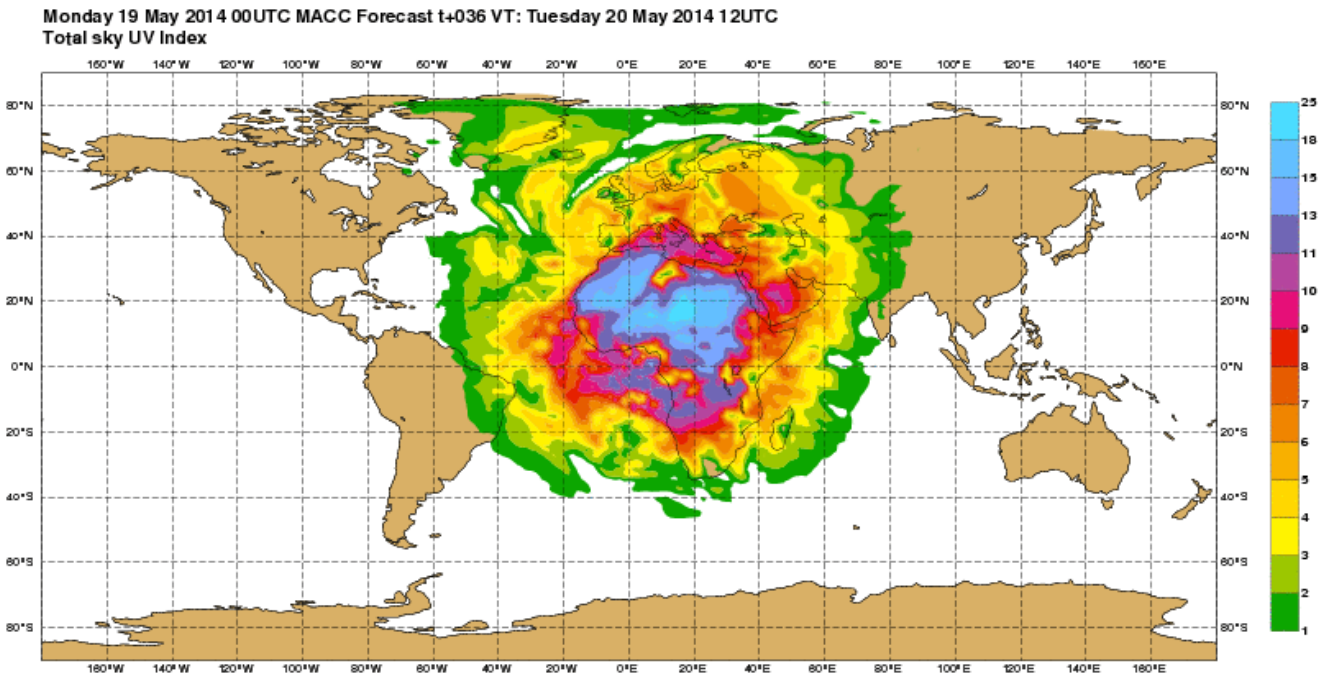
Forecasting sunlight exposure

Applications

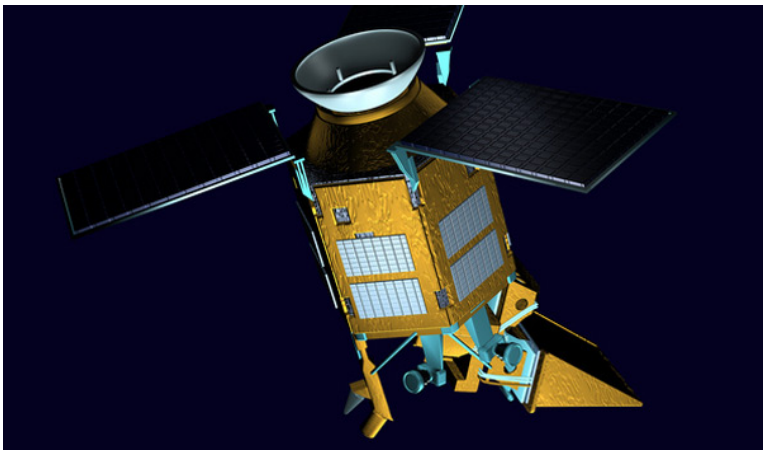
Infromation on solar radiation is useful in various domains: health, agriculture and renewable energies are the first that come to mind, but also urban planning, climate sciences and biology benefit from these data. The global solar exposure is an index which provides information about the amount of solar radiation which reaches the surface of the planet; it can be calculated using hourly visible radiation information from geostationary meteorological satellites (1). Sunlight is a portion of the Sun electromagnetic radiation: it is made up of infrared, visible and ultraviolet light. Radiance values depend mainly on atmospheric conditions: clouds, aerosols, water vapor and ozone are the main factors which affect light absorption and scattering processes (2).

The GMES Project MACC-II offers information about the ultraviolet part of the spectrum which affects human health and about the visible solar spectrum which is a factor for solar energy usage. Main identified users of these data are the solar energy industry, the electricity sector, governments and renewable energy organisations, but also the tourist industry and citizens (2).



