Low troposphere monitoring with TRAQ Mission

T. Phulpin, B. Beghin and P. Hebert
Centre National d’Etudes Spatiales (CNES), C. Camy-Peyret (LPMAA), C. Clerbaux (SA), J. Hadji-Lazaro (SA), P.-F. Coheur (ULB), J.-F. Leon (LOA), L. Lavanan (CMS), P. Levell (KNNI)

Air Quality Monitoring from space

- With cross-dispersion techniques, being able to detect the NO₂ and SO₂ aerosol and retrievals from UV-VIS sensors, but there is still some disagreement between products. The NO₂ retrievals are good in the stratosphere but not very satisfactory in the troposphere. Several promising products have been obtained with TES, CO is not retrieved with good precision by MODITT. First encouraging results for CO and O₃ are not yet presented by SCIAMACHY. Simulations indicate promising results for CO and O₃.
- Simulations indicate promising results from IASI. However, trace gas retrieval are far from being operational.
- Studies to define proper tropospheric missions are slow to converge. There are noticeable differences between the requirements of CAPACITY, IPCC and EUMETSAT.

TRAQ Mission objectives and Requirements

- TRAQ is a scientific mission devoted to:
  - Mapping of emission sources
  - Transport
  - Climate and air quality
- It is also:
  - A gap-filler after Envisat, EOS, ...
  - A GMES preparatory mission
  - A demonstration mission.

TRAQ PAYLOAD

- PARASOL:
  - Mini-satellite in the Polar orbit:
  - On the clouds and other parameters

PARASOL is a micro-satellite in the A-Train. The instrument is the follow-on of POLDER or ADEOS1 and 2. Its main characteristics are:

- The main results of Parasol are:
  - On the aerosols
  - On the clouds and other parameters
- The combination of these various instruments on the same payload has been studied by CNES. Attention was paid to minimize the total weight and power in order to be compatible with a mini-satellite platform.

OCAPI

OCAPI is a multi-channel imaging radiometer polarimeter. It inherits from POLDER/Parasol but with higher spatial resolution and MODIS (SWIR channels)

SIFTI

SIFTI stands alone

The SIFTI stand-alone Mini-satellite (SIFTI) is a new generation infrared instrument designed to monitor air quality in the troposphere.

TROPOMI

TROPOMI is the UV-VIS sensor proposed by KNMI. With the future mission and its performances described in another paper by Level et al., it is a perfect complementary instrument to SIFTI and OCAPI.

CLIM

The CLIM is a mini-satellite platform whose objective is to monitor air quality in the low troposphere. The CLIM is designed by CNES and mastered by CNES. The CLIM is a mini-satellite platform whose objective is to monitor air quality in the low troposphere. The CLIM is designed by CNES and mastered by CNES.

Simulations of performances:

The simulations of performances of SIFTI stand alone and TROPOMI stand alone were developed in 2006.

CONCLUSIONS

To get profiles of polluting species and especially low tropospheric contents, thermal infrared spectrometers are deemed necessary along with UV-VIS sensors. Shortwave infrared is also useful to get CO in the boundary layer. Multidirectional polarimetry is the only spaceborne technique available to detect aerosol micro-particles and should be included in a payload devoted to Air Quality monitoring.

TRAQ is a mission offering the opportunity of improving our knowledge on Air Quality but also allowing to define the characteristics of a future operational mission within the GMES framework.