, meaning we have data for different heights in the atmosphere. This allows us to have a complete picture, including the depth of the ozone hole as well as its horizontal extent.

We use additional 'independent' data (i.e. data that we don't assimilate) to validate our ozone analysis, in effect double-checking our results. For example, we use balloon-borne instruments called ozonesondes that measure ozone as the balloon ascends into the atmosphere. These are launched at several sites around the world, and their data help to corroborate our forecasts.

Why are CAMS data so valuable?

CAMS has provided global ozone forecasts since 2003. These data are important because they're used by policymakers (including from the EU) to help them monitor what is happening to the ozone layer and if it is recovering.

CAMS also runs higher resolution regional air quality models over Europe so that we can look at ozone in the lower atmosphere. At that level ozone is actually a pollutant and dangerous to human health!

Matt Tully, Bureau of Meteorology (BOM)



What is BOM's purpose?

BOM contributes to national social, economic, cultural and environmental goals. We provide observational, meteorological, hydrological and oceanographic services, and undertake research into science and environment related issues.

What is your role within BOM?

I work in the Observing Systems & Operations programme, where part of my role is to manage BOM's ozone networks. At four locations, measurements of the total amount of ozone overhead are made several times a day with a Dobson spectrophotometer. This instrument, which measures ozone by detecting levels of UV radiation penetrating the atmosphere, was designed more than 80 years ago but is still in use in many countries around the world due to its excellent stability over long periods of time. Weekly launches are made of ozonesondes, which Antje mentioned, at three locations. More modern devices for measuring ozone and UV are also operated at some sites, but the Dobsons and ozonesondes provide the longest data records.

These measurements from around Australia, the sub-Antarctic and Antarctica contribute to the global ozone network, which is essential for long-term monitoring of the ozone layer. They also help to validate and calibrate data from satellite instruments used by CAMS.

What benefit do CAMS data bring to BOM?

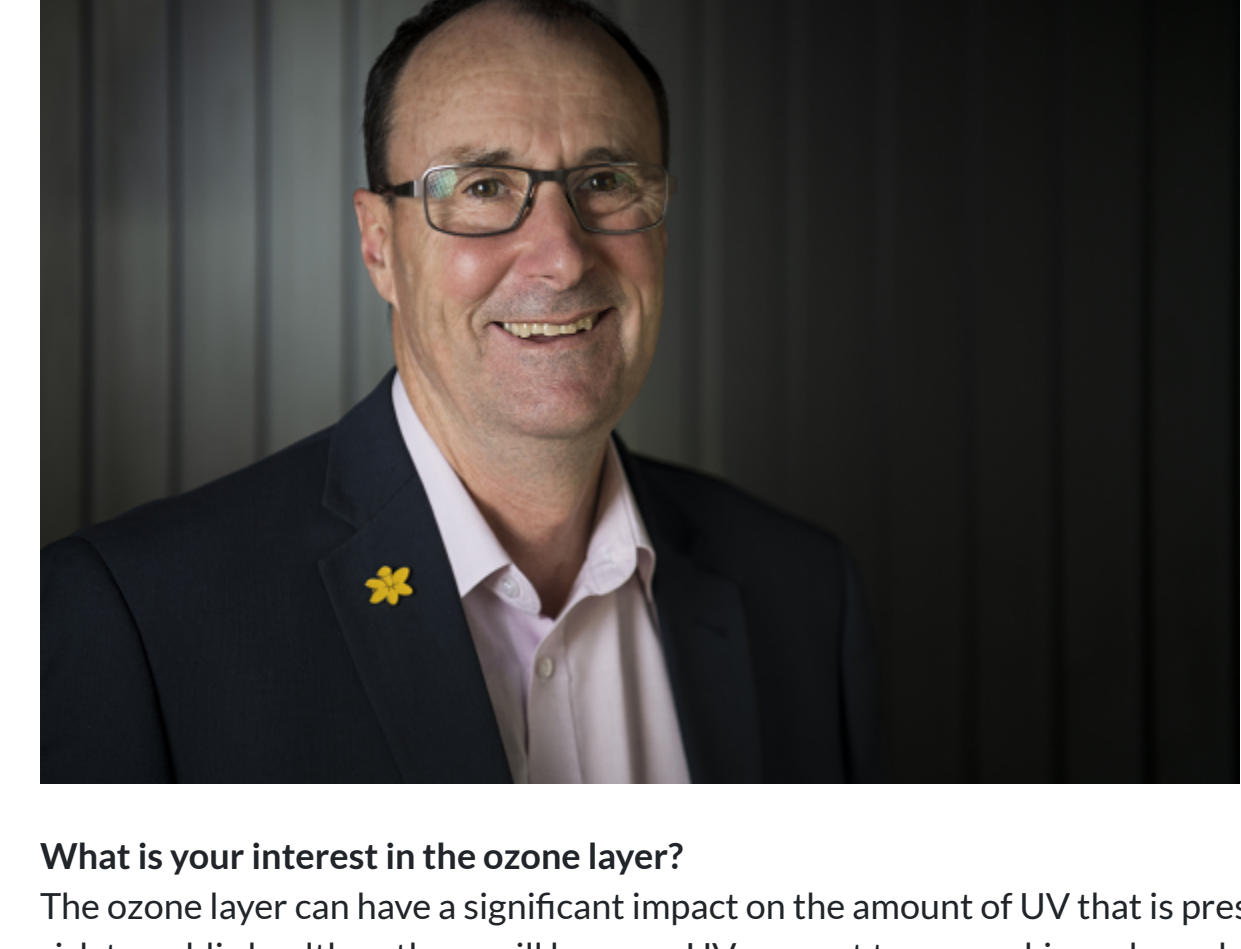
BOM uses CAMS UV data as the basis for its UV forecast and advice to the general public. The maximum UV level and recommended times for sun protection are given in local forecasts, including on the **BOM Weather App**. This information is widely used, for example by schools and child-care centres to ensure children are protected from dangerous exposure to UV.

