

Abstract

The polar-orbiting environmental satellite ENVISAT (ENVISAT = **ENV**ironmental **SAT**ellite), which has been launched in the night of February 28 to March 1, 2002 in Kourou (French Guayana) on board of an Ariane 5, carries ten instruments on board. These instruments observe land surfaces, oceans, polar ice caps and the atmosphere, in order to examine anthropogene environmental influences on the earth system. ENVISAT is the largest satellite, developed by ESA (**E**uropean **S**pace **A**gency) up to now. Three of these ten instruments are remote sensing instruments for atmospheric chemistry: MIPAS (**M**ichelson **I**nterferometer for **P**assive **A**tmospheric **S**ounding), SCIAMACHY (**S**canning **I**maging **A**bsorption **S**pectro**M**eter for **A**tmospheric **C**hartograph**Y**) and GOMOS (**G**lobal **O**zone **M**onitoring by **O**ccultation of **S**tars), which use different measurement techniques and geometry and which provide information about the content of different atmospheric trace gases.

The subject of this thesis is the validation of these ENVISAT data by groundbased FTIR measurements (FTIR = **F**ourier **T**ransform **I**nfra **R**ed). The Institute for Meteorology and Climate Research (IMK) operates two groundbased Fourier spectrometers in international cooperation with the Institutet för Rymdfysik (IRF) in Sweden and the University of Nagoya (Japan) in Kiruna (north Sweden) since 1996 and together with the Instituto Nacional de Meteorología (INM) in Izaña (Tenerife Island) since 1999. From these measurements profiles and column amounts of O₃, HCl, HF, HNO₃, ClONO₂, N₂O, CH₄, NO₂, CO, NO and ClO are derived.

Both stations in Kiruna and Izaña are part of the NDSC (**N**etwork for the **D**etection of **S**tratospheric **C**hange). As part of this network continuous ground-based measurements are performed, and are not limited by campaigns, as for example by balloonborne or airborne measurements. Therefore the ground-based measurements are particularly suitable for the long-term validation of satellite data.

With the MIPAS-ESA measurements the vertical profiles and column amounts of O₃, HNO₃, CH₄ and N₂O were compared, with the SCIAMACHY measurements the column amounts of O₃ and NO₂.

The results indicate that both the O₃- and the HNO₃-measurements of MIPAS-ESA are within the expectations. Thus the middle deviations of the column amounts are around ± 5 %, those of the vertical profiles around ± 10 %. The differences for the tropospheric gases CH₄ and N₂O are as expected very large.

For SCIAMACHY the middle deviations of O₃ are around ± 20 %, for NO₂ from +20 % to -40 %. The variability of the total column amounts are unrealistically large in comparison to atmospheric variability.

In addition to the products, which were generated by the ESA processor, there are scientific evaluations for MIPAS and SCIAMACHY. These are included into this work. The results of MIPAS from a processor, which was developed at the IMK and is operated there, shows that the concistence of these data with the ground-based measurements is still better than from the ESA processor. Particularly in heights up to about 25 km the differences for the ground-based measurements are within the 1σ -noise-error. But also above these 25 km the deviations are smaller than those of the ESA processor.