

Atmospheric Measurements from Space Related to Climate Change and Air Quality

Pieter Levelt^{C, S}

*Royal Netherlands Meteorological Institute (KNMI), Technical University Eindhoven (TUE),
De Bilt, The Netherlands*

The growth of human population and the industrialisation in the 19th and 20th century has led to dramatic changes in the Earth System. The chemical composition of the lowest part of the atmosphere, the so-called troposphere, is changing as a result of human activities. As a result the Earth has entered the “anthropogenic” epoch, where the activities of humans play a key role in the further development of air quality and climate change. The rapid development of megacities and the strong development in the Asian countries are clear examples of the rapid changes that effected the atmosphere in the last decades and will continue to do so in future. For understanding climate change and air quality, global atmospheric changes need to be taken into account. Especially the global inventory of emission sources play a key role in understanding and modelling the troposphere in relation to climate change and air pollution. Also regional and long-range transport of pollution, as well as the rapid development of pollution levels during the day, are important for understanding air quality and climate change and their interaction. The atmosphere therefore needs to be studied and monitored with an integrated observing system, in which satellites play a key role due to the global nature of their measurements. Atmospheric measurements from space started in the 60's with US sensors SBUV and TOMS, focussing on the ozone layer residing in the higher layers in the atmosphere. Sensing the lower atmospheric layers from space is a recent development in satellite remote sensing, where European instruments SCIAMACHY (on board ESA's ENVISAT) and OMI (on board NASA's EOS-Aura) play a leading role. New unprecedented measurements from space from OMI reveal tropospheric pollution maps on a daily basis with urban scale resolution. In this lecture an overview will be given of atmospheric satellite measurements from space and their role in climate change and air pollution. Also challenges and future developments for tropospheric measurements from space will be discussed, including a new Dutch initiative satellite instrument (TROPOMI) for detection of the tropospheric composition to be launched on an ESA satellite in 2014.