How would you describe the current health of the ozone layer?

The ozone layer is now improving as a result of the **Montreal Protocol**. We expect it to continue its slow recovery, so long as nations of the world maintain compliance with the treaty. The **2018 WMO/UNEP Scientific Assessment of Ozone Depletion** found that the Antarctic ozone hole has diminished, both in size and depth, since the year 2000. Outside the polar regions, global ozone stopped declining in the 1990s, and from 1997-2016 actually increased a little – but we are not sure if this is because of human actions.

Over the 21st Century, the ozone layer will be increasingly influenced by a changing atmosphere due to emissions of greenhouse gases such as carbon dioxide, methane and nitrous oxide. For a city like Melbourne, where I live, there will still be days of low ozone and correspondingly extremely high UV levels over summer in the coming decades, and so it is crucial that people continue to take appropriate measures to protect themselves.

Craig Sinclair, Cancer Council Victoria



What is your interest in the ozone layer?

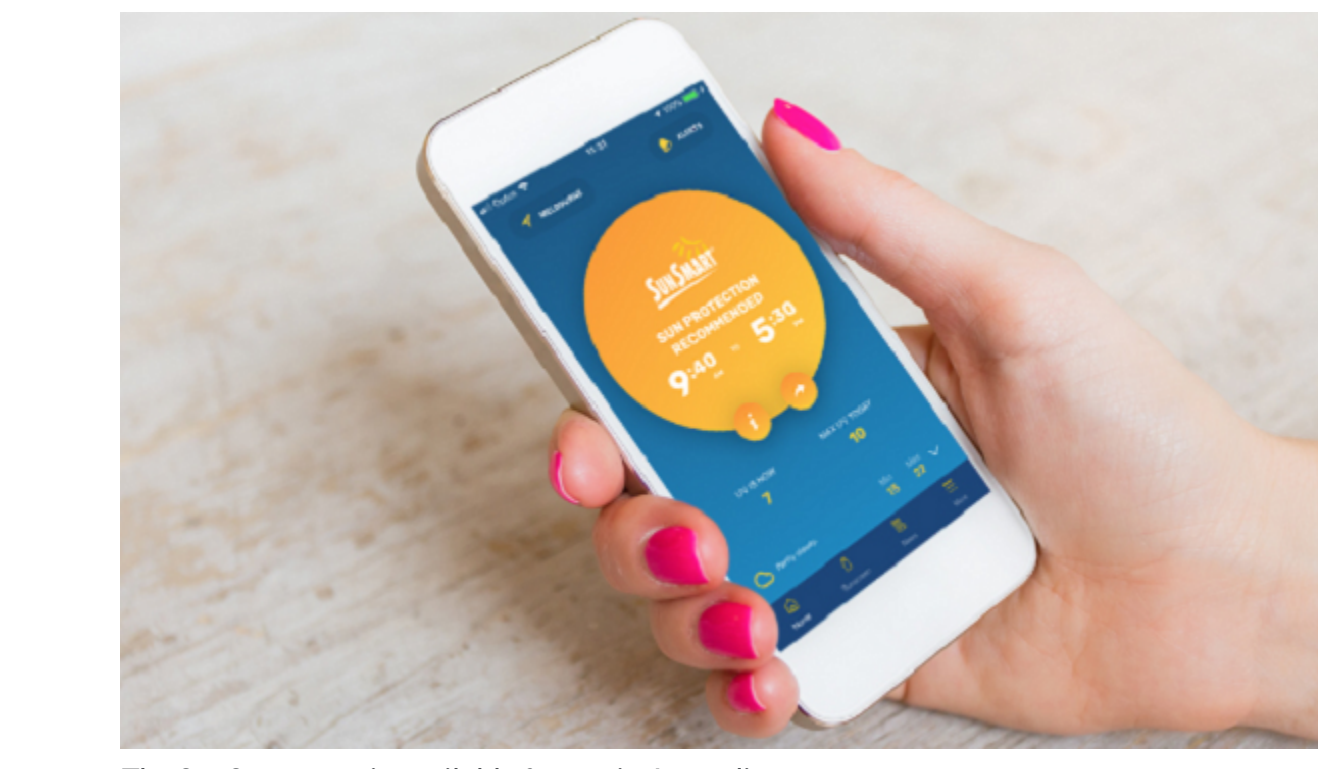
The ozone layer can have a significant impact on the amount of UV that is present at the Earth's surface. If the ozone layer diminishes, there is a much greater risk to public health as there will be more UV present to cause skin and eye damage. I am particularly interested in the ozone layer through my role overseeing the **SunSmart** program, which aims to motivate the behaviour and attitudes of the Victorian population towards sun safe practices, as well as through my engagement at the World Health Organization.

How do you use CAMS data?

We make good use of CAMS data through the **SunSmart Solar UV Phone app**. The app has had over 500,000 downloads! Our primary data source BOM, where Matt works, receives its data from CAMS. Without CAMS data we wouldn't have a reliable and publicly trusted data source for our SunSmart UV app. The CAMS data come from an authoritative and trustworthy source, backed by the EU.

Both yourself and Matt are also co-chairs of the World Meteorological Organization's (WMO) Scientific Advisory Group on Ozone and Solar UV radiation. Can you tell us more about this?

We are there to provide advice to the WMO to guide their priorities and keep them informed of scientific and technical developments. We also review the status of the ozone and UV related aspects of the Global Atmosphere Watch (GAW) network by ensuring there is close collaboration with contributing UV monitoring stations. This means that data are able to be utilised in a way that furthers our understanding of ozone and its relationship with climate. This position, along with my role as Director of the World Health Organization collaborative centre for UV radiation, allows me to further contribute to the protection of public health globally.