Sky UV radiation forecast. This index is an estimate of effective UV solar radiation reaching the Earth's surface that could affect human skin. It takes the effect of ozone, clouds, and aerosol into account. © MACC-II

A very important component of solar radiation is the ultraviolet B, which is a source of vitamin D3 from serum cholesterol for humans, but ultraviolet radiation may be dangerous as well. The ozone layer has a key role in protecting life forms from potentially harmful UV radiation coming from the Sun. Antropogenic emissions (e.g. chlorofluorocarbons, CFCs) reduced the amount of ozone in the stratosphere, especially over the Antarctic, where the ozone hole is located. Effective measures of global ozone concentration are provided by satellite-based atmospheric sensors, especially ultraviolet (UV) and infrared spectrometers. Existing models combine these data with information on clouds and aerosols, estimating and forecasting the amount of UV radiation reaching the surface of the Earth. Remote sensing technologies also help in maintaining and updating the historical records using observations from 1979 until present years. MACC-II provides forecasts of ozone concentrations up to 8 days ahead, and 5-day forecasts of UV radiation which consider ozone, clouds and aerosolo particles.

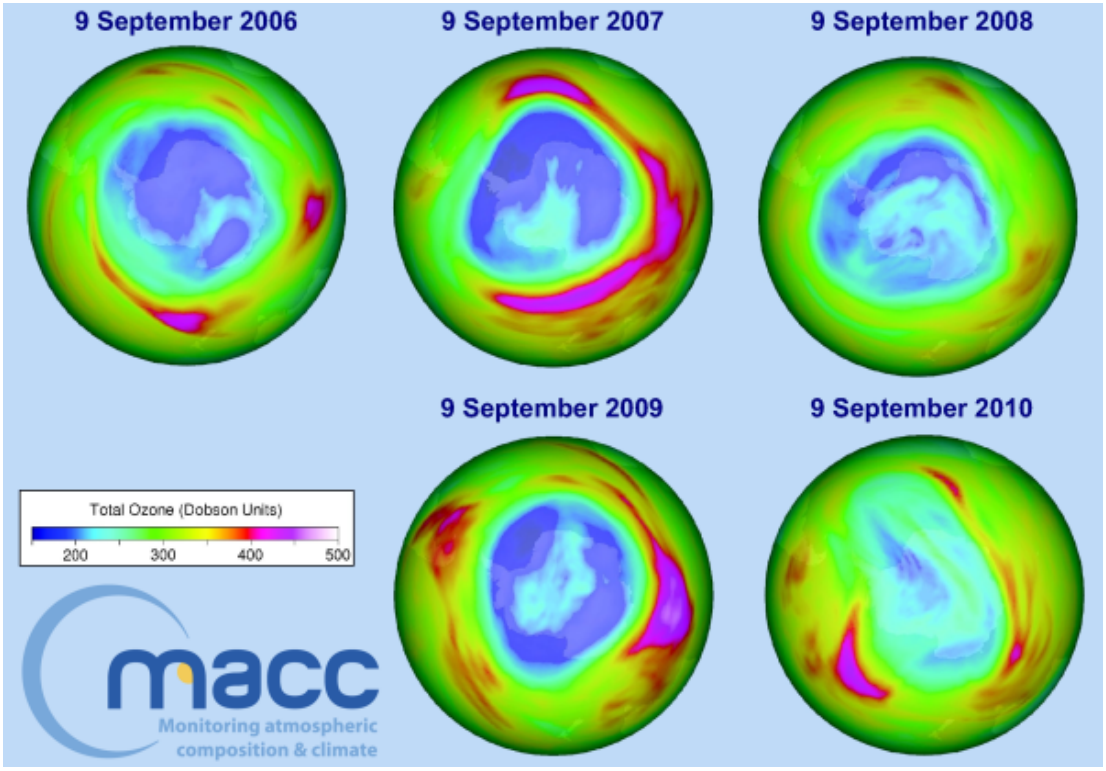


Sentinel-5P. © Astrium-ESA

Copernicus upcoming Sentinel-4, -5 and -5P will provide observations from polar and geostationary orbits, resulting in a continuous operational European capacity and a coherent set of observed variables for atmospheric monitoring. Sentinel-5P is dedicated to monitoring the chemestry of the atmosphere, taking high temporal and spatial resolutions measurements. More cloud-free observations will be available to study tropospheric variability. Measured atmosphere components will be: ozone, nitrogen dioxid, sulfur dioxid, carbon monoxid and aerosols. These data will also support tropospheric and climate monitoring, and the air quality control.

Applications of sunlight and ozone data are for example:

- realtime UV radiation forecasting and risk assessment
- skin health services
- climate change studies
- assessment of ozone protection policies effectivness
- plant growth and disease control
- evaporation and irrigation models
- power generation
- solar heating systems planning and monitoring



Changes in the ozone hole © MACC

References

(1) http://www.bom.gov.au/climate/austmaps/about-solar-maps.shtml

(2) https://www.gmes-atmosphere.eu/services/sr/

Products

Products	Ext. Source	Descriptions	Product Standards	Ref. Project

Success Stories

References

Topic	Description	Keywords	Reference