Deliverable D2.6: Update of detailed chamber overview on the EUROCHAMP website

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Deliverable no.	**2.6**
Lead beneficiary	**CNRS LISA**
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Estimated delivery date	**30/11/19**
Actual delivery date	**01/12/19**
Version	**1**
Comments	

The webpages of all chambers and their characteristics have been updated, integrating more details, as for example:

- The technical description, adding information about the temperature, pressure and RH range
- The mechanical description
- The auxiliary mechanism

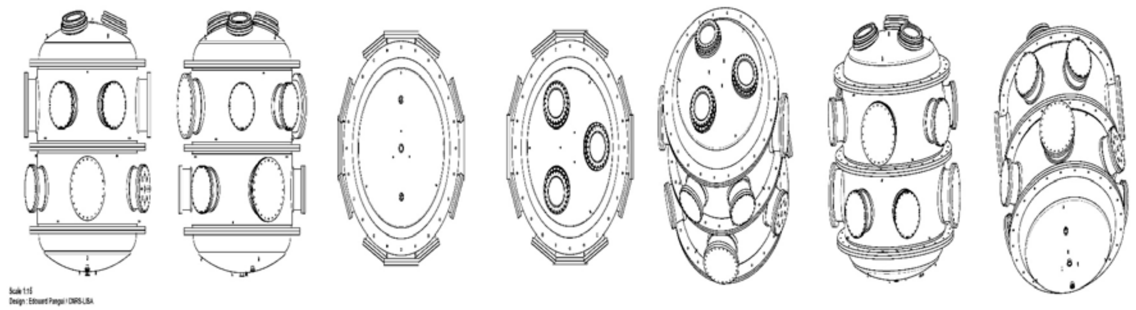
When necessary, information related to TNA access provision has been updated as well.

The link to the chambers' list is the following: https://www.eurochamp.org/Facilities/SimulationChambers.aspx

CESAM - General information	
Access mode	Physical access
Infrastructure name and acronym	Multiphase Atmospheric Experimental Simulation Chamber (CESAM)
Photos	 
Location	Créteil, France
Website	Click here
Legal name of organisation operating the infrastructure	Centre National de la Recherche Scientifique - Laboratoire Interuniversitaire des Systèmes Atmosphériques (CNRS-LISA)
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	The CESAM platform consists of a combination of two chambers (CESAM chamber and CSA chamber) that can work both with gas or multiphase reacting mixtures involving gaseous trace species, organic particles, water droplets, mineral dust, soot and salts. It has been designed to perform studies on multiphase atmospheric processes under realistic conditions. **The CESAM chamber** is the largest atmospheric simulation chamber of the CESAM platform. It is dedicated to the study of multiphase atmospheric processes such as the formation of secondary aerosol or gaseous compounds in cloud-phase reactivity. It's a 4.2 m3 stainless steel atmospheric simulation chamber, evacuable down to a few 10-7 atm and it is temperature controlled between +0°C and +60°C. It is equipped with high power xenon arc lamps which the artificial light source the more realistic to sun irradiation. Due to the very low level of electrostatic charges on its wall the aerosol

	lifetime in CESAM can be very long for submicron particle (up to 4 days) which enable the study of the ageing processes of secondary aerosol as well as their consequences on their properties. The scientific spectrum of CESAM chamber is nevertheless much larger than SOA studies as it is also possible to generate cloud events, to inject desert dust or soots, to seed with ionic aerosols and to perform photochemistry study. CESAM chamber is granted by CNRS as national instrument. **The CSA chamber** is an atmospheric simulation chamber dedicated to the atmospheric gas processes and spectrometry studies. It is a 1m3 pyrex reactor evacuable down to a few 10-2 mbars. It is equipped with artificial irradiation system which consist in 80 UV-lamps (centred at 360 nm and 420 nm) and 16 arc and Hg lamps ($\lambda < 300$ nm). The CSA is equipped with analytical devices for gas phase such asUV-Visible and Visible IBB-CEAS spectrometer, FTIR and PTR-Tof-MS (Kore ltd.) that enable atmospheric chemistry monitoring and cross-determination of compound absorptivities in both IR and UV-Visible spectral ranges withnumerous applications for remote sensing measurements. The CSA chamber is a perfect tool for intercalibration of IR/UV spectra and study the gas phase reactivity of organic and polyfunctional organic species (e.g nitrates). It is a complementary glass chamber which offers a good alternative to stainless steel walls. The CESAM platform is equipped with a comprehensive set of analytical instruments and benefits from the instrumental environment dedicated to atmospheric chemistry provided by LISA: PTR-ToF-MS (Kore ltd.), NOx Analyser, O3 Analyser, SO2 Analyser, External CRDS (Picarro 2302), Sorbent cartridges + GC-MS, Automatic GC- FID, in-situ FTIR, Hygrometer, Supercritical Fluid Extraction- GC-MS, EC/OC (Sunset), Hygroscopy Tandem DMA, Analytical Electron microscopes, SMPS, Light-scattering aerosol, CAPS-Pmex Aerodyne, CAPS-Pmex Aerodyne, Nephelometre (TSI 3596), Aethalometer (AE-31 Magee Scientific), Spectroradiometer LiCOR 1800. Features that make it rare in the world: - Very long submicronic aerosol lifetime - Ability to produce clouds - Protocol for mineral dust seeding - Temperature control and highly realistic artificial solar irradiation - high cleanliness level - Quality of the instrumentation
Services currently offered by the infrastructure and its research environment	The services offered by the infrastructure include: - Access to the full equipment of the CESAM platform to which can be added when possible the equipment of the Pegasus field facility as well as the clean rooms, two electron microscopes (TEM, SEM) - Technical assistance by a staff of highly trained engineers - Scientific assistance (including protocol definition and pre-modelling) by permanent researcher at LISA - Copy of all the level 0 data at the end of the campaign - Data treatment up to level 1 when requested - Data saving (>10 years) on the highly secured LISA computer facility

	- Guest office for up to 4 guests and internet access - 150 m2 lab at ground floor allowing easy access to heavy guest instrument (travelling crane up to 2000 kg available) - 24h access to the lab if requested support for ordering chemicals and consumables,...
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Between 1 and 3 weeks. A typical work includes 2-3 days to carefully prepare the experiments (latest protocol adjustment, connection of potential external instruments, and training on the use of the chamber and the main devices), then 10 days of experiments (1 experiments/day), then 1-2 days for debriefing and base data formatting, saving, and distributing among the users.
Community/user type served	The CESAM platform is mainly used for research project (so academic sector) nevertheless we have had experiment conducted with companies (self-cleaning material) and for protocol testing from governmental agency (INERIS). We believe that we will increase our penetration of the sensors/instrumentation community.
Scientific and technical support offered	Training for the use of the infrastructure and the data treatment is offered. Depending on the degree of expertise of the guest, a data analysis of level 1 (FTIR, PTR-ToF-MS, electronic microscopy and mass spectra) can be proposed to users. In addition, pre-modelling assistance for the definition of experimental conditions is offered to all groups.
Logistic and administrative support offered	Administrative support for ordering chemicals and consumables, logistic support for the management of chemicals, including gases (ordering, conservation, provision), as well as centralised logistic support for liquid nitrogen provision.
Person in charge of access provision at the infrastructure	Dr. Mathieu Cazaunau, Research Engineer at CNRS, **mathieu.cazaunau@lisa.u-pec.fr**
Extended technical information - CESAM installation -	
Physical description	The CESAM chamber is made of 304L stainless steel. Volume : 4177 litres Diameter : ca. 1.8 m (without port extension) Height : ca. 2.3 m Projected horizontal surface area : 2.3m² Surface-to-volume ratio : 4.3 m^{-1} Limit vacuum : 10^{-4} mbar

<table>
<tr>
<td>Mechanical description (image)</td>
<td>


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<tr>
<td>Mechanical description (CAD file)</td>
<td>CAD description in STP format (build by E. Pangui /CNRS-LISA) : CESAM-CADdescription_by_EPangui.zip
Note : STP stands for STandard for the Exchange of Product. STP is a file extension for a 3-D graphic file used by CAD software. STP files are used to store 3D image data in an ASCII format, following the standards defined in ISO 10303-21 : Clear Text Encoding of the Exchange Structure.
STP files can be opened by CATIA (Computer Aided Three Dimensional Interactive Application), a commercial CAD software suite created by Dassault Systemes and marketed by IBM but freevare viewers are also available</td>
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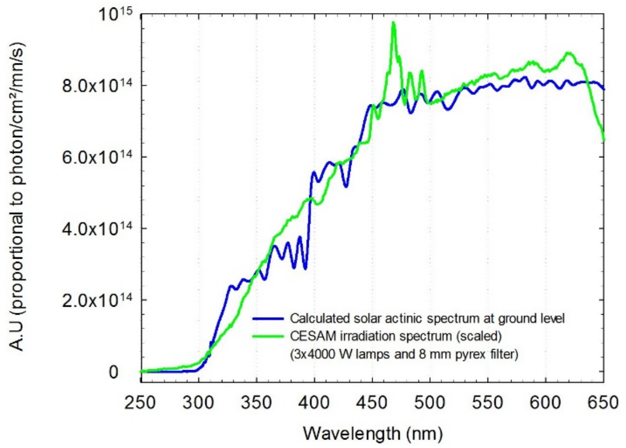
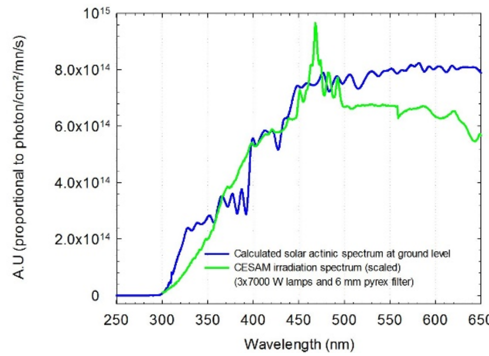
<tr>
<td>Irradiation spectra (image)</td>
<td>




Shape of the CESAM irradiation spectrum (provided by 3 high pressure xenon arc lamp of 4kW each) compared with the solar spectrum a ground level (noon, 45° lat north, 21/06 from TUV NCAR) - Valide for experiment carried out from 2006 to 2016 included (adapted from Wang et al, 2011).

Shape of the CESAM irradiation spectrum (provided by 3 high pressure xenon arc lamps each operated at 6.5 kW)
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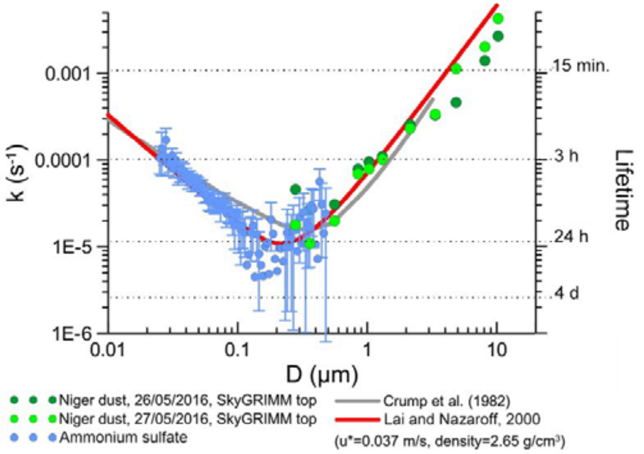
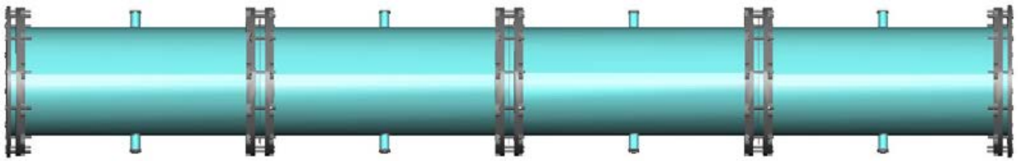
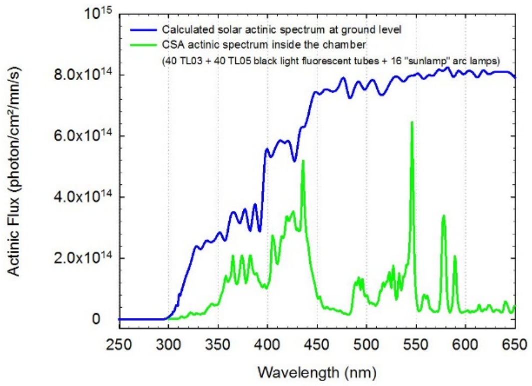
	compared with the solar spectrum a ground level (noon, 45° lat north, 21/06 from TUV NCAR) - Valide for experiment from 2017 on. (mesurement from Dr. M. Cazaunau /CNRS-LISA)
Size dependent aerosol loss / lifetime (image)	 Note : Adapted from Housni Lamkaddam's PhD thesis and Dr. Claudia Di Biagio work
Auxiliary mechanism	From Wang et al, 2011 - to be updated **Reactions** **constants** **Note** $NO_2 \rightarrow NO_{2\_Wall}$ $2.2.10^{-3}$ s^{-1} Indicative value only $NO_2\_Wall \rightarrow NO_2$ $1.0.10^{-1}$ s^{-1} Indicative value only $NO_2 \leftrightarrows NO_{2\_Wall}$ 46 Fast equilibrium : only the ratio k_5/k_{-6} was determining $NO_{2\_Wall} \rightarrow \alpha\ NO + \beta\ HONO$ $2.0.10^{-3}$ s^{-1} $\alpha = 0.34$ and $\beta = 0.07$ $NO_{2\_Wall} + h\nu \rightarrow \delta\ NO + \gamma\ HONO$ $1.4.10^{-2}$ s^{-1} $\delta = 0.51$ and $\gamma = 0.10$ $O_3 \rightarrow O_{3\_Wall}$ $3.0.10^{-4}$ s^{-1}
Description paper	Wang, J., Doussin, J. F., Perrier, S., Perraudin, E., Katrib, Y., Pangui, E., and Picquet-Varrault, B.: **Design of a new multi-phase experimental simulation chamber for atmospheric photosmog, aerosol and cloud chemistry research**, Atmos. Meas. Tech., 4, 2465-2494, https://doi.org/10.5194/amt-4-2465-2011, 2011.
Extended technical information - CSA installation -	

Physical description	The CSA chamber is a cylindrical pyrex reactor. Volume: 977 L Diameter: 45 cm Length: 600 cm Surface-to volume ratio: 9 m^{-1} Limit vacuum: 10^{-2} mbar
Mechanical description (image)	
Mechanical description (CAD file)	CAD description in STP format (build by E. Pangui /CNRS-LISA) : CSA-CADdescription_by_EPangui.zip *Note : STP stands for STandard for the Exchange of Product. STP is a file extension for a 3-D graphic file used by CAD software. STP files are used to store 3D image data in an ASCII format, following the standards defined in ISO 10303-21 : Clear Text Encoding of the Exchange Structure.* *STP files can be opened by CATIA (Computer Aided Three Dimensional Interactive Application), a commercial CAD software suite created by Dassault Systemes and marketed by IBM but freevare viewers are also available*

Irradiation spectra (image)



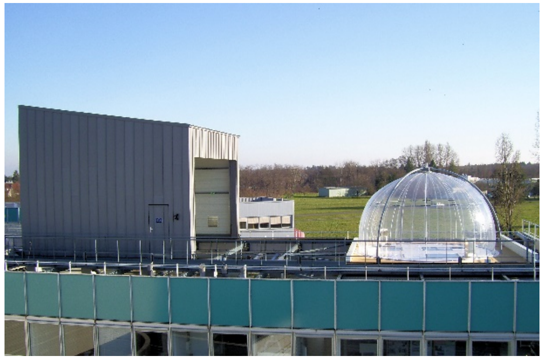
Auxiliary mechanism

1.5. Auxiliary mechanism determined from CSA

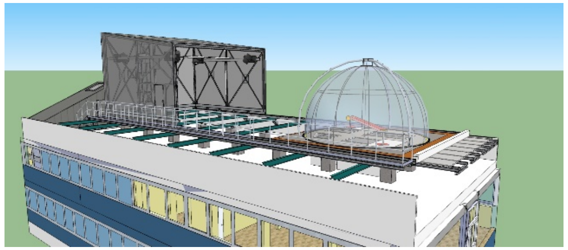
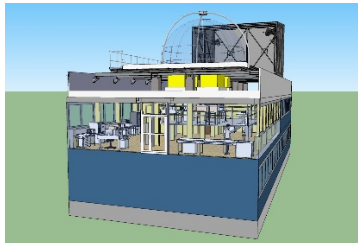
Parameter	Rate (lower - upper limit)	Experiment
Wall loss		
O_3 loss	O3 ⟶ wO_3 k = 2 (1.8 – 35)	Determined in reference experiments Highly dependent on wall cleaning
NO_2 loss	$NO_2 \longrightarrow wNO_2$ $k = 1.3\ (1 – 2) \times 10^{-4}\ s^{-1}$	Determined in reference experiments
Wall sources		
Heterogeneous NO_2 reaction	$NO_2 \longrightarrow \delta HONO + \gamma HNO_3$ $k = 1\ (0.1 – 10) \times 10^{-2}\ s^{-1}$	Determined in reference experiments $\delta = 0.6$, $\gamma = 0.1$
Photolytic NO_2 wall source	hv + wall ⟶ NO_2 $k = 1.3\ (1 – 2) \times 10^{-4}$ ppb s^{-1}	Determined in reference experiments
Photolytic HCHO wall source	hv + wall ⟶ HCHO $k = 5.5\ (5 – 10) \times 10^{-4}\ s^{-1}$	Determined in reference experiments

