Protecting our planet's ozone layer

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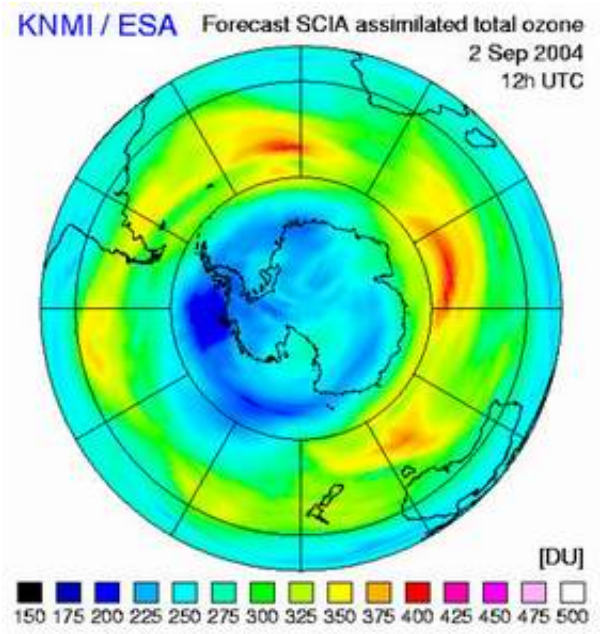

Monitoring our planet's atmosphere has become an international priority. As successive world summits have stressed, our future on Earth could depend on safeguarding our environment. EuroNews 'Space' magazine reports from the Royal Netherlands Meteorological Institute (KNMI) which is using instruments on several satellites **to follow the evolution of ozone around the** planet.

Image: A forecast of September 2004's emerging ozone hole, as seen by ESA's Envisat environmental satellite. Ozone forecasting is available based

on near-real time observations from the Envisat instrument Scanning Imaging Absorption Spectrometer for Atmospheric Cartography (SCIAMACHY), which are inputted into a data assimilation program which provides near-real time ozone fields for today and a forecast for the coming days. The forecast is available through a project called Tropospheric Emission Monitoring Internet Service (TEMIS). The image represents ozone thickness in Dobson Units (DUs), which stands for the total thickness of ozone in a given vertical column if it were concentrated into a single slab at standard temperature and atmospheric pressure – 400 DUs is equivalent to a thickness of four millimetres, for example. Credits: ESA/KNMI

The gas comes in two flavours. On the one hand, at an altitude of 20-30 kilometres, natural ozone provides a protective layer, absorbing the Sun's harmful ultra-violet radiation. This 'good' ozone protects us from sunburn, skin cancer and eye problems.

On the other hand, under the influence of sunlight, nitrogen oxides and hydrocarbons create toxic ozone on Earth's surface. This 'bad' ozone, part of air pollution or smog, may pose a particular health threat to those who already suffer from respiratory problems such as asthma, emphysema and chronic bronchitis.

ESA's Earth observation satellite Envisat is one of the satellites sending back data to scientists at KNMI in Utrecht. One of its instruments called Sciamachy (Scanning Imaging Absorption Spectrometer for Atmospheric Chartography) monitors ozone and other trace gases on a regular and global basis.

"The data from this instrument allows us to calculate the amounts of ozone from day to day," explains Dr Henke Eskes, atmospheric scientist at KNMI. "The coverage maps we obtain show the great variability of the ozone layer and we can precisely track the evolution of the ozone

hole above the South Pole."

Another European satellite ERS-2 carries a similar instrument called GOME. The United States also has a long experience in ozone monitoring with the TOMS (Total Ozone Mapping Spectrometer) instruments, and with its NOAA Earth observation satellites.

Since last summer NASA has its AURA mission, dedicated to the study of the Earth's ozone, air quality and climate. The KNMI has the scientific lead of the Dutch-Finnish Ozone Monitoring Instrument (OMI) on AURA.

"OMI works by looking down at the Earth and measuring how much sunlight is reflected by the planet," says Pieternel Levelt, OMI's Principal investigator. "This provides indications of how much is being absorbed by atmospheric ozone."

The 'good' ozone is under attack from man-produced species containing chlorine and bromine. Amongst these are the famous CFCs, Chlorofluorocarbons, which were used for instance in refrigerators, spray cans and foams. These CFCs greatly contributed to eating away the natural ozone.

Efforts to safeguard our environment and the ozone layer appear to be fruitful. Banning of CFCs by the 1987 UN protocol seems to have stabilised the ozone hole. But the road ahead is still long: KNMI experts expect that pre-1980 average conditions of the 'good' ozone will only be recovered around 2050. The 'bad' ozone is a point of concern: studies predict that the rapid development of mega-cities and related increases in traffic will worsen the situation, increasing surface ozone.

Source: ESA