The

Atmospheric Chemistry Experiment (ACE)

is a Canadian satellite project of the University of Waterloo's Chemistry Department and is part of the

Space Science Program
of the
Canadian Space Agency

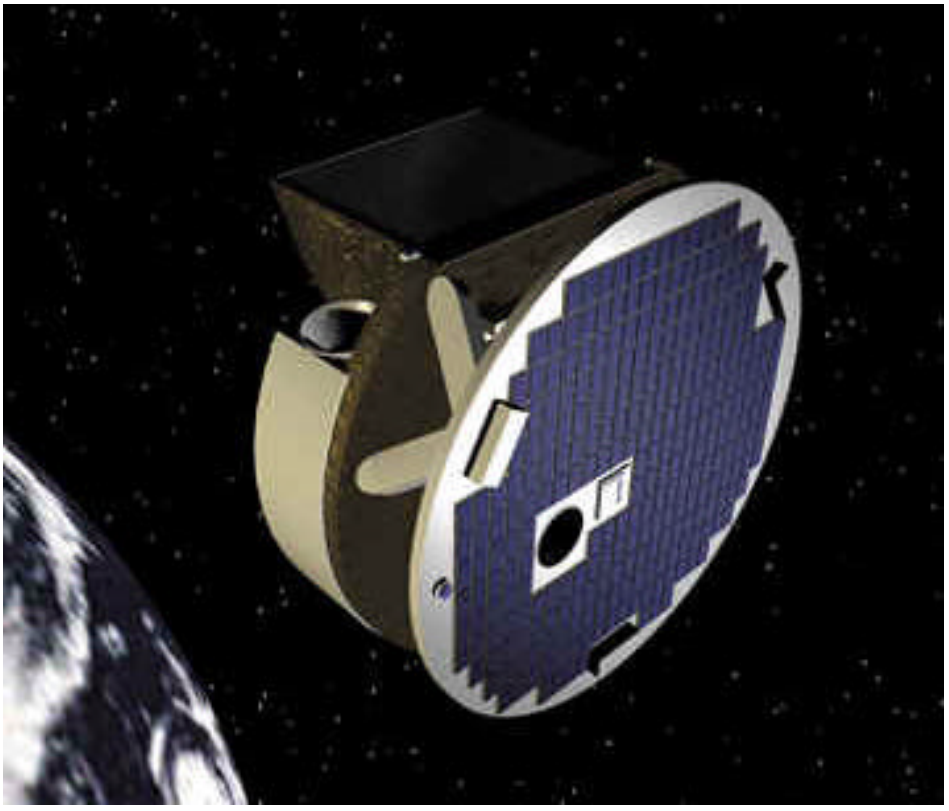
The ACE instrumentation will be launched in 2002 aboard the CSA's

SCISAT-1
spacecraft

The objective of the ACE mission is to improve our understanding of the chemical processes involved in the depletion of the ozone layer

What is ACE?

- ACE is an experiment that will examine the spectra of molecules in the upper atmosphere.
- The ACE experiment will be carried into space by a NASA Pegasus rocket.
- ACE will then orbit the earth taking measurements of the atmosphere for the remainder of its life (two or more years).
- The ACE instrument is composed of:
  - an infrared Fourier Transform Spectrometer
  - an ultraviolet/visible grating spectrometer
  - a sun tracking device
  - a 2-channel visible/near IR imager



ACE PARTNERS

Canada

University of Waterloo

ACE Mission Scientist :

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Dalhousie University

Université de Laval

University of Saskatchewan

University of Toronto

Trent University

University of Western Ontario

York University

BOMEM

TELEOPS

MSC, Dorval

MSC, Toronto

CSA

USA

Harvard-Smithsonian Inst.

NASA, Goddard

NASA, Langley

University of Denver

ITT

ACE PARTNERS

France

LPMA/SA (CNRS)

Sweden

Env. Res. Inst

Japan

Nagoya University

Belgium

THE BELGIAN TEAM

The Belgian ACE team will be composed of scientists from three laboratories:

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ACE SCIENCE GOALS

Priority 1

- **Measurement of regional polar O_3 budget to determine the extent of O_3 loss. This will require measurements of O_3, tracers (CH_4 and N_2O), and meteorological variables (pressure and temperature).**
- **Details of O_3 budget by detailed species measurements (for O_3, H_2O, NO, NO_2, N_2O_5, HNO_3, HNO_4, HCl, $ClNO_3$, ClO) and modelling.**
- **Measurement of composition, size and density of aerosols and PSCs in the visible, near IR and mid IR.**
- **Comparison of measurements in the Arctic and Antarctic with models to provide insight into the differences, with emphasis on the chlorine budget and denitrification.**