Description paper

Doussin, J. F., Ritz, D., DurandJolibois, R., Monod, A., and Carlier, P.: **Design of an environmental chamber for the study of atmospheric chemistry: New developments in the analytical device**, Analusis, 25, 236-242, 1997. link

HELIOS - General information	
Access mode	Physical access
Infrastructure name and acronym	Outdoor Atmospheric Simulation Chamber of Orleans (HELIOS)
Photos	 
Location	Orléans, France
Website	www.helios-cnrs.org
Legal name of organisation operating the infrastructure	Centre National de la Recherche Scientifique - Institut de Combustion Aérothermique Réactivité et Environnement (CNRS-ICARE)
Description of the infrastructure	
Brief general description of the	HELIOS is a large hemispherical outdoor simulation chamber (volume of 90 m³) positioned on the top of the ICARE-CNRS building at Orléans (47°50'18.39N; 1°56'40.03E). The chamber is made of FEP film (250 µm thick) ensuring more than 90 % solar light transmission. The chamber is protected against severe meteorological conditions by a mobile protective housing which contains a series of Xenon lamps enabling experiments to be conducted also using artificial light. This special design makes

infrastructure to which access is offered	HELIOS a unique platform in Europe where experiments can be made using both types of irradiation. HELIOS is dedicated mainly to the investigation of gas-phase processes and radical chemistry under different conditions (sunlight, artificial light and dark). It is equipped with a wide range of state-of-the-art instruments for physical and chemical characterization of trace gases and aerosols. The available range of complementary and highly sensitive instruments allows the investigation of radical chemistry, gas-phase processes and aerosol formation under realistic conditions.
Services currently offered by the infrastructure and its research environment	Investigations of chemical gas-phase processes and radical budgets by determining kinetic parameters, identifying the secondary products in the gas and particles and their yields. The atmospheric lifetimes of the investigated compounds and their degradation mechanisms can be derived.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Two to four weeks including days for the preparation of the experiments and the protocols and data analysis.
Community/user type served	Academics, government agencies and industries.
Scientific and technical support offered	Training for the use of the infrastructure and the data treatment is offered. Depending on the degree of expertise of the guest, a data analysis of level 1 can be offered to users as well as the definition and design of the experiments to be conducted.
Logistic and administrative support offered	Administrative support for ordering chemicals and consumables, logistic support for the management of chemicals, including gases (ordering, conservation, provision), as well as support during the stay
Person in charge of access provision at the infrastructure	Wahid Mellouki, CNRS, **mellouki@cnrs-orleans.fr** Véronique Daële, CNRS, **veronique.daele@cnrs-orleans.fr**
Extended technical information	

Physical description	HELIOS is a 90 m3 half-hemispheric chamber with FEP film ensuring more than 90 % solar light transmission. Diameter : 6 m, Height 3m, Projected horizontal surface area 55 m².
Mechanical description	      
Irradiation spectra	Natural irradiation
Size dependent aerosol loss/lifetime	To be submitted
Auxiliary mechanism	• Rate for dilution of trace gases is obtained from the decay of SF6 • Wall loss of O3, NOx, HCHO and VOCs are obtained from reference experiments under dark, (they depend on the wall condition), typically rates < 2x10-6s-1. • Parameterization of sources for HONO, HCHO, CO, NO2 using measured temperature, solar radiation, relative humidity.

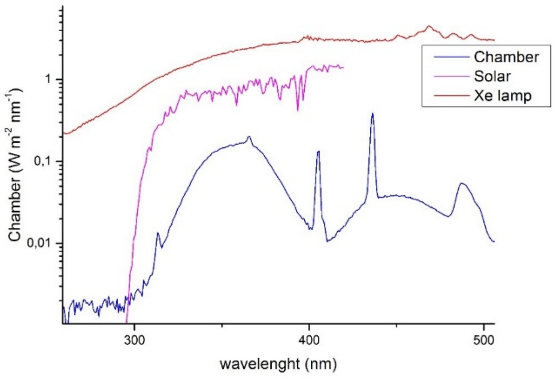
• Photolysis frequencies calculated from actinic flux measured inside the chamber.

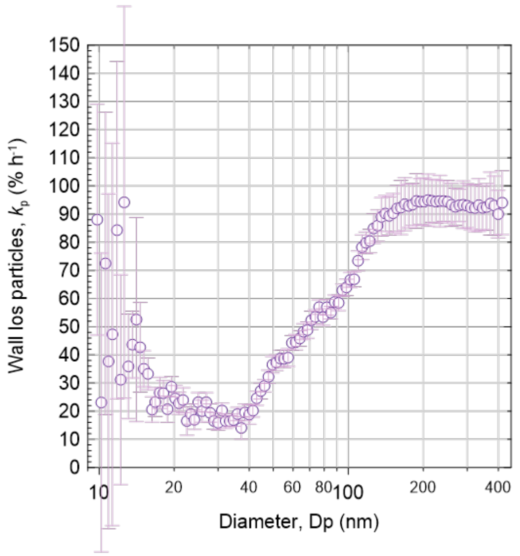
Dilution		
SF_6	$SF_6 \rightarrow dSF_6$ $(1.4\pm0.1)\times10^{-5}\ s^{-1}$	determined in reference experiments with continually adding 60L/min of zero air under dark condition, SF_6 measured using FTIR
Wall loss		
O_3 loss	$O_3 \rightarrow wO_3$ $(1\pm1)\times10^{-6}\ s^{-1}$	determined in reference experiments under dark condition, depend on the wall condition
NO	$NO \rightarrow wNO$ $(1\pm1)\times10^{-6}\ s^{-1}$	
NO_2	$NO_2 \rightarrow wNO_2$ $(1\pm1)\times10^{-6}\ s^{-1}$	
HCHO	$HCHO \rightarrow wHCHO$ $(1\pm1)\times10^{-6}\ s^{-1}$	
VOCs	isoprene $(0.9\pm0.2)\times10^{-6}\ s^{-1}$ methacrolein $(1.4\pm0.5)\times10^{-6}\ s^{-1}$ methyl vinyl ketone $(1.4\pm0.4)\times10^{-6}\ s^{-1}$ cyclohexane $(0.7\pm0.4)\times10^{-6}\ s^{-1}$ cyclohexanone $(0.8\pm0.2)\times10^{-6}\ s^{-1}$ HCHO $(0.1\pm0.1)\times10^{-6}\ s^{-1}$ 2-methyl-3-pentanone $(0.4\pm0.4)\times10^{-6}\ s^{-1}$ perfluoro-2-methyl-3-pentanone $(0.5\pm0.3)\times10^{-6}\ s^{-1}$ Tetramethylethylene $(0.5\pm0.2)\times10^{-6}\ s^{-1}$ a-pinene $(0.5\pm0.2)\times10^{-6}\ s^{-1}$ limonene $(0.5\pm0.2)\times10^{-6}\ s^{-1}$	
Wall emission		
	$h\nu$ + wall $\rightarrow NO_2$ $(1.4\pm0.7)\times10^{6}$ molecule s^{-1}	determined in reference experiments under natural irradiation, depend on the wall condition These numbers have been obtained under: $J_{NO2}=(5.3\text{-}6.4)\times10^{-3}\ s^{-1}$
	$h\nu$ + wall $\rightarrow O_3$ $(1.1\pm0.1)\times10^{7}$ molecule s^{-1}	
	$h\nu$ + wall $\rightarrow CO$ $(7.1\pm0.1)\times10^{7}$ molecule s^{-1}	
	$h\nu$ + wall $\rightarrow HCHO$ $(6.3\pm1.4)\times10^{6}$ molecule s^{-1}	
	$h\nu$ + wall $\rightarrow HONO$ $(6.9\pm1.4)\times10^{5}$ molecule s^{-1}	

Description paper	Y. Ren, B. Grosselin, V. Daele, A. Mellouki **Investigation of the reaction of ozone with isoprene, methacrolein and methyl vinyl ketone using the HELIOS chamber**, Faraday Discussions, Faraday Discuss., 2017, 200, 289, DOI: 10.1039/c7fd00014f Y. Ren, PhD Thesis, University pf Orleans, May 2017 (**http://www.icare.cnrs-orleans.fr/IMG/theses/2017-Ren-th.pdf**)

ISAC - General information	
Access mode	Physical access
Infrastructure name and acronym	Interfaces Simulation Atmospheric Chamber (ISAC)
Photos	
Location	Lyon, France
Website and/or 360° tours	
Legal name of organisation operating the infrastructure	Centre National de la Recheche Scientifique - CNRS (IRCELyon)
Description of the infrastructure	

Brief general description of the infrastructure to which access is offered	ISAC is a medium sized indoor simulation chamber which has been developed specifically to investigate interfaces processes such as air-water-air, air-sol,…, interfaces. It is made of a 2m³ Teflon envelop embedded in a structure containing the irradiation system UV and visible light sources. On the floor of the chamber sits a tank which can be filled with any liquid/material/chemicals. The liquid filling and emptying can be done without opening the chamber. The cuboid shape of the chamber allows people to enter by a door to manually scrub the walls and the tank allowing to minimize the memory effects of the chamber. Samples can be taken at 2 different heights to measure concentration gradients in the chamber. The analytical devices permanently connected to the chamber are gas phase monitors (O_3, CO, NO_x at pptv level), particle size distribution measured by SMPS and SRI-TOF-MS for VOC analysis. Water from the tank can be analysed by UPLC-HR-MS and by Ion Chromatography. A more advanced characterization of the particulate matter can be achieved online with AMS or offline by sampling and chemical analysis by UPLC-HR-MS and TEM/EDX measurements. Even more advanced analysis on particles can be conducted on the Ly-EtTEM microscope which allows to work under a controlled atmosphere until 20 mbar.
Services currently offered by the infrastructure and its research environment	The chamber now well characterized allows the study of interfacial processes and especially liquid/gas interactions. It is equipped with the most advanced analytical equipment to investigate both gas and liquid phases. Morphological characterisation of the particulate matter formed in the chamber and its behaviour when exposed to gases can be studied with Environmental TEM. This instrument is quasi unique in Europe as it allows precise determination of exchanges at macroscopic interfaces. The research engineer will teach how to use the chamber and will ensure that the experiments are run in an optimal way.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	5 days allows to run a blank experiment, a “real” experiment and the collection of the particulate matter samples. These 5 days of experiment include half a day of work on the E-TEM. A study with variable parameters will require 4 weeks of experiments
Community/user type served	Users from academic sector (expert and young researchers), SMEs
Scientific and technical support offered	A research engineer will follow, support and monitor on-going activities.
Logistic and administrative support offered	Local logistic support is currently offered to all visitors coming to IRCELyon
Person in charge of access provision at the infrastructure	Sébastien Perrier, research engineer, **sebastien.perrier@ircelyon.univ-lyon1.fr**

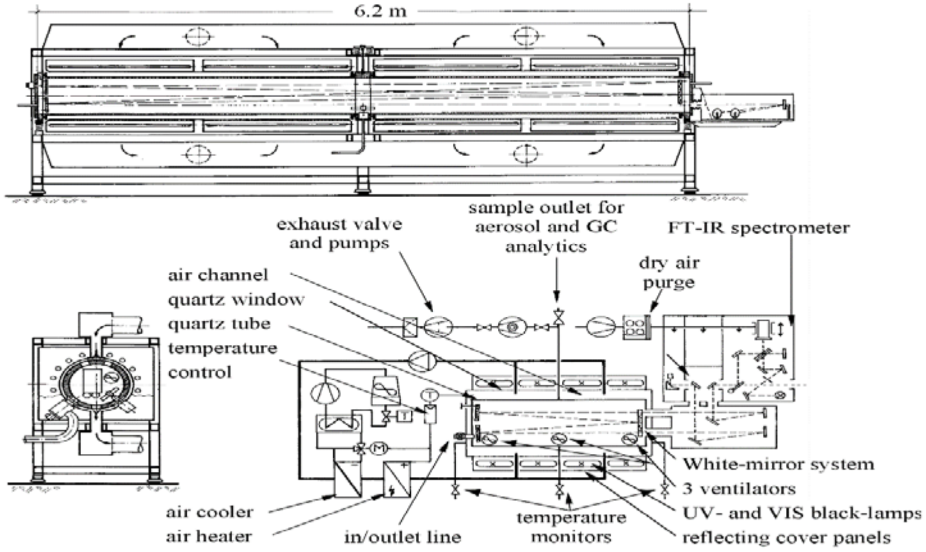
Extended technical information	
Physical description	ISAC is a parallelepiped rectangle teflon chamber. The temperature is not controlled but regulated by the air of the laboratory which is air conditioned. S/V ratio: 5m-1 dimensions: 1x1x2 m Temperature range: 20-25 °C Pressure range: atmospheric pressure RH range: 0-90%
Mechanical description	1m side length and 2m height. Volume is 2 m3.
Irradiation spectra	

Size dependent aerosol loss/lifetime	
Auxiliary mechanism	$O_3 \rightarrow O_{3\_Wall}$ $k_{W,O3} = 5.5 \times 10^{-6}\ s^{-1}$
Description paper	Alpert P, Ciuraru R, Rossignol S, Passananti M, Tinel L, Perrier S, Dupart Y, Steimer S, Ammann M, Donaldson D, George C : Fatty Acid Surfactant Photochemistry Results in New Particle Formation. Scientific reports 2017 n°7. DOI ref : 10.1038/s41598-017-12601-2. Hal ref : hal-01625639 Bernard, F., Ciuraru, R., Boréave, A. & George, C. Photosensitized Formation of Secondary Organic Aerosols Above the Air/Water 8 Interface. Environ. Sci. Technol. 50, 8678-8686, doi:10.1021/acs.est.6b03520 (2016)

QUAREC - General information	
Access mode	Physical access
Infrastructure name and acronym	Quartz Reactor (QUAREC)
Photos	 
Location	Wuppertal, Germany
Website	http://www.ptc.uni-wuppertal.de/forschung/atmosphaerenchemie.html; http://www.ptc.uni-wuppertal.de/forschung/atmosphaerenchemie/laborstudien.html
Legal name of organisation operating the infrastructure	Bergische Universität Wuppertal

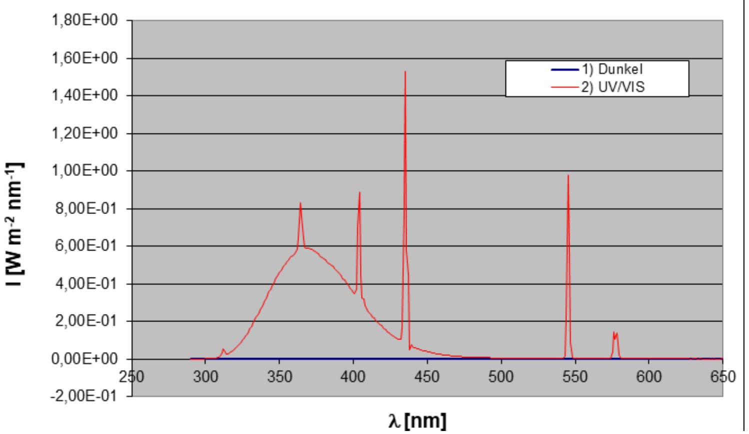
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	The QUAREC reactor consists of two quartz cylinders with an inner diameter of 0.47 m and a total joined length of 6.2 m. The chamber is closed at both ends by aluminium flanges which contain numerous inlet and outlet ports for the introduction of bath gases and chemicals. A pumping system consisting of a turbo-molecular pump backed by a double stage rotary fore pump allows the photoreactor to be evacuated to 10-3 Torr. Magnetically coupled Teflon mixing fans are mounted inside the chamber to ensure homogeneous mixing of the reactants. Two types of lamps are available for photolysis of the radical/atom precursors: 32 super actinic fluorescent lamps (Philips TL 05/40 W: 320<λ<480 nm, λmax=360 nm) and 32 low-pressure mercury lamps (Philips TUV/40W, λmax=254 nm). The lamps are distributed evenly around the photoreactor, are wired in parallel, and can be switched by pairs. A White type multiple-reflection mirror system with a total optical path length of 484.7 ± 0.8 m is mounted inside the photoreactor for sensitive in situ long path absorption monitoring of reactants and products in the IR spectral range 4000 – 700 cm-1. IR spectra are usually recorded with a spectral resolution of 1 cm-1 using a Thermo IS50 Advanced FT-IR spectrometer equipped with a KBr beam splitter and a liquid nitrogen cooled mercury-cadmium-telluride (MCTA) detector. The reactor can be actually operated at room temperature (293±4 K). A new temperature control unit (255 – 330 K) will be available within the fourth quarter of 2020. Apart from FTIR spectrometry a GC-MS/FID system, LOPAP and monitors for the detection of NOx, O3 and HONO are also available and can be attached to the reactor.
Services currently offered by the infrastructure and its research environment	Investigations of gas-phase photooxidation processes including: - Determination of rate coefficients for the reactions of OH, NO3 halogens and ozone with VOCs - Product analysis of the radical or ozone mediated photooxidation of VOCs - Help in the elucidation of VOC degradation mechanisms
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Two to three weeks
Community/user type served	QUAREC is mainly used for research and training projects

