

Testing Atmospheric Chemistry in Anticyclones - TACIA

OBJECTIVES

The project is centred around quasi-Lagrangian aircraft measurements from the MRF C-130 in conjunction with theoretical model calculations and data analysis. The objectives are to collect a high quality dataset with good time resolution and suitable for validation of Lagrangian and Eulerian models, of ozone and precursors as well as of intermediate species and products over sea in air coming off the European Continent. It will be investigated how European emissions impact on northern hemisphere ozone and in particular on ozone over the North Atlantic, and to what extent the ozone balance over the North Atlantic can be estimated from a knowledge of individual production and loss processes. It will be investigated if indirect estimates of the concentration of the hydroxyl radical can be made from the measurements. If yes, can a relationship between the concentrations of OH and NO_x be derived?

Furthermore it will be investigated if it is possible to strengthen the knowledge of the relative roles of VOC and NO_x in forming ozone in a European continental plume over the North Atlantic, and if measured concentrations of NO_y species and individual hydrocarbons are consistent with current European emission inventories.

TACIA participants

- NILU - Norwegian Institute for Air Research, Norway, coordinator ([Dr. professor Øystein Hov](#))
- UB - University of Bergen, Norway, ([Dr. Frode Flatoy](#))
- MRF - Meteorological Office Research Flight, UK, partner ([Dr. John S. Foot](#))
- Research Center Juelich - Institute for Atmospheric chemistry 2, Germany, partner (professor [Dieter Kley](#))
- UEA - University of East Anglia, UK, partner ([Dr. professor Stuart Penkett](#))
- SA - Service d'Aéronomie du CNRS, Institut Pierre et Simon Laplace, France, partner ([Dr. Matthias Beekmann](#))
- Centre de Faibles Radioactivités, Institut Pierre et Simon Laplace, France - unfunded contribution to TACIA ([Dr. Daniel Martin](#))
- UC - University of Cambridge, UK ([Drs. Kathy Law and John Pyle](#))

Instrumentation for the TACIA flights

specie	instrument
Ozone O ₃	Chemiluminescence or UV photometer (MRF)
Water Vapour H ₂ O	Ly-a fluorescence and dewpoint (MRF)
Position, winds u,v,w	INS, GPS, wind vanes (MRF)
Temperature T	Rosemount PRT (MRF)
Peroxyacetylnitrate PAN	Gas chromatography (GC) (MRF)
Hydrocarbons NMHC	Grab sample and subsequent GC FID (C ₂ -C ₆) analysis (mainly NILU)
Carbon monoxide CO	Resonance fluorescence (FZJ)
NO ₂ photolysis JNO ₂	Photometer (FZJ)
Nitric oxide NO	Chemiluminescence (UEA)
Nitrogen dioxide NO ₂	Photolysis + chemiluminescence (UEA)
Total reactive N NO _y	Gold converter + chemiluminescence (UEA)
Nitric Acid HNO ₃	Gold converter + chemiluminescence + denuder (UEA)
Speciated peroxides (inorganic and organic)	Fluorimetric (UEA)
Formaldehyde HCHO	(UEA)
Aerosol size spectrum	Passive Cavity Optical Probe (MRF)

ROLE OF PARTICIPANTS

Forschungszentrum Jülich

The Forschungszentrum Jülich will provide and operate in-situ instrumentation on the C-130 and generate and provide analysed data from these instruments to the data bank.

The in-situ instrumentation from the Forschungszentrum Jülich will be a high time and spatial resolution instrument to measure carbon monoxide (CO). A prototype of this instrument has already successfully been used on the C-130 for the OCTA project. The Forschungszentrum Jülich will incorporate technical improvements and build a rugged version of the instrument, so that it can be operationally employed during the TACIA campaigns.

The Forschungszentrum Jülich will provide and operate a calibrated and well characterized photoelectrical instrument to measure the photodissociation rate of nitrogen dioxide ($J(\text{NO}_2)$).

TACIA partners

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