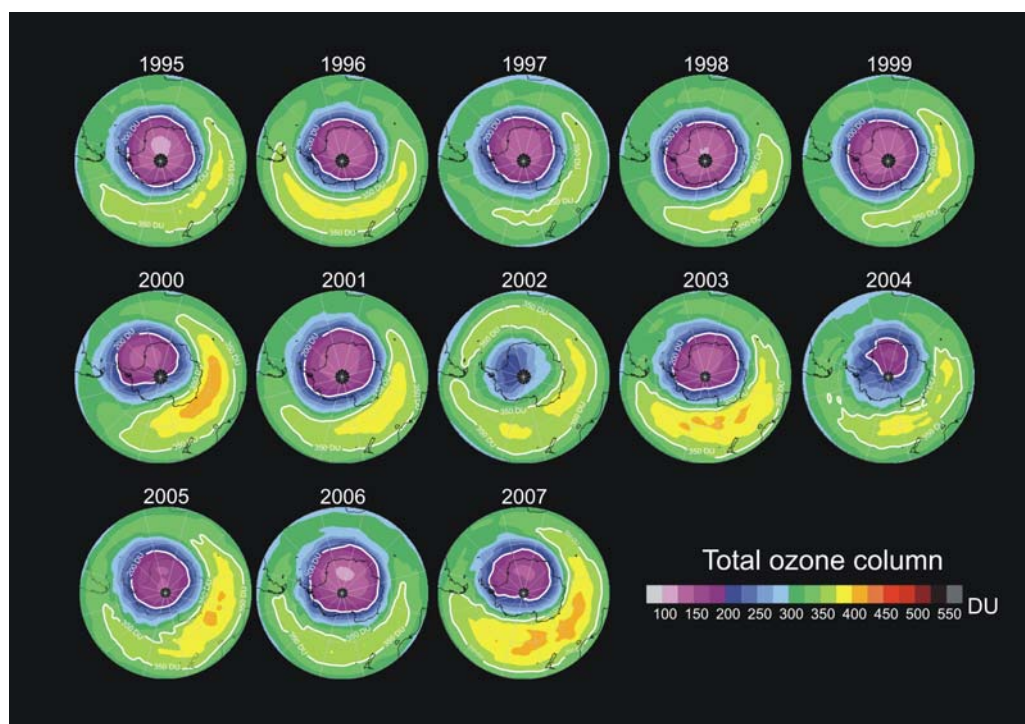


Monitoring of the ozone layer with SCIAMACHY

The stratospheric ozone layer protects life on Earth from the harmful UV radiation of the Sun. Manmade chemicals containing chlorine and bromine, especially chlorofluorocarbons (CFCs), are transported to the stratosphere. Their decomposition results in the depletion of the ozone layer. The discovery of the Antarctic ozone hole and of long-term ozone depletion at middle latitudes (e. g. over Europe) in the 1980's have not only led to a ban on the use of CFCs and related compounds (Montreal Protocol), but also stimulated research and monitoring of the ozone layer by satellites. Europe started satellite monitoring of the ozone layer with the Global Ozone Monitoring Experiment (GOME), a spin-off of SCIAMACHY. GOME provided global observations from 1995 until 2003. SCIAMACHY started its observations of the ozone layer in 2002 and continues until today.

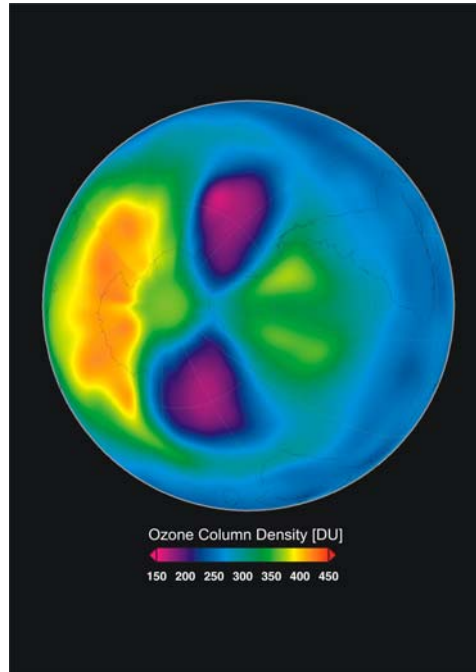
The observations of the ozone layer, other chemical compounds, and polar stratospheric clouds (PSCs) in the stratosphere by SCIAMACHY have contributed significantly to our understanding of the ozone hole and its dependence on the circulation of the stratosphere (meteorology) and chemical composition. A few highlights of ozone research using SCIAMACHY data in the period 2002–2007 are described hereafter.



Ozone hole is stabilizing but not yet on the decline

The contiguous time series of GOME and SCIAMACHY observations show that the size and depth of the Antarctic ozone hole is varying from year to year. This variation depends on the meteorological conditions of the winter stratosphere. There are indications that the ozone layer decline at mid latitudes – due to chemical destruction – has stopped in response to the Montreal Protocol. A recovery of global ozone levels to values before the ozone hole era (around 1980) will not occur before the middle of this century, the exact timing depends on the response of ozone to future climate change. Continuation of routine satellite observations in coming decades is mandatory for monitoring ozone in a changing climate.

The ozone hole in 2002, the first year of SCIAMACHY, was unique since the ozone hole broke up into two smaller holes due to an unusual meteorology over the Antarctic continent. The ozone hole of 2006 was extremely large. The ozone hole of 2007 again was average-size. A measurable decrease in the average size and depth of the Antarctic ozone hole is not expected before the next decade.



Causes of ozone destruction are being observed by SCIAMACHY

The relative contribution of dynamical (meteorological) and chemical processes to the observed ozone variability strongly depends on altitude. In addition to the total column data on ozone and related species already measured by GOME, SCIAMACHY also measures the vertical distribution of ozone in the stratosphere (so-called profile) using its special limb view mode. The profile data shows where the ozone depletion takes place. The SCIAMACHY limb profiles of polar stratospheric clouds and of the free radicals bromine oxide (BrO), chlorine dioxide (OCIO), and nitrogen dioxide (NO₂), verify our understanding of ozone chemistry.

UV radiation forecasts based on SCIAMACHY data useful for public health

Since skin cancer rate is increasing in Western Europe, direct warnings to the public, using satellite measurements, are an important element to create awareness for the risks of sunbathing. From SCIAMACHY's ozone measurements, forecasts of ultraviolet radiation at the surface are being made to inform the public.

Montreal protocol is successful in protecting ozone layer and climate

As a result of the Vienna Convention on Ozone Depleting Substances and the Montreal protocol, CFCs and related compounds have been phased out. The success of the treaty, which has been now ratified by 190 states, proves that measures taken at international level do have an effect. Since CFCs are minor greenhouse gases, the Montreal Protocol also helps protecting our climate against additional warming.

SCIAMACHY constitutes a joint contribution from Germany, the Netherlands and Belgium.