Scientific and technical support offered	Guidance in the planning and assistance in performing and evaluating the experiments performed in QUAREC. A technician is permanently on site to ensure the smooth operation of the facility.
Logistic and administrative support offered	Assistance is given with the bath gases necessary for the experiments and also the ordering of chemicals (if desired). If requested assistance in finding accommodation for the duration of the TNA will be provided.
Person in charge of access provision at the infrastructure	Person in charge of access provision at the infrastructure: Prof. Peter Wiesen (wiesen@uni-wuppertal.de) and/or Dr. Iulia Patroescu-Klotz (patroescu@uni-wuppertal.de)
Extended technical information	
Physical description	The QUAREC chamber is made of 2 quartz glass tubes with metal end flanges Volume: 1080 litres (1.08 m3) Diameter: 0.47 m Length: 6.2 m Total Surface Area: 9.5 m2 Lateral Surface Area: 9.15 m2 End Flange Surface Area: 2 x 0.173 m2 Surface-to Volume Ratio: 8.79 m-1 Temperature range: 298 ±5 K Pressure range: 762±10 Torr RH range: ≤ 1 % [4)]
List of instruments	FTIR: VOC, O_3, NO_y GC-MS/FID: VOC LOPAP: HONO, O_3, NO_2 O_3 monitor: O3

	NO monitor — NO, NO_2
Mechanical description (schematic)	
Mechanical description	Limited mechanical information is available on request
Irradiation spectra	see table below

Process	Nominal Rate	Comment/ status M36
hv + wall = OH	(1 10^6 molecule cm^{-3})	Not accurately known
hv + wall = NO	(1-10) *10^{-7} molecules s^{-1}	Highly variable
NO_2 = 0.5HONO + 0.5wHNO_3	(5±2) 10^{-5} s^{-1}	QUAREC characterisation
wHNO_3 + hv = OH + NO_2	J(HNO_3)	Not yet known
N_2O_5 = 2 wHNO_3	3*10^{-4}	QUAREC characterisation
N_2O_5 + H_20 = 2 wHNO_3	6.5 10^{-20} cm^3 s^{-1}	IUPAC
O_3 = wO_3	(3±1) 10^{-5} s^{-1}	QUAREC characterisation

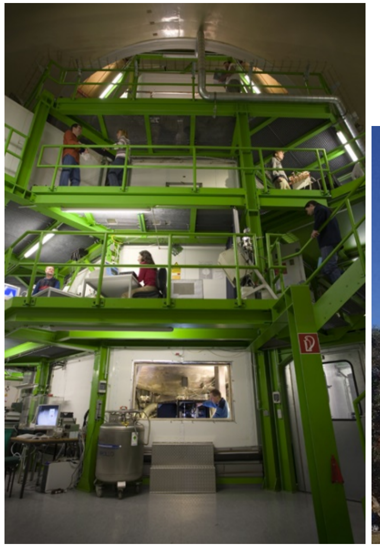
HNO_3 = $wHNO_3$	3-6 10^{-5} s^{-1}	QUAREC characterisation
Initial HONO		not detected (~ppb)
J(NO_2)	3.5 10^{-3} s^{-1}	chemical actinometry
J(NO_2)	3.5 10^{-3} s^{-1}	Spectral radiometer
J(HCHO)	3.7 10^{-6} s^{-1}	Spectral radiometer
J(HONO)	6.8 10^{-4} s^{-1}	Spectral radiometer



Auxiliary mechanism

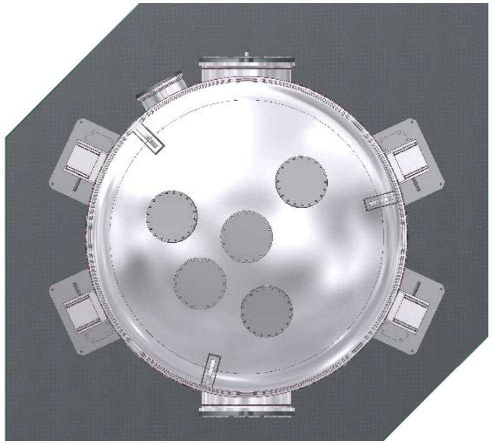
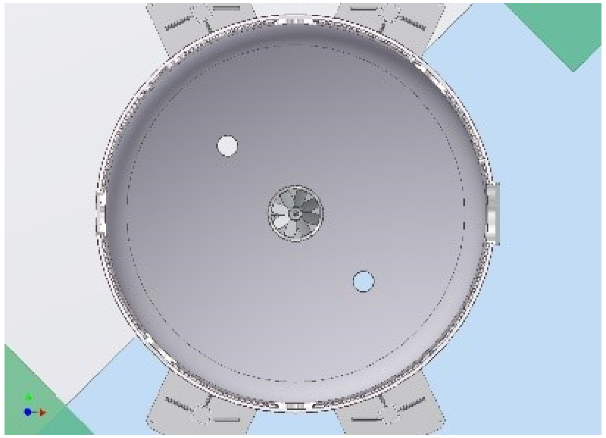
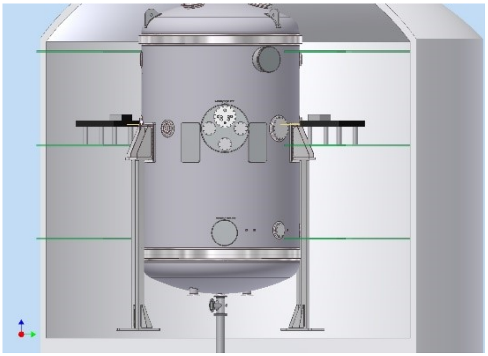
Process	**Nominal Rate**	**Comment/ status M36**
hv + wall = OH	(1 10^{6} molecule cm^{-3})	Not accurately known
hv + wall = NO	(1-10) *10^{-7} molecules s^{-1}	Highly variable
NO_2 = 0.5HONO + 0.5$wHNO_3$	(5±2) 10^{-5} s^{-1}	QUAREC characterisation
$wHNO_3$ + hv = OH + NO_2	J(HNO_3)	Not yet known
N_2O_5 = 2 $wHNO_3$	3*10^{-4}	QUAREC characterisation
N_2O_5 + H_20 = 2 $wHNO_3$	6.5 10^{-20} cm^3 s^{-1}	IUPAC
O_3 = wO_3	(3±1) 10^{-5} s^{-1}	QUAREC characterisation
HNO_3 = $wHNO_3$	3-6 10^{-5} s^{-1}	QUAREC characterisation
Initial HONO		not detected (~ppb)

	$J(NO_2)$	$3.5\ 10^{-3}\ s^{-1}$	chemical actinometry
	$J(NO_2)$	$3.5\ 10^{-3}\ s^{-1}$	Spectral radiometer
	J(HCHO)	$3.7\ 10^{-6}\ s^{-1}$	Spectral radiometer
	J(HONO)	$6.8\ 10^{-4}\ s^{-1}$	Spectral radiometer
Description paper	I. Barnes, K.H. Becker and N. Mihalopoulos, **An FTIR Product Study of the Photooxidation of Dimethyl Disulfide**. J. Atmos. Chem. 18 (1994)267-289.		

AIDA - General information	
Access mode	Physical access
Infrastructure name and acronym	Aerosol Interaction and Dynamics in the Atmosphere (AIDA)
Photos	 
Location	The AIDA chamber is located about 10 km north of the city of Karlsruhe, Germany, at 49°05'42.9"N 8°25'45.7"E. Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen, Germany
Website	http://www.imk-aaf.kit.edu/73.php
Legal name of organisation operating the infrastructure	Karlsruhe Institute of Technology (KIT)

Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	AIDA is a unique experimental facility for investigating the impact of aerosols on climate, weather, and the environment. Aerosol and cloud experiments are performed in the 84.5 m^3 AIDA chamber under relevant atmospheric conditions within a wide range of temperature(+50°C to -90°C), pressure (1 to 1000 hPa), and relative humidity (0% to 100%). During cloud simulation experiments, transient water and ice supersaturations are achieved for time periods from minutes up to about 1 hour with peak relative humidity values of more than 200%. Aerosol aging experiments can be performed on time scales up to several days. Thereby, the capabilities to simulate tropospheric and stratospheric conditions and to generate supersaturations and clouds in a large volume are unique in Europe. A 3.7 m^3 volume stainless steel chamber for the preparation and characterisation of aerosols at room temperature is connected to the large AIDA chamber. The AIDA facility is equipped with an extensive suite of state of the art instruments, both commercial and custom built. Research areas supported at the ADIA facility include aerosol physics, aerosol chemistry, and aerosol-cloud interactions. Analysis of the AIDA experiments is supported with the AIDA database and the aerosol process model COSIMA. Unique features: - Coverage of a wide temperature, pressure, and humidity range - Generation and control of liquid, mixed-phase and ice clouds - In situ instruments for the characterisation of aerosols & trace gases - Capability to install and simultaneously operate many sampling and in situ instruments from external users.
Services currently offered by the infrastructure and its research environment	The AIDA team offers support for planning the chamber use (joint workshops, kick off meetings), for adapting instruments to the chamber, for data acquisition, for remote access to instruments, for data storage and documentation , for flexible experiment planning during measurement campaigns (TNA), and for data analysis. The AIDA facility is also offered and used as a platform to test, intercompare and calibrate atmospheric hygrometers and ice nucleating particle instruments. Administrative support is offered for shipment and customs issues as well as for travel directions and accommodation. Suggestions for new research topics/experiments are welcome and will be discussed with the users to find the appropriate setup for new projects at AIDA.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Most campaign have a duration between 1 and 4 weeks. A typical measurement campaign includes a few days of careful preparation of the experiments (e.g. connection of potential external instruments, scientific discussion and scheduling), then 1-3 weeks (5-15 working days) of experiments, followed by 1-2 days for deinstallation and debriefing. Typically, experiments are conducted during working days and day time. The night time is used for automated cleaning and experiment preparation cycles.
Community/user type served	Research groups from atmospheric science community make up the vast majority of the users. To a smaller extend, companies use the facility for testing new and innovative instruments.

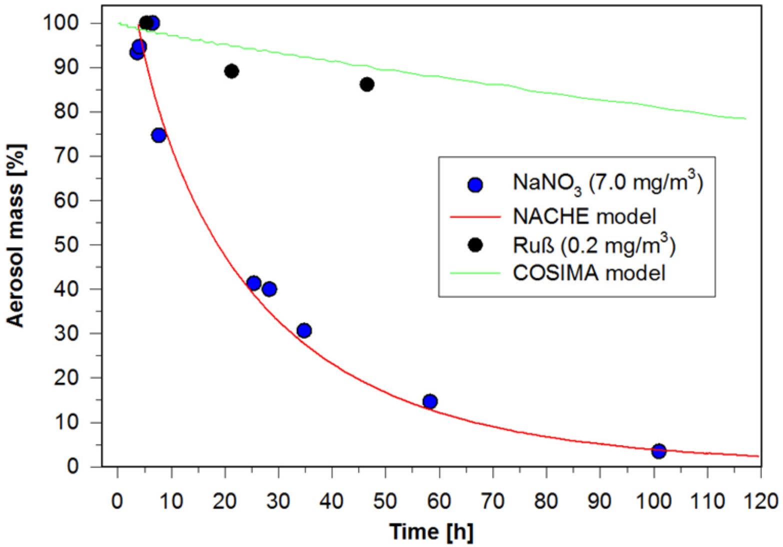
Scientific and technical support offered	The AIDA team offers support for planning the chamber use (joint workshops, kick off meetings, daily science meetings), for adaptation of instruments to the chamber (electronic or mechanical workshops), for synchronous data acquisition (local network, IT support), for remote access to instruments, for data storage (facility database), and for data analysis.
Logistic and administrative support offered	The AIDA team offers support for transport of instruments, customs issues, TNA applications, travel and local accommodation.
Person in charge of access provision at the infrastructure	Dr. Harald Saathoff, **harald.saathoff@kit.edu** Dr. Ottmar Möhler, **ottmar.moehler@kit.edu** Usually all leading scientists at the AIDA facility support the trans national access activities.
Extended technical description	
Physical description	The AIDA chamber consists of an aluminium (ALMg3) cylinder. Volume: 84.5 m3 Diameter: 4.0 m Heigth: 7.5 m Projected horizontal surface area: 12 m2 Surface to volume ratio: 1.2 m-1 Temperature range: 183-323 K Pressure range: 0.01 to 1100 hPa

Mechanical description	   
Irradiation spectra	Not yet available

Auxiliary mechanism	**Parameter** / **Rate** / **Experiment** Typical wall loss rate for compounds that stick perfectly to aluminum surfaces like acids or N_2O_5 / $(8\pm4)*10^{-4}\ s^{-1}$ / Reference experiments with different organic and inorganic acids and N_2O_5 Typical wall loss rate for compact nucleation mode particles / $10^{-3}\ s^{-1}$ / Reference experiments compared to the aerosol dynamic model COSIMA Typical wall loss rate for compact particles with diameters between a few ten and a few hundred nanometers / $10^{-6}\ s^{-1}$ / Reference experiments compared to the aerosol dynamic model COSIMA Ozone wall loss in clean air decreases with ozone concentration and temperature / $2.2*10^{-6}\ s^{-1}$ (313 K) $6.8*10^{-7}\ s^{-1}$ (296 K) $4.3*10^{-7}\ s^{-1}$ (238 K) / Reference experiments with initially 100 ppb of ozone in pure air
Instrumentation	The AIDA chamber is equipped with a comprehensive, unique set of sensitive instruments for trace gases, aerosol particles, cloud droplets, ice crystals, and physical parameters. Trace gases are measured in situ by long path absorption (3 White cells with optical paths length up to 300 m) using an FTIR spectrometer (VERTEX 80, Bruker) and a tunable diode laser hygrometer (H2O & HDO). Trace gases are sampled via Teflon and coated steel tubes and measured by various monitors (O_3, NO, NO_2, SO_2, CO, CO_2), optical feedback cavity ring down spectroscopy (water isotopologues), as well as mass spectrometers (HR-TOF-CIMS (Iodide ions), Aerodyne; HR-TOF-PTR-MS 4000, Ionicon). Water vapor is measured also by a calibrated reference dew point hygrometer (MBW373). Aerosol particles are characterized online by a high resolution aerosol mass spectrometer (WToF-AMS, Aerodyne, size resolved chemical composition), a chemical ionization mass spectrometer using iodide ions (FIGAERO-HR-TOF-CIMS, Aerodyne, oxidized organic compounds), and a CHARON inlet coupled online to a proton transfer mass spectrometer (CHARON PTR-TOF-MS 4000, Ionicon, volatile particle compounds). Furthermore, different condensation particle counters with different lower cut-off sizes (CPCs, TSI & Palas), different particle sizers covering the size range from 4 nm to 240 µm (SMPS, APS, WELAS OPC) are connected to the chamber. Particle light scattering and depolarization are monitored in situ at a wavelength of 488 nm (SIMONE). Particle optical properties are

The nested table in the Auxiliary mechanism row:

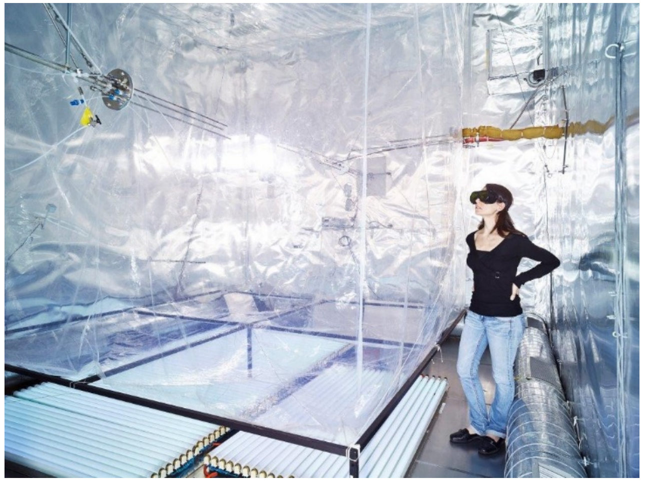
Parameter	Rate	Experiment
Typical wall loss rate for compounds that stick perfectly to aluminum surfaces like acids or N_2O_5	$(8\pm4)*10^{-4}\ s^{-1}$	Reference experiments with different organic and inorganic acids and N_2O_5
Typical wall loss rate for compact nucleation mode particles	$10^{-3}\ s^{-1}$	Reference experiments compared to the aerosol dynamic model COSIMA
Typical wall loss rate for compact particles with diameters between a few ten and a few hundred nanometers	$10^{-6}\ s^{-1}$	Reference experiments compared to the aerosol dynamic model COSIMA
Ozone wall loss in clean air decreases with ozone concentration and temperature	$2.2*10^{-6}\ s^{-1}$ (313 K) $6.8*10^{-7}\ s^{-1}$ (296 K) $4.3*10^{-7}\ s^{-1}$ (238 K)	Reference experiments with initially 100 ppb of ozone in pure air

	measured by a single particle soot photometer (SP2), a photoacoustic absorption spectrometer, and a nephelometer (TSI). Physical parameters like pressure and temperatures are permanently monitored.
Size dependent aerosol loss/lifetime	The wall loss for compact particles in the AIDA chamber range between about 10-3 s-1 (nucleation mode) to 10-6 s-1 for diameters between a few and a few hundred nanometers, respectively. For example the lifetime for compact accumulation mode particles is in the order or 1-2 days and for aggregate particles like soot it is in the order of 10 days. 
Description paper	A review of optical measurements at the aerosol and cloud chamber AIDA, Wagner, R., Linke, C., Naumann, K. H., Schnaiter, M., Vragel, M., Gangl, M. and Horvath, H., Journal of Quantitative Spectroscopy & Radiative Transfer 110 (11), 930-949 (2009) Chamber Simulations of Cloud Chemistry: The AIDA Chamber, Wagner, Robert and Bunz, Helmut and Linke, Claudia and Möhler, Ottmar and Naumann, Karl-Heinz and Saathoff, Harald and Schnaiter, Martin and Schurath, Ulrich, Proceedings of the NATO Advanced Research Workshop No. 980164 “Environmental Simulation Chambers: Application to Atmospheric Chemical Processes", Barnes, I. and Rudzinski, K. (Eds.), Springer (2006)