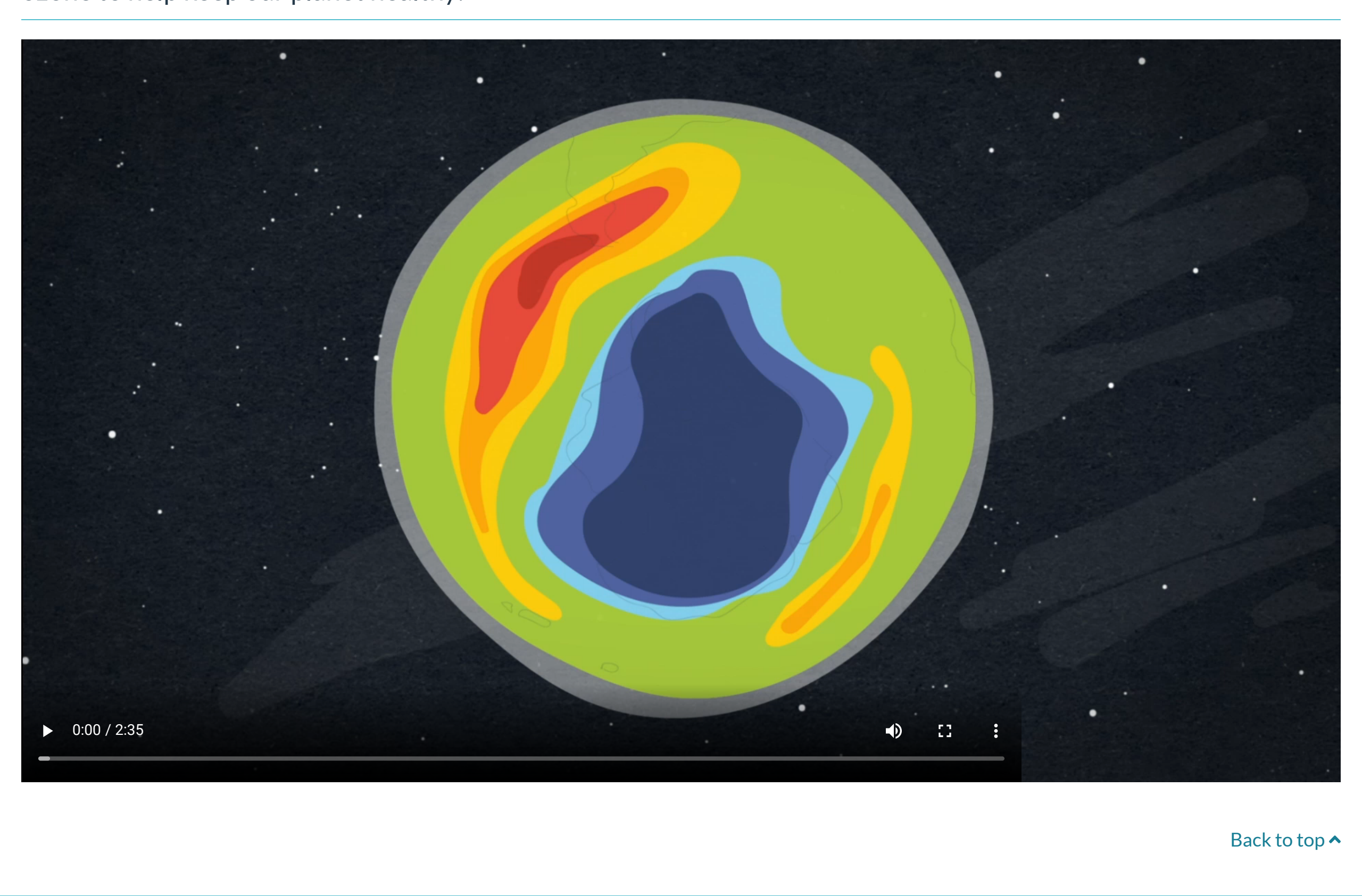
The SunSmart app is available for use in Australia.

Are you working on any new projects involving CAMS data?

At the moment, we are working up a proposal to develop a Global Solar UV App to provide timely and accurate information to the general public on UV to inform their sun protection behaviour, no matter where they live. This will include current UV, maximum UV and times when sun protection is required. I am sure CAMS will be able to assist us with this project as well.

As we have seen, CAMS data on the ozone layer are incredibly useful for many, from scientists working with the data directly, to policymakers and the general public. The ozone layer is a vital part of our atmosphere, and also represents an environmental success story of nations coming together to prevent its depletion. CAMS data help us to see the effect that commitment to the Montreal Protocol continues to have. The viewpoints in this article remind us of this important work and the positive impact we can have by studying and taking care of our atmosphere.

Find out about the role of the ozone layer, the formation of the ozone hole, and how we monitor atmospheric ozone to help keep our planet healthy:



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