# Milestone anniversary for the "Climate watcher in Space": 10 years of SCIAMACHY on ENVISAT

**Scientific lead at the Institute of Environmental Physics**

It is now ten years since the ENVISAT European environment satellite was launched into orbit around the Earth. Among the equipment on board is the "Scanning Imaging Absorption Spectrometer for Atmospheric Chartography" – SCIAMACHY for short. It is continually mapping the ozone layer and the development of the ozone hole. Over the past decade, it has delivered reliable and important data which help scientists to better understand phenomena like the hole in the ozone layer. Moreover, SCIAMACHY provides data on the efficiency of environmental protection measures and the increased threat to the environment in the wake of economic growth. Lead scientist of the SCIAMACHY mission is Professor John P. Burrows of the Institute of Environmental Physics at the University of Bremen. Working in cooperation with the German Aerospace Center Dort (DLR) in Oberpfaffenhofen, this is where the data are systematically evaluated and interpreted – data that have considerably influenced our worldview in the past decade.

The ENVISAT European environmental satellite is the largest Earth observation satellite ever built. It was launched into space on 28th February 2002 from the European space port in Kourou, French Guiana, with one of the first Ariane-5 rockets. The SCIAMACHY spectrometer, funded almost 50% by the DLR, went into operation. It continually monitors the ozone layer and the development of the ozone hole, adding to the measurements carried out by its predecessor sensor, GOME, launched in 1966 on the satellite ERS-2. With some pretty surprising results: for instance, in two winters – 1996/1997 and 2010/2011 – an ozone hole was observed over the North Pole. Until that time, scientists knew only about the ozone hole over the South Pole. Among other things, this discovery led to the worldwide ban on ozone depleting chemical substances.

**Improved environmental protection in Europe**

SCIAMACHY not only observes changes in the ozone layer but is also capable of detecting air pollutants like nitrogen dioxide, which is formed in combustion processes especially by power stations and road vehicles. Hence, over the past 15 years, the data gathered in space has brought about environmental measures that have contributed towards improving the air quality in large parts of Europe. On the other hand, though, countries with fast-growing economies – especially China – have been shown to emit considerably increased amounts of nitrogen dioxide.

**Sources and sinks of greenhouse gases**

With SCIAMACHY, it was possible to chart the worldwide distribution of major greenhouse gases such as carbon dioxide ($CO_2$) and methane from space for the first time. This helps us to gain a better understanding of the natural and 'manmade' sources and sinks of these greenhouse gases. Systematic observations with SCIAMACHY have contributed to improving the determination and detection of methane in wetlands and to a better understanding of the carbon budget of boreal forests, thereby helping to find answers to major questions concerning climate change and developing effective corrective measures.

SCIAMACHY and ENVISAT are expected to be operational until 2014, at the least. However, the fuel supply will inevitably run short, sooner or later. The European Space Agency, in cooperation with the European Union and the weather satellite operator EUMETSAT, is currently planning the so-called 'Sentinel Missions', which are to take place after SCIAMACHY. Almost all running data series shall be

continued in these satellite missions, with one major exemption: it is no longer possible to monitor and chart carbon dioxide, the most important manmade greenhouse gas. For this reason, a team of international scientists headed by the Institute of Environmental Physics, University of Bremen, has submitted a proposal to ESA suggesting CarbonSat as a satellite mission specializing on $CO_2$ and methane. Should the proposal be approved, CarbonSat could probably be launched in 2019. Will SCIAMACHY on ENVISAT remain operational until then? Only time can tell.

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