SAPHIR - General information	
Access mode	Physical access
Infrastructure name and acronym	Simulation of Atmospheric PHotochemistry In a Large Reaction Chamber (SAPHIR)
Photos	
Location	Forschungszentrum Jülich, Jülich, Germany Geographical position: 50.909° N, 6.4131° O
Website	http://www.fz-juelich.de/iek/iek-8/EN/Expertise/Infrastructure/SAPHIR/SAPHIR_node.html
Legal name of organisation operating the infrastructure	Forschungszentrum Jülich GmbH
Description of the infrastructure	

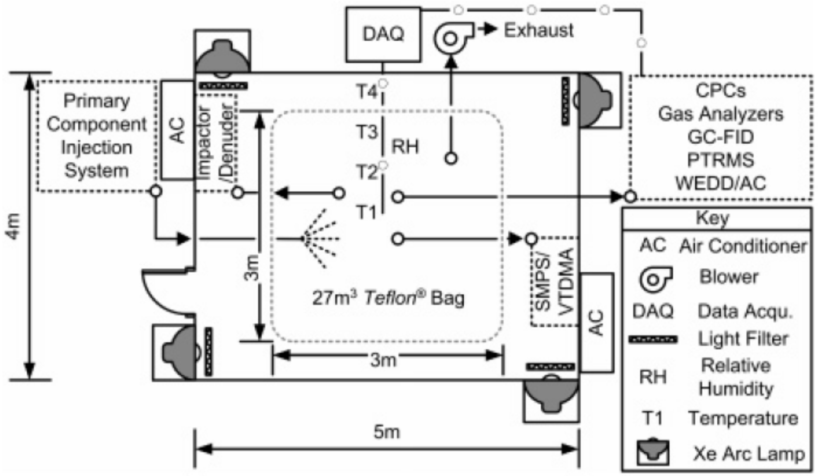
Brief general description of the infrastructure to which access is offered	SAPHIR provides a platform for reproducible studies of the atmospheric degradation of biogenic and anthropogenic trace gases and the build-up of secondary particles and pollutants. The outdoor chamber is of cylindrical shape (volume : 270m3) and has a shutter system that can be quickly opened and closed to expose the air mixtures to sunlight. The high purity of the air supply and the large volume to surface ratio allows running experiments at low, atmospheric concentrations of trace gases with only minor influences of chamber wall interactions, so that the transformation of trace gases and aerosol can be observed over a long period up to several days. Either artificial trace gas mixtures can be added or emissions from plants that are housed in a separate plant chamber, which air can be transferred into the SAPHIR chamber. The SAPHIR chamber is equipped with a comprehensive, unique set of sensitive instruments for radicals, traces gases, aerosols, and physical parameters. Radicals are detected by differential optical absorption spectrometer (OH), which is worldwide the only absolute measurement device for OH radicals, laser induced fluorescence (LIF-FAGE for OH, HO2, RO2, and OH reactivity) and cavity ring-down spectroscopy (NO3, N2O5). Organic species including oxygenated species are measured by proton-transfer mass spectrometer (PTR-TOF-MS) and gas chromatography. Aerosol properties are characterized by a high resolution aerosol mass spectrometer (WToF-AMS, size resolved chemical composition), CPCs, SMPS and cloud condensation nuclei counter. Inorganic species (NO, NO2, O3, HONO) and also physical parameters are permanently monitored.
Services currently offered by the infrastructure and its research environment	• The chamber can be used for high quality experiments investigating the transformation of gas-phase species and aerosols can be performed with the focus on photochemistry. • Measurements of trace gases with instrumentation that is permanently installed at the chamber are made available. Quality of measurements is regularly checked by calibration. • Installation of additional instrumentation provided by users is supported. • Planning of experiments is done in collaboration with experts from Forschungszentrum Jülich.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	3-4 weeks
Community/user type served	SAPHIR is mainly used for research projects.
Scientific and technical support offered	Planning of experiments is assisted by experts from Forschungszentrum Jülich
Logistic and administrative support offered	Support is provided for the logistic and administrative planning of projects at the chamber.

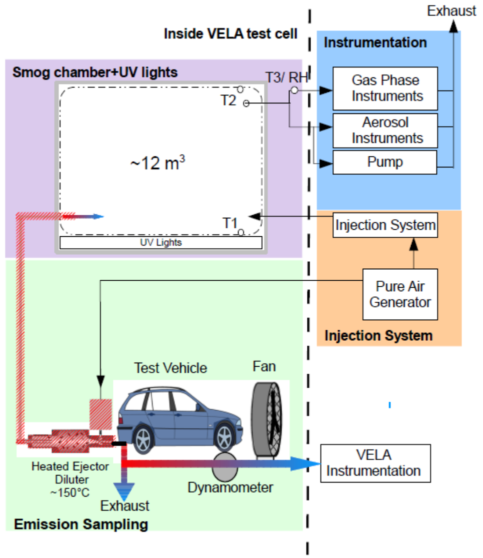
Person in charge of access provision at the infrastructure	Dr. Hendrik Fuchs, researcher, **h.fuchs@fz-juelich.de**
Extended technical information	
Physical description	Outdoor chamber made of double-wall Teflon (FEP) film, cylindrical shape (diameter 5m, length 18m, volume 270m^3) • S/V ratio: ~ 1 • Temperature range: ambient temperature; there is no active temperature control, directly from ambient (typically 10 to 25°C) • RH range: 0 to 90% RH • Projected surface area: ~270m2 surface area in total • Aerosol lifetime: the loss rate is approximately 2 x 10e-5 s-1, meaning a lifetime of 14 hours
Radiation spectra	Natural sunlight. Shutter system allows for experiments in the dark.
Auxiliary mechanism	• Parameterization of sources for nitrous acid, formaldehyde, acetone using measured temperature, solar radiation, relative humidity. • Rate for dilution of trace gases calculated from measured replenishment flow. • Background OH reactivity parameterized as reactant behaving like CO (conversion of OH to HO2). Typical values for OH reactivity less than 1.5s-1. • Ozone loss in clean air (typically rate < 3x10-6s-1. • Photolysis frequencies calculated from actinic flux measured outside the chamber.
Description paper	Rohrer, F., et al. (2005). "**Characterisation of the photolytic {HONO}-source in the atmosphere simulation chamber {SAPHIR}**." Atmos. Chem. Phys. 5: 2189-2201.

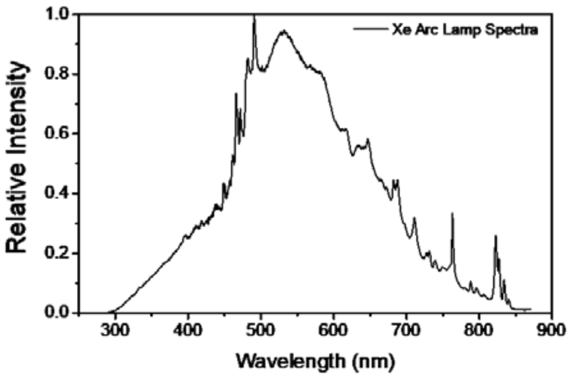
PACS-C3 - General information	
Access mode	Physical access: “hands-on” access to ENV chamber
Infrastructure name and acronym	PSI Atmospheric Chemistry Simulation Chambers (PACS-C3)
Photos	 
Location	Villigen, Switzerland
Website	https://www.psi.ch/lac/smog-chamber
Legal name of organisation operating the infrastructure	Paul Scherrer Institut
Description of the infrastructure	

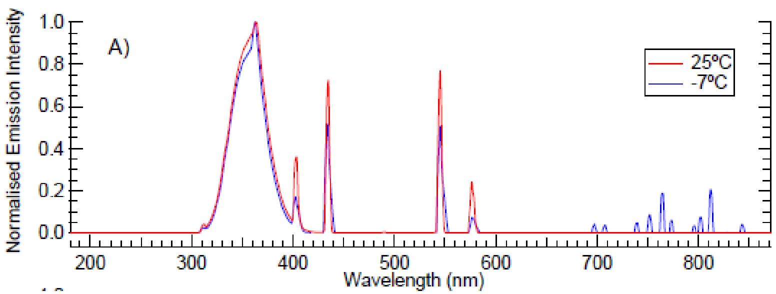
Brief general description of the infrastructure to which access is offered	PACS-C3 consists of 3 different simulation chambers, a stationary 27 m^3 chamber (air-conditioned at 15 to 30 °C), a mobile 9 m^3 chamber (without own air condition), and a stationary 9 m^3 cool chamber (air-conditioned between -10 to 30 °C). The stationary big chamber has the advantage of a large air volume, which is important when many instruments sample for long times, such as for inter-comparison purposes. The mobile chamber can be brought to any emission source and is therefore especially suited to e.g. evaluate secondary organic aerosol (SOA) formation from test benches. The cool chamber is able to simulate SOA formation also at temperatures down to -10°C, which is especially relevant for wood burning emissions, which typically occur at low temperatures. PSI has a full suite of state of the art instrumentation. Depending on the objectives of the campaign, the chambers can be equipped with the following instruments for gas phase characterization: a proton-transfer reaction time of flight mass spectrometer (PTR-TOF-MS), a chemical ionization atmospheric pressure interface time of flight MS (CI-APi-TOF), as well as the standard NOx and ozone monitors; for NO there is also a high sensitivity instrument (detection limit 5 ppt) available, important for experiments a low NOx conditions. For the characterization of the particle phase the following instrumentation is available: condensation particle counters with different lower cut-off sizes (3 and 10 nm), a particle size magnifier (PSM for even smaller particles, scanning mobility particle sizers (SMPS) for the size distribution (two different size ranges available with a nano and a standard SMPS), a high resolution time of flight aerosol mass spectrometer (TOF-AMS), extractive electrospray ionization time-of-flight mass spectrometer (EESI-ToF), an instrument for on-line determination or reactive oxygen species (ROS) and peroxides. In addition, a FIGAERO (Filter Inlet for Gas and Aerosols) coupled to a CI-APi-TOF is available for chemical speciation of gas and aerosol components. For black carbon measurements, a single particle soot photometer (SP2) and an aethalometer are available.
Services currently offered by the infrastructure and its research environment	Visiting scientists are invited to suggest state of the art research to be performed with any of our simulation chambers. In addition, visiting scientists are encouraged to join the PSI experiments according to the Work plan.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Around three weeks of access
Community/user type served	Researchers interested in formation and aging of secondary organic aerosol, or characterization of black carbon.

Scientific and technical support offered	The very large suite of state of the art instrumentation at PACS-C3 will ensure that additional instruments brought in by the scientific visitors will provide the maximum benefit. Moreover, PSI offers specific calibration experiments for instruments measuring black carbon, where the black carbon core aerosols will be coated with varying amounts of scattering material.
Logistic and administrative support offered	Guest house available for cost effective accommodation. Technical support in setting up of instrumentation.
Person in charge of access provision at the infrastructure	Prof. Urs Baltensperger, Laboratory Head, **urs.baltensperger@psi.ch**
Extended technical information	
Physical description	Large Smog Chamber: The chamber is a 27m3 (3×3×3 m) flexible bag made of 125 µm Teflon® fluorocarbon film (FEP). The bag is suspended in a temperature controlled wooden enclosure having dimension 4×5×4 m (L×W×H). Temperature can be stabilized to 1°C within the range of 17 to 25 °C. Four xenon arc lamps and/or a bank of 80 black lights can be used as light source. The surface-to-volume ratio of the chamber is 2 m^2 / m^3 and the chamber can be operated at ambient to slightly above pressures. Aerosol lifetimes in the large chamber can be as long as 12 – 15 hours. JNO_2 for this chamber is 1.6 x 10^{-3} sec^{-1}. Cool Chamber & Mobile Smog Chamber: It consists of 9m3 Teflon bag hung on an aluminum frame together with a battery of 40 100W UV lights (Ergoline, Cleo Performance solarium lamps). Connected to the chamber is a separable control unit consisting of a pure air generation system (737-250 series, AADCO Instruments, Inc., USA) and inlet lines for gaseous components (NO, NO2, O3, H2O, organic compounds). All of these units may be mounted on a trailer for transport or ambient studies, or dismounted and deployed in various configurations. The surface-to-volume ratio of these chambers is 3.2 m^2 / m^3 and can be operated at ambient to slightly above pressures. The JNO_2 values for the chambers is: 3 x 10^{-3} sec^{-1}. Aerosol lifetimes in these chambers is usually ~3-5 hours. Relative humidity in the mobile chamber can be adjusted rapidly and accurately to anywhere between 0-95%. When operated independently of the transport trailer, the temperature is determined by the capabilities of the host facility; experiments have so far been conducted in the range -10 to 30 °C.

Mechanical description (Large Chamber)	 Taken from description paper, DOI: **10.1021/es0489137**

<table>
<tr><td>Mechanical description (Mobile & Cool chamber)</td><td>

Taken from description paper, DOI: 10.5194/acp-13-9141-2013</td></tr>
<tr><td>Irradiation spectra</td><td>Large Smog Chamber:

</td></tr>
</table>

	Mobile & Cool Chamber:  Taken from description paper, DOI: **10.5194/acp-13-9141-2013**
Auxiliary mechanism	hv + wall à HONO (g) 9.1 x 10^6 molecules cm^{-3} sec^{-1} NO_2(g) à 0.5 HONO (g) + 0.5 HNO_3 (wall) 0.53 x 10^{-6} sec^{-1} hv + wall à HCHO (g) 5 x 10^6 molecule cm^{-3} sec $^{-1}$ N_2O_5 (g) à 2 HNO_3 (wall) 1 x 10^{-20} cm^3 sec $^{-1}$ O_3 (g) à O_3 (wall) 4 x 10^{-6} sec^{-1} HNO_3 (g) à HNO_3 (wall) 1 x 10^{-4} sec^{-1} HNO_3 (wall) + hv à NO_2 (g) + OH (g) J_{HNO3} NO_2 (g) + hv + wall à HONO 8.4 x 10^{-6} sec^{-1} Taken from DOI: **10.5194/acp-8-6453-2008**
Description paper	Large Smog Chamber: Dwane Paulsen, Josef Dommen, Markus Kalberer, André S. H. Prévôt, René Richter, Mirjam Sax, Martin Steinbacher, Ernest Weingartner, and Urs Baltensperger. **Secondary organic aerosol formation by irradiation of 1, 3,5-trimethylbenzene-NOx-H2O in a new reaction chamber for atmospheric chemistry and physics**. Environ. Sci. Technol. 39,2668–2678 (2005). DOI: 10.1021/es0489137 Metzger, A., Dommen, J., Gaeggeler, K., Duplissy, J., Prevot, A. S. H., Kleffmann, J., Elshorbany, Y., Wisthaler, A., and Baltensperger, U.: **Evaluation of 1,3,5 trimethylbenzene degradation in the detailed tropospheric chemistry mechanism, MCMv3.1, using environmental chamber data**, Atmos. Chem. Phys., 8, 6453-6468, 2008 DOI : 10.5194/acp-8-6453-2008 Mobile Smog Chamber / Cool Chamber : Platt, S. M., El Haddad, I., Zardini, A. A., Clairotte, M., Astorga, C., Wolf, R., Slowik, J. G., Temime-Roussel, B., Marchand, N., Ježek, I., Drinovec, L., Močnik, G., Möhler, O., Richter, R., Barmet, P., Bianchi, F., Baltensperger, U., and Prévôt, A. S.

