Geophysical Research Abstracts
Vol. 18, EGU2016-1528, 2016
EGU General Assembly 2016

Observing the Impact of the Anthropocene from Space: the Evolution of Atmospheric Observation

John P. Burrows
Institute of Environmental Physics/Remote Sensing, University of Bremen, P.O, Box 330440, 28334 Bremen, Germany

From the Neolithic revolution to the industrial revolution over $\sim$ 10 000 years, the earth's population rose from several millions to 1 Billion powered by energy from a mixture of biofuels, water and solar power and a limited amount of the combustion of coal. The industrial revolution began in the UK in the late 18th century, and has been fuelled by the combustion of fossil fuels, initially coal but then oil and gas. This has led to a dramatic rise in both the human population, now comprising over 7 Billion with more than 50% living in urban areas, and its standard of living. The expectation is that by 2050 population will be of the order of 10 Billion with 75% dwelling in urban areas. Anthropogenic activity has resulted in pollution from the local to the global scale, changes in land use, the destruction of stratospheric ozone, the modification of biogeochemical cycling, the destruction of species, ecosystems and ecosystem services and climate change. The earth has entered a new geological epoch the anthropocene. The observation of atmospheric composition provides a unique early warning of the natural and anthropogenic origins of change. Consistent and consolidated measurements from the local to the global scale are required to test our knowledge of the biogeochemical cycles, which determine atmospheric composition, and to assess and attribute accurately their modification by anthropogenic activity.
To achieve global measurements of atmospheric constituents (trace gases, aerosol and cloud parameters) the SCIAMACHY (SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY), Project was initiated in the early 1980s. This was the first passive remote sensing space based instrumentation, designed to make simultaneous contiguous measurements of the solar upwelling radiation at the top of the atmosphere from the ultraviolet to the shortwave infrared. The SCIAMACHY project resulted in measurements of the instruments GOME, originally called SCIA-mini, on ESA ERS-2 (1995 to 2011), SCIAMACHY on ESA Envisat (2002 to 2012), GOME-2 on ESA/EUMETSAT Metop series (2006 to 2020) as well as the planned EU Copernicus/ ESA /EUMETSAT Sentinel 4, originally called GeoSCIA, which will be the first geostationary instrument of its kind flying on Meteosat Third Generation Sounder from 2019 to 2015 to 2034 and the Sentinel 5, which is the follow on to GOME-2 and will fly on Metop Second Generation from 2020 to 2035. In addition new missions, such as the proposal CarbonSat/ CarbonSat constellation are required
SCIAMACHY has provided unique information about the composition of the lower thermosphere, the mesosphere and the stratosphere using limb and occultation measurements. The nadir measurements by GOME/SCIAMACHY/GOME-2 have been successfully used to retrieve information about trace tropospheric constituents, aerosol and clouds parameters, ocean colour and sun induced fluorescence. This presentation will address key issues related to our understanding of the changes of atmospheric composition and the evolution of observations from space based and some aircraft platforms.