Priority 2

- **Mid-latitude O_3 budget.**
- **Measurement of Arctic vortex descent.**

Priority 3

- **Measurement of winds.**
- **Study of upper tropospheric chemistry.**
- **Monitoring of CFCs, CFC substitutes and greenhouse gases.**

SCIENTIFIC CONTRIBUTIONS OF THE ACE BELGIAN TEAM

FTIR data analysis

UV-visible data analysis

Aerosol studies

Data assimilation and modelling

Validations

Supporting laboratory measurements

FTIR data analysis

- Long experience in infrared solar absorption spectroscopy

  from the ground: at the International Scientific Station of the Jungfraujoch (ISSJ)

  from space: ATMOS on board ATLAS-1, -2 and –3
  Grille spectrometer SPACELAB-1 and ATLAS-1

  - ISSJ is part of the primary alpine stations of the NDSC (Network for the Detection of Stratospheric Change)

- Will exploit the experience gained from the ENVISAT studies for the benefit of ACE.

- Is involved in the EUMETSAT-IASI satellite project

Scientists involved:
Ir. B. Barret,Dr. C. Clerbaux, Dr. P.-F. Coheur, Dr. M. De Mazière, Dr. D. Fonteyn, Dr. F. Hendrick, Dr F. Mélen, Dr. C. Servais, Dr. M. Van Roozendael, Dr R. Zander

UV-visible data analysis

- 10 year experience of the members of the Belgian team in DOAS retrieval of minor atmospheric constituents:

  from ground-based grating spectrometers

  - ISSJ, OHP, Harestua

  from mobile high resolution UV-visible Fourier-transform spectrometers used in various European campaigns.

  from the satellite data analysis of ESA/GOME.

Scientists involved:

Ir. B. Barret, Dr. M. Carleer, Dr. M. De Mazière, Dr. D. Fonteyn, Dr. F. Hendrick, Dr. C. Hermans, Ir. J-C. Lambert, Dr .Ing. A-C. Vandaele, Dr. M. Van Roozendael

Aerosol studies

- large experience in the retrieval of stratospheric aerosols(ORA)
    - IASB is an Expert Support Laboratory for the future GOMOS mission on board ENVISAT.

Scientists involved:
Dr. C. Bingen, Dr. M. De Mazière, Dr. G. Franssens, Dr. D. Fussen

Data assimilation and modelling

- has developed a global Eulerian chemical variational assimilation system of the stratosphere
(with advanced chemical scheme, detailed treatment of heterogeneous processes on aerosols and polar stratospheric cloud particles).

- has particular experience concerning the study of Cl_y, F_y and NO_2 budgets based on IR data.

Scientists involved:
Dr. C. Clerbaux, Dr. M. De Mazière, Dr. D. Fonteyn, Dr. D. Fussen, Dr. F. Hendrick

Validations

- exploits three UV-visible DOAS spectrometers at NDSC stations in Europe (Harestua, ISSJ, OHP)
- operates two FTIR instruments at ISSJ
- has acquired experience in the corresponding data analysis and interpretation.
- disposes of two portable Bruker FTIR spectrometers. These will be operated in Brussels and in a subtropical site (TBD) for the extension of the NDSC network, or in measurement campaigns that can be planned for the purpose of ACE validation.
- has access to the overall ensemble of NDSC data that might be useful for ACE and MAESTRO validation purposes.

Scientists involved:

Ir. B. Barret, Dr. M. Carleer, Dr. M. De Mazière, Dr. C. Hermans, Ir. J-C. Lambert, Dr. F. Mélen, Dr. A-C. Vandaele, Dr. M. Van Roozendael, Dr. C. Servais, Dr. R. Zander

Supporting laboratory measurements

- Two high-resolution Fourier transform spectrometers, which can be operated from the near UV to the infrared.
- Several absorption cells that can provide absorption paths from a few cm up to several km.

Enable to measure absolute intensities and cross-sections in real atmospheric conditions and their variation with temperature and pressure.
The expertise acquired by the Belgian team in this field can contribute to supply most of the laboratory measurements that are necessary to reduce the uncertainties in the ACE level 2 data processing.

Scientists involved:
Dr. M. Carleer, Dr. C. Hermans, Dr. A-C. Vandaele, Dr. J. Vander Auwera