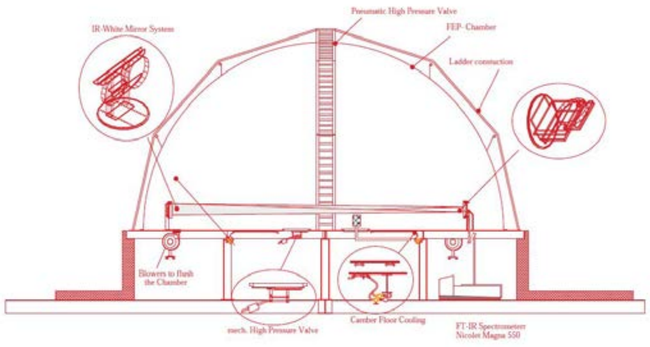
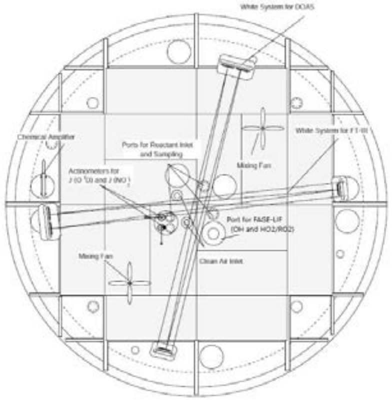
	H.: **Secondary organic aerosol formation from gasoline vehicle emissions in a new mobile environmental reaction chamber**, Atmos. Chem. Phys., 13, 9141-9158, 2013 DOI : 10.5194/acp-13-9141-2013

EUPHORE - General information	
Access mode	Physical access
Infrastructure name and acronym	EUropean PHOtoREactor (EUPHORE)
Photos	
Location	Paterna (Valencia), Spain
Website	http://www.ceam.es/WWWEUPHORE/home.htm
Legal name of organisation operating the infrastructure	Fundación Centro de Estudios Ambientales del Mediterráneo (CEAM)
Description of the infrastructure	
Brief general description of the	EUPHORE is one of the major international outdoor simulation chamber facilities and it is used to research atmospheric chemical processes. Its characteristics allow the simulation of these processes under near-real conditions thanks to its large size and to the use of natural light. The installation has two twin outdoor atmospheric simulation chambers. Each chamber consists of a half

infrastructure to which access is offered	spherical transparent bag of fluorine-ethene-propene (FEP) with a volume of about 200 m3, making it one of the biggest outdoor simulation chambers in the world. EUPHORE chambers are equipped with a large number of analytical instruments for measuring physical parameters as well as a diverse range of biogenic and anthropogenic compounds and its intermediates and products in both the gas and the particle phases. Over its 20-year existence, EUPHORE has become a reference worldwide within its field. Its location in Spain, with a high number of sunny weather days, allows the chambers to be used on nearly 2/3 of the working days per year, and has enabled a large number of studies to be performed and to considerably enhance the expertise of the EUPHORE staff. Installation of a huge number of external high-level instrumentation can be accommodated, to carry out extensive intercomparison/scientific campaigns. The EUPHORE chambers are equipped with a broad number of analytical instruments in order to analyse VOCs, radical species, aerosols, O3, NOx, PAN, organic nitrates, hydroperoxides and organic acids. For in-situ measurements optical techniques such as LP-FTIR and LP-UV/VIS DOAS spectroscopy are available. For the sensitive analysis of reaction products several O3, SO2, CO and NOx monitors, as well as HONO-LOPAP monitor, PTRMS, GC-MS and GC-MS systems can be employed for sampling the trace gas components directly from the gas phase, with pre-concentration techniques (e.g. Solid Phase Microextraction, filters) or with solvent trapping. Also, there are off-line techniques: HPLC, LC-MS and GC-MS for the measurement of a different range of compounds, including biogenic and anthropogenic, both in the gas and in the particle phase. For the measurement of OH and HO2 radicals, a Laser Induced Fluorescence LIF is available. To measure aerosol formation from biogenic or anthropogenic precursor VOCs during oxidation, the EUPHORE installation is equipped with a SMPS system and a continuous-operating microbalance (TEOM) providing particle numbers and mass concentration. Besides, physical parameters are measured to properly characterize the studied processes (P, T, RH, radiation). Features that make it rare in the world: - One of the biggest outdoor simulation chambers in the world, i.e. better simulation of real conditions - It is a reference worldwide, holding a vast experience gained throughout its creation 20 years ago - Wide range of instruments - Humidity control and simulation of NOx profiles - Its location in Valencia allows its wide exploitation - Installation of a huge number of external high-level instrumentation can be accommodated simultaneously, to carry out extensive intercomparison/scientific campaigns
Services currently offered by the infrastructure and its research environment	- Installation of a large number of external high-level instrumentation can be accommodated at the same time, thus allowing extensive intercomparison/scientific campaigns to be performed. - EUPHORE staff EUPHORE gives technical support to users for adaptation of their instruments to the chamber - Electronic and mechanical workshops to ease the adaptation of instruments to the chambers - Data storage and documentation (facility database, on-line protocols with description of the experiments, etc..)

	- Provision and storage of chemicals for the experiments - Guest office for up to 15 people and a library - 50 m2 lab to place user instruments to be directly connected to the chamber, and more than 400 m2 of laboratory where instruments can also be placed
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Between 1 and 4 weeks. Tipically, the campaign starts with the installation of external instruments, which may take 1-2 days, latest discussions and advices to better adapt the experiements and the latest adjustments and chamber conditioning, then 10 days of experiments (1 experiments/day), then 1-2 days for debriefing and base data formatting, saving, and distributing among the users.
Community/user type served	Scientific projects as well as studies contracted by enterprises are welcome. EUPHORE has a vast experience in research oriented projects while in the last years, many companies have used the chambers to test new instrumentation and to carry out studies their products before being released to the market (e.g. pesticides, photocatalytic materials, etc).
Scientific and technical support offered	The EUPHORE team offers support for planning the experiments. Depending on the grade of expertise of the users, EUPHORE staff gives advice on the design of the experiments, for flexible adaptation of the experimental schedule during the measurement campaigns and for data analysis: Equally, data collected with our instrumentation can be analysed by our staff or by the users, which are provided with both the raw and the treated data, when requested.
Logistic and administrative support offered	- Administrative support for ordering chemicals and consumables - Support for the management of chemicals, including gases (ordering, conservation, provision) and gases required for the functioning of the external instruments - Support for hotel booking/accomodation during the stay
Person in charge of access provision at the infrastructure	Dr. Amalia Muñoz, Senior Researcher, EUPHORE facility coordinator **amalia@ceam.es**
Extended technical information	
Physical description	EUPHORE consists of two identical half-spherical FEP (fluorineethene-propene) foil chambers with volumes of approximately 200 m3. A retractable steel housing surrounds the chamber and is used to control the time of exposure to sunlight. The chamber is filled to atmospheric pressure with purified dry air and the temperature and humidity inside the chamber are measured continuously using PT-100 thermocouples and a dew-point mirror system.

	S/V ratio: S/V = 1 m-1 Dimensions: - 2 hemispherical chambers made of FEP foil. - Volume: $200 m^3$ each - Diameter: 9 m Temperature range: Ambient temperature (+ 0-6 K) Pressure range: (ambient pressure + 2 mbar) 990 - 1020 mbar RH range: 0 - 60% if FTIR is used, up to 90% otherwise Geographic position: longitude = -0.5°, latitude = 39.5°N Projected surface area: $63.6 m^2$ (horizontal surface area)
Mechanical description	Each chamber consists of a half-spherical Teflon bag with a volume of ca 200m3. The chambers are made of FEP (fluorine-ethene-propene) foil with a thickness of 0.127 mm, with transmission of more than 80% in the wavelength range between 280 and 640 nm. The chamber consists of 32 welded segments of the foil. The Teflon bags are suspended from a central point inside the frame of ladders. The chambers are protected against atmospheric influences by two half-sphere shaped protective houses. Each chamber floor consists of 32 symmetrically arranged aluminium panels covered with FEP foil. The chamber bags are connected to the floors with the help of specially designed clamps. An integrated rubber cord is used as a seal between the bag and the chamber floor. Located on each chamber floor are 10 large circular openings (diameter of 0.6 m) and 20 smaller openings (diameter of 0.2 m), each closed with aluminum flanges, for accessing the chamber, for installing instrumentation in the chambers and as sampling ports. To compensate heating of the chamber by solar radiation, the chamber floor panels are cooled by a refrigerating system. In order to stabilize the chambers against wind, the pressure in the chambers has to be slightly higher than the outside pressure. To protect the foil different safety precautions are installed. The pressure in the chambers is typically regulated within a range 100 to 200 Pa above the outside pressure. To clean the chambers after an experiment the chamber valve can be opened while air is flushed through the chamber. The inlet and outlet ports and other accessories, like mixing fans, analytical systems, mechanical excess pressure valves, are located on the floor in order that the chamber surface is free for light entry. Integrated into the flanges are ports for the input of reactants and the sampling lines for the different analytical instruments.

	 Pneumatic High Pressure Valve IR-White Mirror System FEP- Chamber Ladder construction Blowers to flush the Chamber mech. High Pressure Valve Camber Floor Cooling FT-IR Spectrometer Nicolet Magna 550  White System for DOAS White System for FT-IR Chemical Amplifier Ports for Reactant Inlet and Sampling Mixing Fan Port for FAGE-LIF (OH and HO2/RO2) Mixing Fan Clean Air Inlet

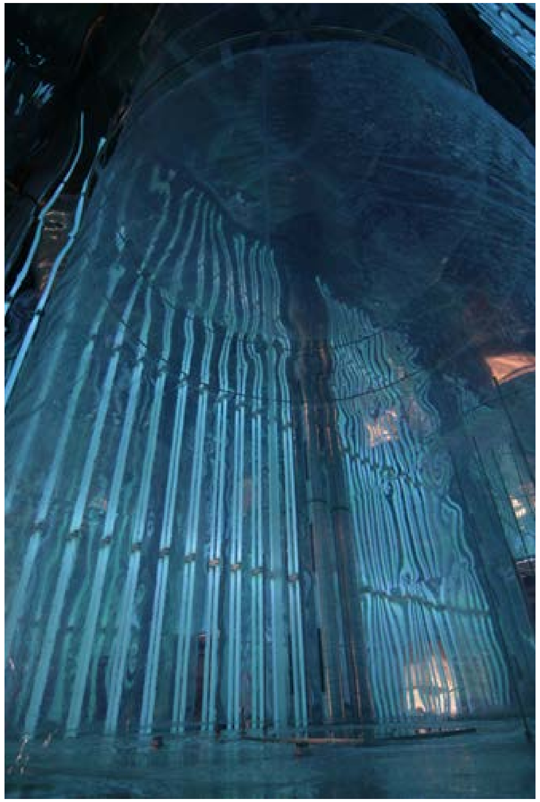
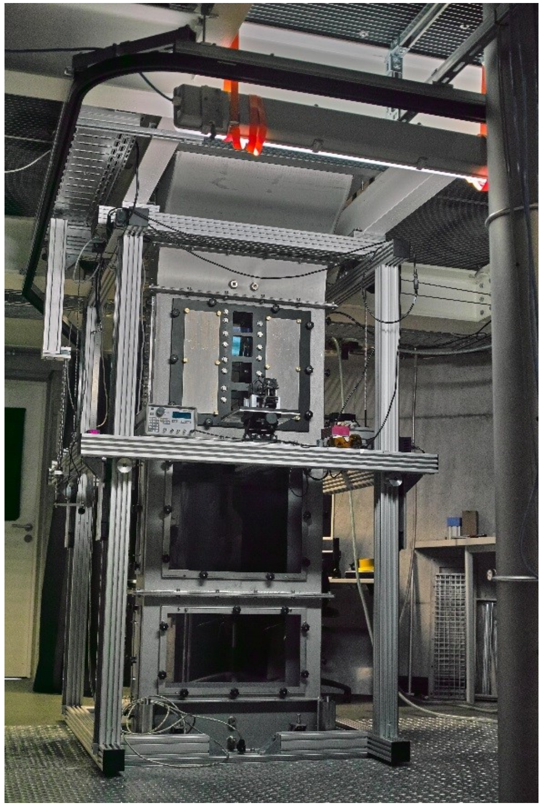
Auxiliary mechanism

Parameter	Rate (lower - upper limit)	Experiment
HCOOH wall source	$S \longrightarrow HCOOH$ Light: $k_{dry} = 2.126 \times 10^{-4}$ ppb s^{-1} $k_{50\%RH} = 6.617 \times 10^{-4}$ ppb s^{-1} Dark : k_{dry} = BDL [a] $k_{50\%RH} = 5.716 \times 10^{-4}$ ppb s^{-1}	Determined in reference experiments
HCHO wall source	$S \longrightarrow HCHO$ $W(HCHO) = c \times j(NO_2)\exp^{(-T0/T)}$ for ($c = 3.1 \times 10^{17}$ cm^{-3} and $T_0 = 5686$ K) Light: $k_{dry} = 1.885 \times 10^{-4}$ ppb s^{-1} $k_{50\%RH} = 1.366 \times 10^{-4}$ ppb s^{-1} Dark : k_{dry} = BDL $k_{50\%RH} = 0.6883 \times 10^{-4}$ ppb s^{-1}	Determined in reference experiments Zador et al. (2006)
HONO wall source	$S \longrightarrow HONO$ Dark : $k_{50\%RH} = 0.2029 \times 10^{-4}$ ppb s^{-1} $W(HONO) = a \times j(NO_2) \times \exp^{(-T0/T)}$ for ($RH<2\%$, $a = 7.3 \times 10^{21}$ cm^{-3}, $T_0 = 8945$ K) $W(HONO) = W(HONO)_{dry} + j(NO_2) \times b \times RHq$ being ($2\%<RH<15\%$, $b = 5.8 \times 10^{8}$ cm^{-3} and $q = 0.36$)	Determined in reference experiments Zador et al. (2006)
O_3 wall source	$S \longrightarrow O_3$ Light: k_{dry} = BDL $k_{50\%RH} = 1.574 \times 10^{-4}$ ppb s^{-1} Dark : k_{dry} = BDL $k_{50\%RH}$ = BDL	Determined in reference experiments
NO wall source	$S \longrightarrow NO$ Light: $k_{dry} = 0.282 \times 10^{-4}$ ppb s^{-1} $k_{50\%RH} = 2.44 \times 10^{-4}$ ppb s^{-1} Dark : $k_{dry} = 0.699 \times 10^{-4}$ ppb s^{-1} $k_{50\%RH} = 0.757 \times 10^{-4}$ ppb s^{-1}	Determined in reference experiments
NO_2 wall source	$S \longrightarrow O_3$ Light: k_{dry} = BDL $k_{50\%RH}$ = BDL Dark : k_{dry} = BDL $k_{50\%RH}$ = BDL	Determined in reference experiments
O_3, NO, NO_2 loss	$X \longrightarrow wX$	Dilution is dominant loss term.

[a] Below detection limit

Irradiation spectra	Natural sunlight. Photolysis frequencies calculated from actinic flux measured inside the chamber.
Description paper	Bloss, C., V. Wagner, A. Bonzanini, M. E. Jenkin, K. Wirtz, M. Martin-Reviejo and M. J. Pilling: (2005a) **Evaluation of detailed aromatic mechanisms (MCMv3 and MCMv3.1) against environmental chamber data**, Atmospheric Chemistry and Physics 5: 623-639 Bloss, C., V. Wagner, M. E. Jenkin, R. Volkamer, W. J. Bloss, J. D. Lee, D. E. Heard, K. Wirtz, M. Martin-Reviejo, G. Rea, J. C. Wenger and M. J. Pilling: (2005b) **Developement of a detailed chemical mechanism (MCMv3.1) for the atmospheric oxidation of aromatic hydrocarbons**, Atmospheric Chemistry and Physics 5: 641-664 Zador, J., V. Wagner, K. Wirtz and M.J. Pilling (2005) **Quantitative assessment of uncertainties for a model of tropospheric**

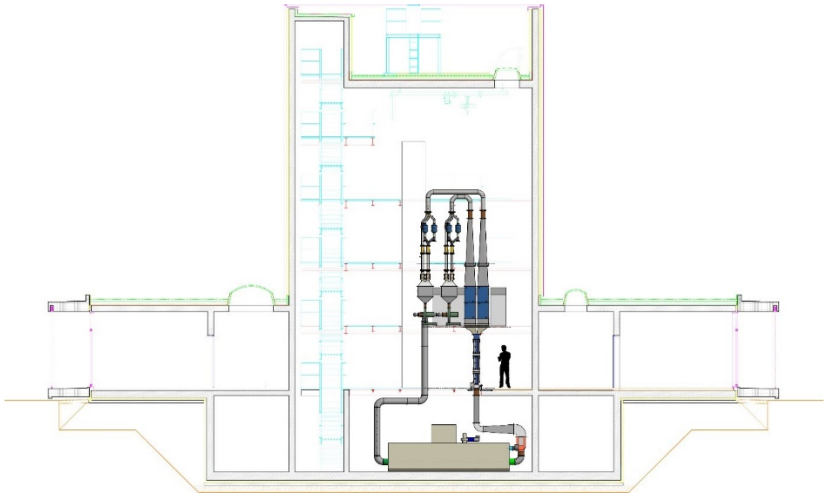
	ethene oxidation using the European Photoreactor (EUPHORE), Atmos. Env. 39, 2805–2817 Zador, J., T. Turanyi, K. Wirtz and M.J. Pilling (2006) **Measurement and investigation of chamber radical sources in the European Photoreactor (EUPHORE)**, J. Atmos. Chem. 55, 147–166

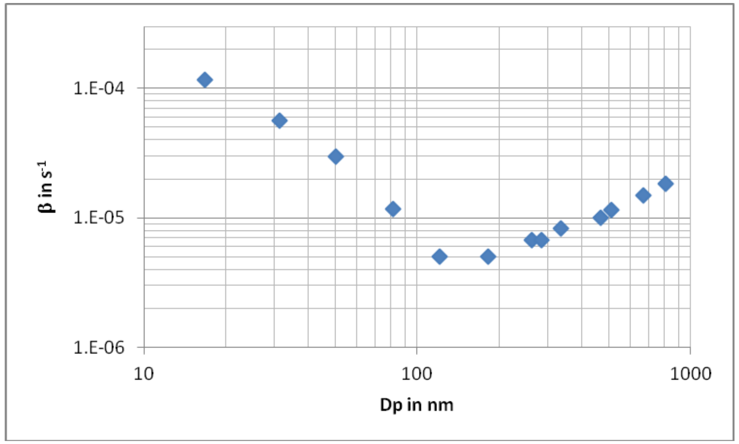
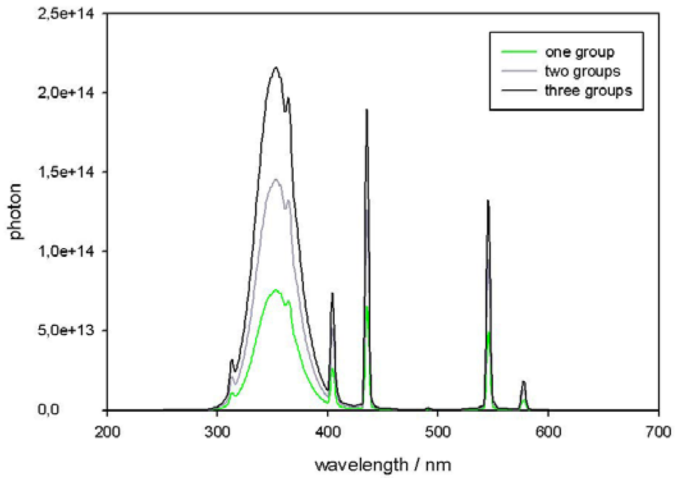
LEAK-LACIS - General information	
Access mode	Physical access
Infrastructure name and acronym	Leipziger Aerosolkammer (LEAK) / Leipziger Aerosol and Cloud Interaction Simulator (LACIS)
Photos	 
Location	Permoserstr. 15, D-04318 Leipzig, Germany

Website	http://www.tropos.de/en/research/projects-infrastructures-technology/technology-at-tropos/aerosol-research-facilities/aerosol-chamber-experiments/ http://www.tropos.de/en/research/projects-infrastructures-technology/technology-at-tropos/aerosol-research-facilities/lacis/
Legal name of organisation operating the infrastructure	Leibniz-Institut für Troposphärenforschung e.V. (TROPOS)
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	The simulation chamber LEAK has a cylindrical geometry, a volume of 19 m^3 and is made of Teflon FEP film. LEAK is equipped with a humidifier, ozone and particle generators. Fifty-six UV lamps (100W Eversun Super, Phillips) are used to illuminate the aerosol chamber. LEAK experiments are performed at humidities up to 80%, allowing the study of multiphase chemical processes with deliquescent particles. Additionally, black-light and low–pressure mercury lamps are installed to produce continuously OH-radicals from HONO or H_2O_2. Outlets of the chamber are connected with a condensation particle counter (CPC), a continuous monitoring ozone analyzer and a particle sampling filter device with a fixed integrated annular denuder to avoid gaseous contamination of the deposited particles during sampling. Additionally, particle sampling can be performed by a condensational sampler (C-GIS) and two available particle-into-liquid samplers (PILS). Since recently LEAK can be operated as a flow-through-reactor which has been proven useful for the study of HOMs / ELVOCs where LEAK belongs to the few chamber installations where these species are being investigated. The size distributions of particles in the aerosol chamber as a function of time are measured by a differential mobility particle sizer (DMPS). An Agilent gas chromatograph (GC-MS) and a PTR-TOF-MS (Ionicon) monitor the gas-phase hydrocarbon concentrations in the chamber. Besides trace gas monitors, a variety of state-of-the-art instrumentation including a CI-APi-TOF (Airmodus, Ltd., Tofwerk AG) and a W-ToF Aerosol mass spectrometer (Aerodyne Inc) is available. For the analysis of particulate products highly sophisticated instrumentation, e.g. High-Performance Liquid Chromatography Electrospray Ionization coupled to Time-of-Flight Mass Spectrometry (HPLC/(-)ESI-TOFMS), Ultra-Performance Liquid Chromatography Electrospray Ionization coupled to Ion-Mobility Mass Spectrometer with a Time-of-Flight Mass Spectrometry (UPLC/ESI-IMS-QTOFMS) and High-Performance Anion-Exchange Chromatography with Pulsed Amperometric Detection (HPAEC-PAD) can be used. Complementary methods are capillary electrophoresis (CE) and CE-MS while auxiliary measurements include carbon sum parameters, ion chromatography and include IC and CE. Very advanced offline analytical capabilities are through cooperation with the UFZ on campus allowing FT-ICR-MS and nano-SIMS studies.

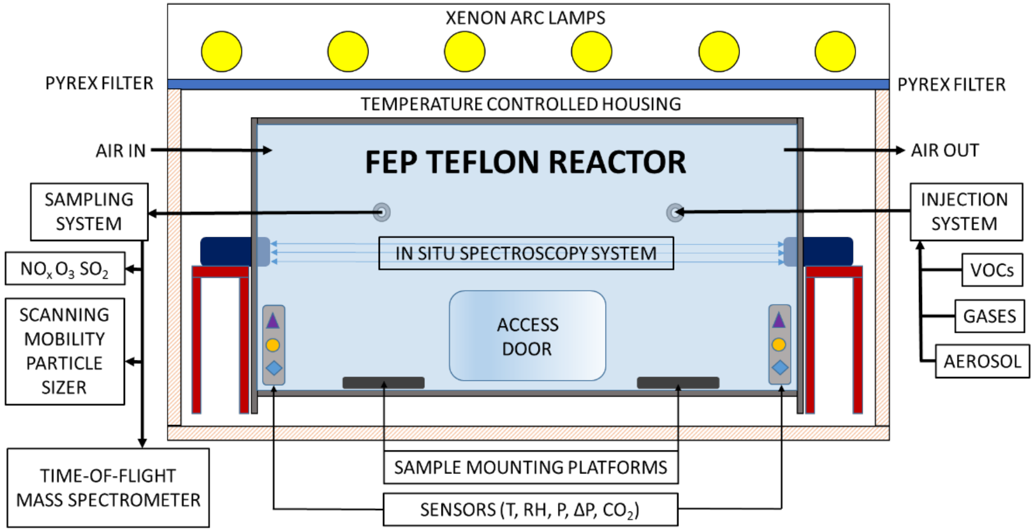
	The Leipzig Biomass Burning Facility (LBBF) is part of LEAK. This facility allows studying not only the emissions from biomass burning but also the processing (aging) of the emitted smoke, i.e. to allow the investigation of gas phase products as well as SOA formation. LEAK and the Leipziger Aerosol and Cloud Interaction Simulator (LACIS) can interact to allow not only the study of chemical particle processes but also the measurement of important microphysical properties like cloud droplet and ice-formation depending on the chemical nature of the particles generated and characterised in LEAK. Hence, in summary, LEAK offers: •The ability to perform experiments at high relative humidities for aerosol multiphase process studies. •Highly sophisticate analytical tools for offline particle organics analysis. •The use of the LBBF for studies of biomass aerosol processing. •The interaction with LACIS for the characterisation of the microphysical properties of the particles. The Leipzig Aerosol and Cloud Interaction Simulator (LACIS) is a world-widely unique infrastructure for investigating aerosol-cloud- interaction processes under well-defined fluid- and thermodynamic conditions. E.g., LACIS has been very successfully, used for studying the hygroscopic growth and activation of aerosol particles. Currently the main focus at LACIS is on heterogeneous ice nucleation induced by lab-generated and natural aerosol particles. LACIS offers a variety of state-of-the-art and high-end peripheral instrumentation for generating and physically characterizing aerosol and ice particles, as well as cloud droplets. Computational fluid and particle / droplet dynamical models are available for determination of suitable experimental conditions and interpretation of experimental results. LACIS is currently extended to allow for the investigation of cloud microphysical processes under turbulent flow conditions. Thereby we are opening up and offering new and unique research opportunities concerning the interactions between cloud microphysics and turbulence. Specifically, LACIS offers: •provision of well-defined and -characterized aerosol-particles •opportunities to investigate cloud microphysical processes under well-defined thermodynamic, laminar or turbulent flow conditions. This includes both fundamental research at process level, and the intercomparison and evaluation of instrumentation.
Services currently offered by the infrastructure and its research environment	LEAK-LACIS has a more then 10-year history in providing access for guest researchers from all over the world. This comprises both, the scientific and logistical organisation of scientific activities in general and measurement campaigns, in particular. Efficient high-quality research is ensured through the existing excellent expertise in the experimental and theoretical investigation of gas-phase processes, SOA formation processes and the processing of biomass burning exhausts as well as aerosol and cloud microphysical processes. LEAK-LACIS is operated by a team of highly motivated, capable, and experienced

	PhD-, PostDoc-, and senior-level scientists which makes high quality scientific work and stimulating discussion a matter of course. Last but not least, TROPOS has year-long experience in the logistics of hosting guest scientists and organizing international transport of equipment.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	A total of 110 access days is offered under EUROCHAMP-2020 at LEAK-LACIS including provision of peripheral instrumentation for chemical analysis, peripheral instrumentation for physical aerosol characterization and use of biomass burning facility. Most campaigns have a duration between 1 and 3 weeks. A typical work includes 2-3 days to carefully prepare the experiments, then 10 days of experiments (1 experiments/day), then 1-2 days for debriefing and base data formatting, saving, and distributing among the users.
Community/user type served	Users from the academic sector (expert as well as young researchers) make up the vast majority of the users.
Scientific and technical support offered	Both scientific and technical support is offered at LEAK-LACIS.
Logistic and administrative support offered	Support concerning shipping, handling of instrumentation, travel and accommodation is offered at LEAK-LACIS.
Person in charge of access provision at the infrastructure	LEAK: Prof. Dr. Hartmut Herrmann, Head of the Atmospheric Chemistry Department (ACD), **herrmann@tropos.de** LACIS: Dr. Frank Stratmann, Head Experimental Aerosol and Cloud Microphysics department, **straddi@tropos.de**
Extended technical description	
Physical description	The LEAK-chamber is made of Teflon FEP 500A with a cylindrical geometry Volume: 19 m3 Diameter: 3m Height: 2.68 m Surface-to-volume ratio : 2 m-1 temperature range: LEAK: 16-30°C; ACD-C: 10-40°C Irradiation JNO2: 6.4x10-3 s-1

	Pressure range: ambient RH range: <5% to 80% The LACIS is a turbulent humid-air wind-tunnel, i.e., a flow through chamber, made of stainless steel with a cubic geometry. Length: 2.0 m Width: 0.8 m Depth: 0.2 m Volume: 0.32 m3 Surface-to-volume ratio: 12.5 m-1 Flowrate: 10000 l/min Temperature range: -40°C ... +25°C Pressure range: measurements are performed in ambient pressure RH range: ~1% - 100%~, supersaturation can be achieved through isobaric mixing of two saturated air-flows (up to 2% so far).
Mechanical description (LACIS)	

Size dependent aerosol loss/lifetime (LEAK)	
Irradiation spectrum	
Description paper	LEAK: Mothes et al to Mutzel, A., Poulain, L., Berndt, T., Iinuma, Y., Rodigast, M., Böge,O., Richters, S., Spindler, G., Sipilä, M., Jokinen, T., Kulmala,M., and Herrmann, H.: **Highly Oxidized Multifunctional Organic Compounds Observed in Tropospheric Particles: A Fieldand Laboratory Study**, Environ. Sci. Technol., 49, 7754-7761, https://doi.org/10.1021/acs.est.5b00885, 2015

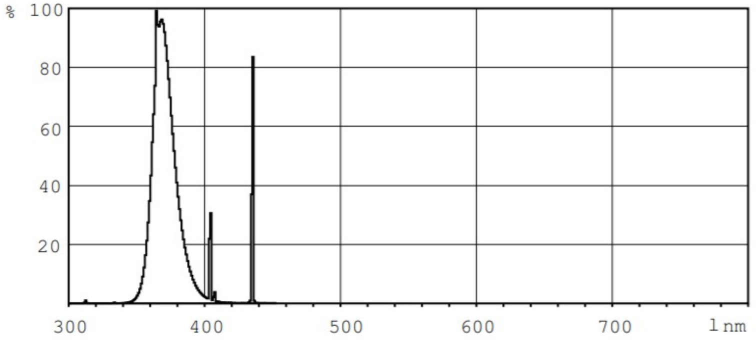
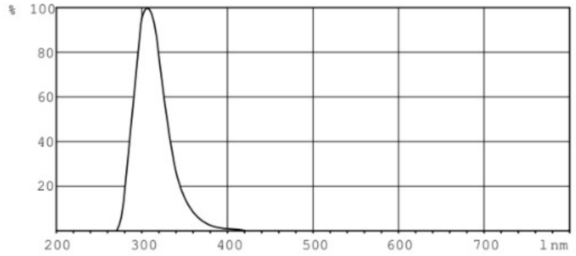
	LACIS: Niedermeier, D., Voigtländer, J., Schmalfuß, S., Busch, D., Schumacher, J., Shaw, R. A., and Stratmann, F.: **Characterization and first results from LACIS-T: A moist-air wind tunnel to study aerosol-cloud-turbulence interactions**, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2019-343, in review, 2019.

IASC - General information	
Access mode	Physical access
Infrastructure name and acronym	Irish Atmospheric Simulation Chamber (IASC)
Photos	
Location	Cork, Ireland
Website	http://www.ucc.ie/en/crac/facilities/iasc
Legal name of organisation operating the infrastructure	University College Cork - National University of Ireland, Cork

Description of the infrastructure

Brief general description of the infrastructure to which access is offered	IASC is a new custom-built facility funded by €1.1M from Science Foundation Ireland. The chamber is a 27 m^3 cuboid (4.5 m long x 3 m wide x 2 m high) made of FEP Teflon foil, supported in a frame and surrounded by a temperature-controlled housing. Several banks of UV lamps provide radiation to enable studies of atmospheric photochemistry. The chamber is fitted with valves for filling/flushing the chamber with purified air and numerous ports for adding/sampling gases and particles. A specially designed access door allows items (sensors, test materials) to be positioned inside the chamber. The facility is equipped with a comprehensive range of instruments: • State-of-the-art chemical ionisation time-of-flight mass spectrometer for monitoring volatile organic compounds (VOCs) and other gases at atmospherically relevant concentrations. • Unique custom-built spectroscopy system for in situ measurements of gases, radicals and properties of particles. Current capabilities are based on cavity enhanced spectroscopies and include HONO, NO_2, NO_3, radicals, as well as halogenated species (I2, IO etc.) and total extinction in the near UV. The system is customisable and can be adapted to measure a range of species over different parts of the spectrum. • Continuous online measurements of gases (NO_x, O_3, SO_2 analyzers) and particles (scanning mobility particle sizer). • Two instruments that are unique within the EUROCHAMP consortium are also available: - Single particle mass spectrometer (ATOFMS) for online measurements of aerosol composition - Wideband integrated bioaerosol sensor (WIBS) for measurements of biological particles (bioaerosols).
Services currently offered by the infrastructure and its research environment	The new IASC facility is well equipped for innovative studies that address major challenges in air quality and climate research. The scientific team are experts in VOC degradation, SOA formation and characterisation, development and application of novel spectroscopic techniques for atmospheric measurements. We encourage fellow scientists working in these areas to make use of our unique facilities. However, the chamber has also been built to attract users from other areas, especially materials science and technology. The versatile and highly-instrumented nature of the infrastructure makes it an ideal testbed for new technologies in atmospheric monitoring, sensors, pollutant removal etc. The facility will thus promote new synergistic collaborations between researchers in atmospheric and materials science, resulting in increased attractiveness to international partners and greater competitiveness in H2020 research funding calls.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	10 to 15 access days

Community/user type served	- Academic users (PhD and postdocs) for atmospheric process studies - Industrial/SME partners for testing and evaluating performance of new sensors, atmospheric monitoring equipment etc.
Scientific and technical support offered	Scientific support is provided by Prof. John Wenger, Prof. Andy Ruth and Dr. Dean Venables, who will work with users on experimental design and generate a detailed day-to-day plan for visits. Training in general use of the chamber and instrumentation will be provided by PhD qualified Technical Officers with many years of experience in this area. The technical team will also facilitate any modifications required to connect instruments, insert sensors and test materials etc. Interpretation of data obtained by the time-of-flight mass spectrometer will be supported by Prof. Wenger, while detailed operation of the in-situ spectroscopy system (and subsequent data analysis) will be supervised by Prof. Ruth and Dr. Venables.
Logistic and administrative support offered	The IASC Management Team will deal with all access requests and work with users to identify days/weeks that are most suitable for the proposed work. The operating schedule will be posted on the Facility's website and updated regularly. Financial aspects of the Access Charge Plan will be managed by experienced staff working in the Chemistry Department and the University Finance Office.
Person in charge of access provision at the infrastructure	Professor John Wenger, Director of Centre for Research into Atmospheric Chemistry - University College Cork. **j.wenger@ucc.ie**
Extended technical description	
Physical description	Cuboid made of FEP Teflon foil Dimensions: 3.85 m long, 2.40 m wide and 3.00 high. Volume = 27.2 m3 Surface area = 56.0 m2 Surface/volume = 2.1 m-1 Temperature range = 18 – 23 °C Pressure range = 1000-1030 mbar RH range <1% - 65%

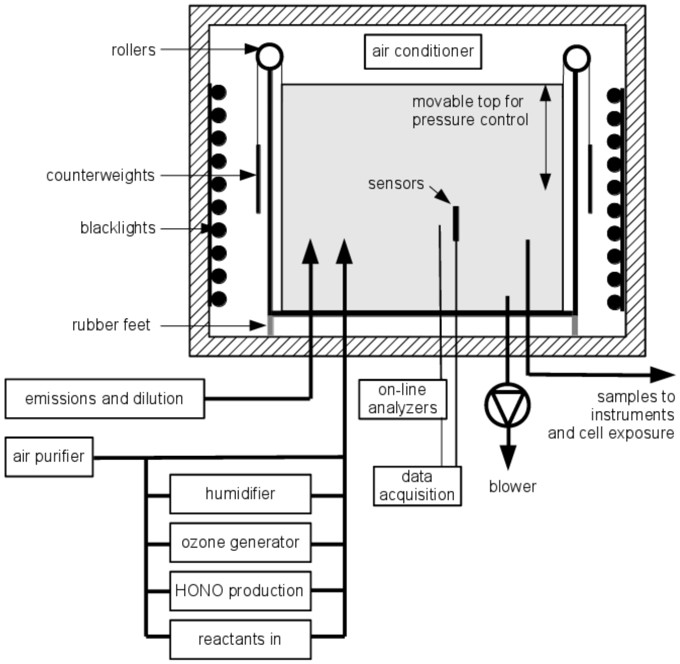
Irradiation spectra	125 UVA Lamps (Phillips Actinic BL TL 40W/10) Emission spectrum  25 UVB Lamps (Phillips TL 40W/12 RS) Emission spectrum  Estimated maximum J(NO2) value = $6{\times}10^{-3}$ s^{-1}

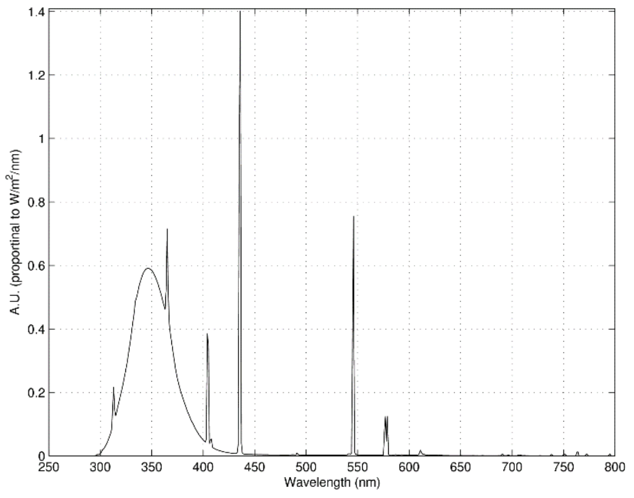
ILMARI - General information	
Access mode	Physical access
Infrastructure name and acronym	Aerosol physics, chemistry and toxicology research unit (ILMARI)
Photos	
Location	Kuopio, Finland
Website	http://www.uef.fi/en/web/ilmari
Legal name of organisation operating the infrastructure	University of Eastern Finland (UEF)
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	The ILMARI chamber has been designed for performing aging studies of emissions from different sources in atmospherically relevant conditions. The suite of sources includes biomass burning appliances and vehicles mounted on a chassis dynamometer. The chamber is a batch reactor where the oxidizing environment, humidity, temperature, the amount of initial seed, and UV conditions are controlled. The chamber is located in an air-conditioned and temperature-controlled enclosure and it consists of a 29 m3 TeflonTM FEP bag mounted in a frame which has a movable top and a counterweight system to ensure the pressure control over the experiments. Normally, the chamber is kept at an overpressure of a few Pa, in order to minimize the inward flow of contaminants. The measured half-life of aerosol particles in the chamber is at least 8 hours (size-dependent). In the emission experiments, the diluted emissions from combustion sources or selected precursor organics are injected to the chamber so that the wanted concentrations are achieved. Photochemical reactions are initiated by ultraviolet radiation produced by blacklight lamps located in the sides of the chamber. Two types of lamps, with spectra centered at 350 nm and 340 nm, are used to produce radiation spectrum that corresponds the radiation conditions comparable to local atmospheric conditions. The chamber enclosure is coated with reflective aluminium blanket to maximize the irradiance in the chamber and to ensure an equal illumination. When dark aging is desired, oxidants,

	such as ozone, can be injected into the chamber. The ozone production capacity in ILMARI is high enough to achieve also ozone concentrations of several ppm, if needed, in the experiments and cleaning procedure. Between experiments the chamber is flushed with clean air produced by an AADCO 737-250 air purifier with methane reactors and humidified with ultrapure deionized water to the wanted humidity. The temperature and relative humidity are measured in the middle of the chamber and gaseous components, such as ozone, oxides of nitrogen, sulphur dioxide, and carbon dioxide, are monitored continuously. ILMARI is equipped with state-of-the-art particle and gas analysis systems. Particle size distributions can be measured online using Differential Mobility Analysers (DMA), the Electrical Low Pressure Impactors (ELPI) and the Fast Mobility Particle Sizer (FMPS). For online particle measurements condensation particle counters (CPC), Tapered Element Oscillation Microbalance (TEOM) and Nanoparticle Surface Area Monitor (NSAM) are available for online particle number, mass and surface area measurements, respectively. Particle size-resolved chemical composition is analysed with Soot Particle Aerosol Mass Spectrometer (SP-AMS). Gas compounds are analysed using several single component gas analysers, an FTIR multicomponent analyzer, as well as with mass spectrometers including Proton Transfer Reaction – Mass Spectrometry (PTR-MS) and atmospheric pressure chemical ionization mass spectrometry (API-ToF-MS). Aerosol optical properties (light scattering and absorption) are measured with a nephelometer and an aethalometer, respectively. Further aerosol analysis systems include the Aerosol Particle Mass Monitor (APM), Cloud Condensation Nuclei counter (CCNc), Hygroscopic and Volatility Tandem Differential Analyzers (HTDMA, VTDMA), and a Spectrometer for Ice Nuclei (SPIN). Off-line analyses of particles and gases are carried out from filters, impactior substrates and absorbent tubes. From the collected particulate sample metals, water soluble ions, PAHs, organic carbon (OC) and element carbon (EC) can be analysed. Also samples for electron microscopy using SEM and TEM with EDS elemental analyses are performed. Features that make it rare in the world: - Connection to a versatile set of emission sources - Connection to an on-line exposure system for living cells, for health effect studies

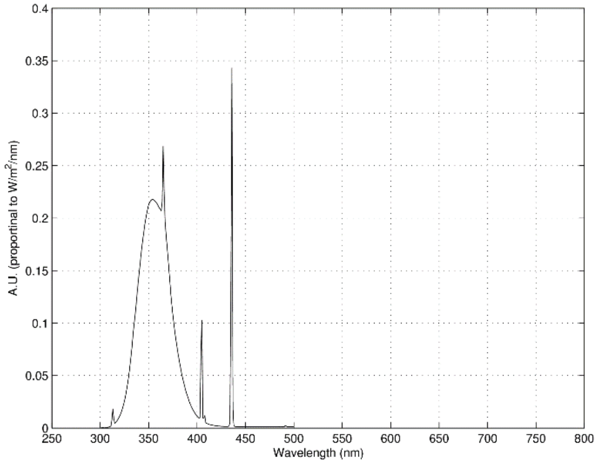
	- Quality and versatility of the instrumentation - Considerably long half-life of aerosol particles
Services currently offered by the infrastructure and its research environment	The services offered by the infrastructure include: - Access to the full equipment of the ILMARI chamber -Technical assistance by experienced aerosol physicists and laboratory engineers - Personnel to operate the full ILMARI facility - Copy of all the level 0 data at the end of the campaign - Data treatment up to level 1 when requested - Daytime access to the lab spaces if requested - In-campus accommodation - Guest office and internet access for visitors - Support for ordering chemicals and consumables
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Between 2 and 4 weeks plus the preparatory phase. A typical work includes: - one or two weeks preparation by UEF personnel to carefully prepare the experiments (latest protocol adjustments, connection and preparation of emission sources and measurement instruments, and training on the use of the chamber and on the main services). NB! The infirmation about the campaign timing must be submitted to UEF **at least 6 months before** the actual measurement campaign, to confirm the availability of the ILMARI facility. - Experiments (1 experiment per day, including week-ends if needed) - Dynamic debriefing and adjustment of experiments during the measurement campaign, if needed - a couple of days for debriefing and ase data formatting, saving and distributing among the users - 1-2 weeks of data processing by UEF personnel for level 1 data availability
Community/user type served	The ILMARI chamber is mainly used for research projects but it is also open to experiments conducted with companies.

Scientific and technical support offered	Due to the complexity of ILMARI facility, UEF personnel operates the full facility. Scientific support is available for planning the measurements and for data analysis and interpretation.
Logistic and administrative support offered	Administrative support for ordering chemicals and consumables, logistic support for the management of chemicals, including gases (ordering, conservation, provision).
Person in charge of access provision at the infrastructure	Annele Virtanen, Professor, **annele.virtanen@uef.fi**
Extended technical information	
Physical description	The ILMARI chamber is a collapsible bag made of Teflon FEP with a shape of a rectangular prism. Dimensions: 3.5 m (L), 3.5 m (W), 2.4 m (H) Volume: 29.4 m^3 Surface area: 58.1 m^2 Surface-to-volume ratio: 2.0 m^{-1} S/V ratio: 2 m^{-1} Temperature, pressure, and RH range: The temperature in ILMARI chamber in irradiation experiments can be controlled between 20 and 40 degC and in dark experiments between 15 and 40 degC, although typically the experiments are done at 20 ± 1 degC. The pressure in the chamber is not controlled and is the prevailing atmospheric pressure plus the few pascals overpressure. The relative humidity in the chamber can be adjusted between 3 and 100 %RH but typical humidities are 3-5 %RH for dry experiments and 50%RH for humid experiments. - Injection and sampling lines through the chamber floor. - A maintenance hatch in the chamber floor for in-chamber access. - The collapsible bag is attached to a movable top frame for pressure control. - Blacklight lamps on two opposite sides of the chamber. - In an thermally insulated enclosure whose inner walls are covered with reflecting aluminium foil.

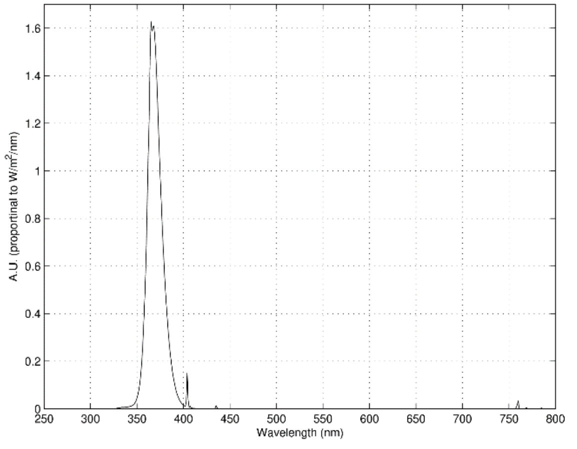
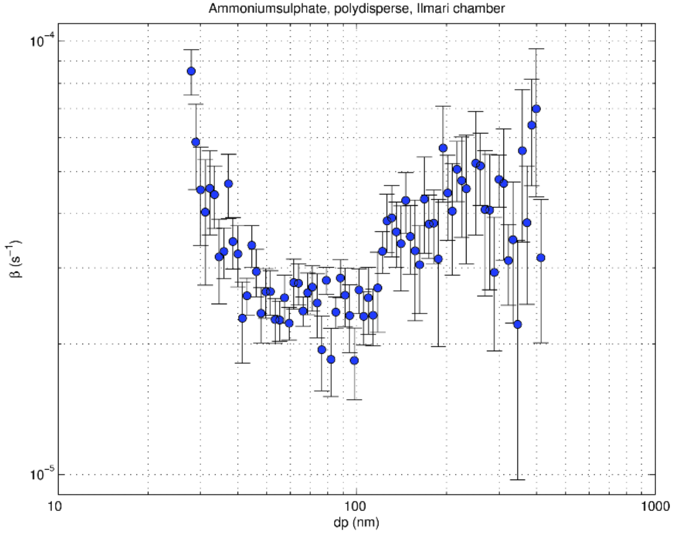
Mechanical description	
Irradiation spectra	In ILMARI, three types of blacklight lamps have been used: "365 nm", "350 nm", and "340 nm". The usage of the 365 nm lamps has been discontinued. Spectrum for "340 nm" lamps:



Spectrum for "350 nm" lamps:



Spectrum for "365 nm" lamps:

	
Size dependent aerosol loss/lifetime	

<table>
<tr><td>Auxiliary mechanism</td><td>
<table>
<tr><th>Parameter</th><th>Rate (lower - upper limit)</th><th>Experiment</th></tr>
<tr><td>Dilution</td><td>$X + DIL \longrightarrow$</td><td>The ILMARI chamber is used as a batch reactor. In typical experiments the sample in the chamber is not diluted.</td></tr>
<tr><td>O_3 loss</td><td>$O_3 \longrightarrow wO_3$
$k = 0.65\ (0.5 – 0.8) \times 10^{-6}\ s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>Heterogeneous NO_2 reaction</td><td>$NO_2 \longrightarrow 0.5HONO + 0.5HNO_3$
$k = 0.3\ (0.2\text{-}0.4) \times 10^{-6}\ s^{-1}$ (dry)
(up to $4.5 \times 10^{-6}\ s^{-1}$ in humid conditions)</td><td>Direct measurement of NO_2 loss and HONO increase</td></tr>
<tr><td>Photolytic HONO wall source</td><td>hv + wall $\longrightarrow$ HONO
$k = 3\ (1.5\text{-}6) \times 10^{6}$ molec $cm^{-3}\ s^{-1}$</td><td>Direct measurement of HONO and comparison to the simulated HONO</td></tr>
<tr><td>Photolytic Heterogeneous NO_2 reaction</td><td>NO_2 + hv + wall $\longrightarrow$ HONO
$k = 9\ (4 – 16) \times 10^{-6}\ s^{-1}$</td><td>Comparison of simulation and measurements</td></tr>
</table>
</td></tr>
<tr><td>Description paper</td><td>Leskinen, A., Yli-Pirilä, P., Kuuspalo, K., Sippula, O., Jalava, P., Hirvonen, M.-R., Jokiniemi, J., Virtanen, A., Komppula, M., and Lehtinen, K.E.J.: Characterization and testing of a new environmental chamber, Atmos. Meas. Tech., 8, 2267–2278, 2015, doi:10.5194/amt-8-2267-2015</td></tr>
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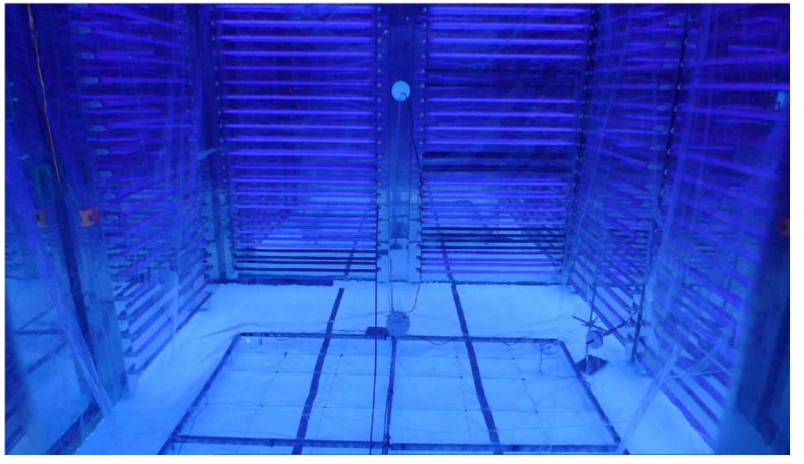
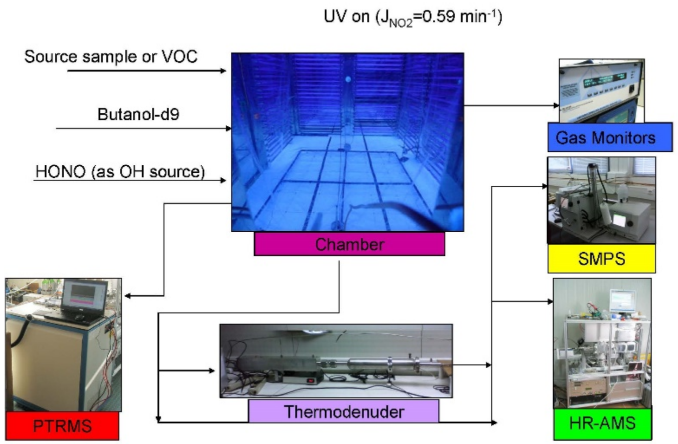
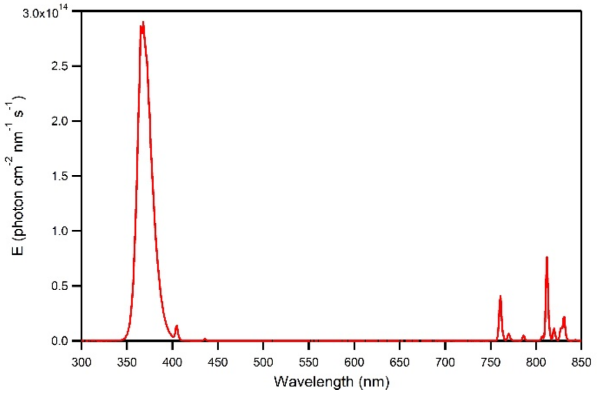
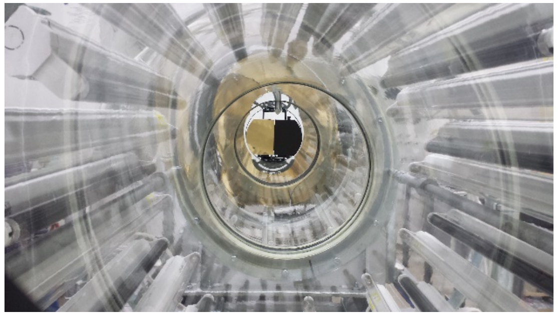
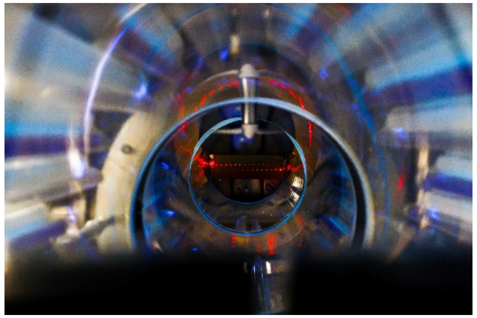
FORTH-ASC - General information	
Access mode	Physical access
Infrastructure name and acronym	FORTH Atmospheric Simulation Chamber (FORTH-ASC)
Photos	
Location	Patras, Greece
Website	**Laqs.iceht.forth.gr**
Legal name of organisation operating the infrastructure	Foundation for Research and Technology Hellas, Institute of Chemical Engineering Sciences (FORTH/ICEHT)
Description of the infrastructure	
Brief general description of the infrastructure to	Indoor chamber: 10_3 Teflon reactor in $30m_3$ temperature controlled UV-equipped room. plus two $2m_3$ Teflon reactors inside UV-equipped enclosure. Outdoor mobile chamber system: Two $2m_3$ Teflon reactors inside UV-equipped enclosure. The system can be used either outdoors in Patras or can be moved with the help of the FORTH mobile laboratory to the desired location.

which access is offered	Instrumentation includes: HR-AMS, PTR-MS, SMPS, ultrafine-SMPS, APS, thermodenuder, SO_2, NOx, CO, CO_2, O3, NH_3 monitors, MAAP, TEOM, nephelometer, Dry-Ambient Aerosol Size Spectrometer (DAASS). Unique features: source characterization (wood burning, open burning, gasoline and diesel engines, scooters, food cooking, etc.) The chamber can operate with natural sunlight, artificial UV, or in the dark. Instrumentation can be housed inside the FORTH mobile laboratory. Unique abilities to perform ambient air perturbation experiments (starting with ambient air) changing the conditions in the first chamber and keeping the second as baseline. Can be moved to field sites.
Services currently offered by the infrastructure and its research environment	- Testing/intercomparisons of new instruments. - Studies of specific organic aerosol systems. - Atmospheric “perturbation” experiments. - Characterization of sources. - Chemical aging experiments for primary and secondary organic aerosol. - Ambient nucleation experiments.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Between 2 and 4 weeks. A typical campaign includes 2-3 days of preparing the chamber for the experiments (e.g. connection of external instruments, testing), then 10-15 days of experiments (one experiment per day) and finally 2-3 days of data sharing and preliminary analysis and planning of the rest of the analysis and synthesis.
Community/user type served	The FORTH chamber has been used until now mainly by the academic sector. However, it is available for both the private sector and government.
Scientific and technical support offered	The FORTH team (depending on user needs) can either perform or train the user to perform all activities. In the one unit of access we include the: - Preparation of chamber (cleaning, testing, characterization) - Experiment (design is quite flexible, all instruments of LAQS are available) - Correction of raw data [HR-AMS corrections for collection efficiency, wall loss corrections for particles, quality assurance/quality control of data]
Logistic and administrative support offered	Assistance with transport and installation of additional instrumentation to the site is offered. Troubleshooting and repairs can be provided. The institute offers assistance by providing local accommodations.

Person in charge of access provision at the infrastructure	Dr. Evangelia Kostenidou, LAQS Manager, **v_kostenidou@chemeng.upatras.gr**
Extended technical information	
Physical description	The main FORTH-ASC chamber is a 10 m^3 Teflon reactor inside a 30 m^3 temperature-controlled UV-equipped room. The dimensions of the reactor are approximately 2.2 x 2.2 x 2 m. The reactor operates at a little above atmospheric pressure. S/V ratio: 2.7 m^{-1} Irradiation J_{NO2}: 0.59 hr^{-1} or 0.4 hr^{-1} (2/3 of the lights on) or 0.2 hr^{-1} (1/3 of the lights on) Temperature range: 15-40° C RH range: <5% - 90% Projected surface area: 4-5 m^2
Mechanical description (image)	Teflon reactor suspended inside a 30 m^3 room with polished aluminum covered walls. The vertical walls are covered with black lights 

<table>
<tr><td>Irradiation spectra</td><td>
</td></tr>
<tr><td>Size dependent aerosol loss/lifetime</td><td>10-20 hr for 0.1-2 µm particles (defined as in 1/k, where k is the particle wall loss rate constant to the walls)</td></tr>
<tr><td>Auxiliary mechanism</td><td>
<table>
<tr><th>Parameter</th><th>Rate (lower - upper limit)</th><th>Experiment</th></tr>
<tr><td>O_3 loss</td><td>$O_3 \longrightarrow wO_3$
$k = 1\ (0.5 - 1.6)$</td><td>Determined in reference experiments</td></tr>
<tr><td>NO loss</td><td>$NO \longrightarrow wNO$
$k = 2.5\ (2.2 - 3.1) \times 10^{-6}\ s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>NO_2 loss</td><td>$NO_2 \longrightarrow wNO_2$
$k = 0.81\ (0.56 - 0.94) \times 10^{-6}\ s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>Toluene loss</td><td>Tol $\longrightarrow$ wTol
$k = 1.8\ (1.2 - 2.1) \times 10^{-6}\ s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>A-pinene loss</td><td>a-pin $\longrightarrow$ w a-pin
$k = 6\ (3.4 - 7.8) \times 10^{-6}\ s^{-1}$</td><td>Determined in reference experiments</td></tr>
</table>
</td></tr>
</table>

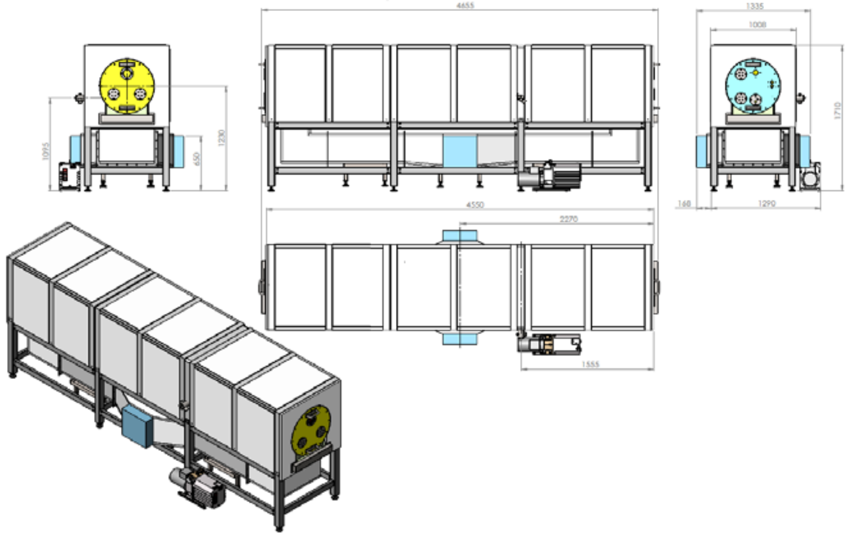
Description paper	Information about the chamber can be found in the following publications: - Kostenidou E., C. Kaltsonoudis, M. Tsiflikiotou, E. Louvaris, L. M. Russell, and S. N. Pandis (2013) Burning of olive trees : a major organic aerosol source in the Mediterranean, Atmos. Chem. Phys., 13, 8797-8811. - Kaltsonoudis, C., E. Kostenidou, E. Louvaris, M. Psichoudaki, E. Tsiligiannis, K. Florou, A. Liangou, and S. N. Pandis (2017) Characterization of fresh and aged organic aerosol emissions from meat charbroiling, Atmos. Chem. Phys., 17, 7143-7155. - Louvaris, E. E., E. Karnezi, E. Kostenidou, C. Kaltsonoudis, and S. N. Pandis (2017) Estimation of the volatility distribution of organic aerosol combining thermodenuder and isothermal dilution measurements, Atmos. Meas. Tech., 10, 3909-3918.

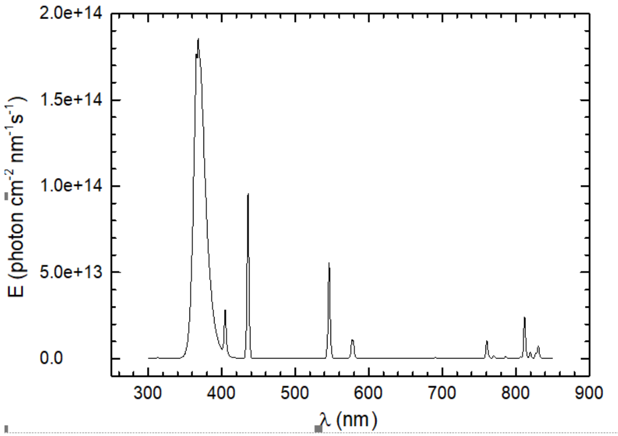
CERNESIM - General information	
Access mode	Physical access
Infrastructure name and acronym	Iintegrated Centre of Environmental Science Studies in the North East Region (of Romania), (CERNESIM)
Photos	 
Location	Iasi, Romania
Website	https://www.erris.gov.ro/cernesim.uaic.ro
Legal name of organisation operating the infrastructure	Alexandru Ioan Cuza University of Iasi
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	The indoor ESC-Q-UAIC chamber is a closed cylindrical vessel of internal dimensions of 0.48 m diameter and 4.2 m length. The reactor volume is of 760 L and the ratio of interior surface to volume is about 8.8 m-1. This rigid reactor is made of three quartz tubes connected by flanges and is vacuum compatible. It can be operated over a range of pressure from 5×10-3 to 1200 mbar. The chamber body is mounted on a steel framework with help of six adjustable anti-vibrating stands in order to limit the vibration effects coming from the ground level and the pumping system. The chamber is connected to the ground to prevent any electrical charge build-up. It is closed at both ends by stainless steel flanges with appropriate insertions for reactants and bath gases inlet systems, pressure and temperature measurement units. Sampling lines made either of PTFE or stainless steel are appropriately disposed for on-line/off-line measurements of various chemical parameters (gaseous or aerosol phase products). A technical description (vacuum

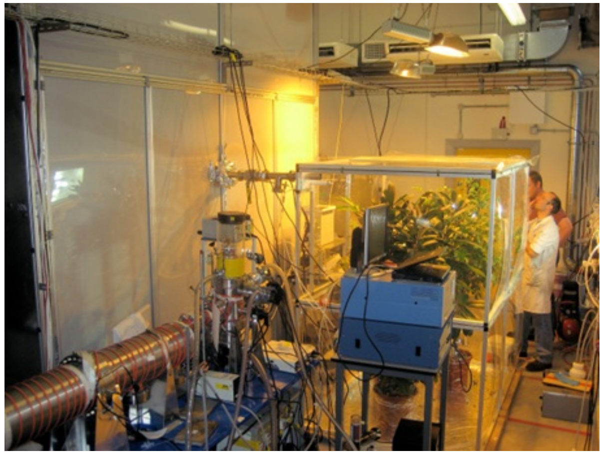
	system, homogeneous mixing, black-light lamps and actinic lamps for irradiation, pressure, temperature and relative humidity measuring systems, Fourier Transform Infra-Red spectrometer (FT-IR) interfaced with a multiple White path cell giving a total optical path length of (492 ± 0.2) m of the chamber can be found at the http://erris.gov.ro/cernesim.uaic.ro. The ESC-Q-UAIC chamber is equipped with a large panel of analytical instruments dedicated to gas and particulate measurements as well as instruments for monitoring the physical parameters of the chamber. However, a number of available ports provide space for the connection of other instruments which can be temporarily required to address specific scientific issues. Off and on line analyses can be achieved by using the wide range of conventional analytical equipments (http://erris.gov.ro/cernesim.uaic.ro).
Services currently offered by the infrastructure and its research environment	All analytical, atmospheric measurement and testing facilities, built around the ESC-Q-UAIC chamber, may offer services for researchers with interest in: 1. Chemical analysis of various organic and inorganic pollutants from natural matrixes; 2. Investigation of chemical degradation of pollutants under simulated environmental conditions; 3. Testing new instruments with applicability to the industry (new sensors for monitoring gaseous pollutants); 4. Development of ecological technologies for the destruction of gas pollutants. The infrastructure built around the ESC-Q-UAIC chamber is already included into Registry of the Romanian Research Infrastructures, a booking gate for research infrastructure services. Taking into account the uniqueness character of the ESC-Q-UAIC chamber's state-of-the-art facilities (suitable for studying the physics and chemistry of various pollutants under simulated atmosphere), at both the Romanian and Eastern European level, emphasise is given to the idea that this infrastructure can enhance and strengthen researchers interest for high-quality investigation. It is envisaged to enable researches interest, especially from this region of Europe, to fulfil their main scientific task and fruitfully to accompany within their efforts to respond to a number of challenges arisen in recent decades in this important research area.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	The ESC-Q-UAIC infrastructure offers availability to be involved in the following research tasks: • Atmospheric degradation studies (both at kinetic and mechanistic level) of various gas pollutants by using long path FT-IR spectrometry for in situ measurement and gas/liquid chromatography-mass spectrometry or other spectrometric techniques (e.g., AMS, PTR-MS) for off- and on- line analyses. • Testing new instruments with applicability to the industry (new sensors of monitoring of gaseous pollutants). • Development of ecological technologies for the destruction of gas pollutants. The ESC-Q-UAIC infrastructure can be devoted to be used for about 18 days for activities related for studying the physics and chemistry of various pollutants under simulated atmosphere.

Community/user type served	The ESC-Q-UAIC infrastructure offers its availability to be easily accessed by users from the academic sector, experts and young researchers, PhD or master students. Additionally, activities to rise up the interest of SMEs to access the ESC-Q-UAIC infrastructure are envisaged. In particular the SMEs that are interested on developing and testing new equipments for monitoring atmospheric pollutants or other analytical equipments are included under our main target.
Scientific and technical support offered	The research team (academic staff) presently operating with the ESC-Q-UAIC infrastructure may offer scientific and technical support in the following areas: 1) preparation of a certain type of experiment; 2) establishment and implementation of an experiment; 3) recording and evaluating FT-IR spectra in in-situ mode in the ESC-Q-UAIC chamber; 4) recording PTR-MS spectra and analysing data; 5) using thef SMPS device and analysing data; 6) GC-MS analysis and evaluation; 7) estimating the parameters of interest; 8) making corrections (wall loss, secondary reactions); 9) adjust certain parameters (sampling rate, actinic flux intensity, optical path length, number of interferograms or samples); 10) synthesizing various substances used as sources of radicals.
Logistic and administrative support offered	The ESC-Q-UAIC environmental simulation chamber is part of the laboratory that has been created for the investigation of physical and chemical processes from atmosphere. This infrastructure was settled up in the “Alexandru Ioan Cuza” University of Iasi (UAIC), the oldest university in Romania and a higher education institution with tradition. Through the achievements realized at both educational and scientific level, UAIC has gained national and international recognition integrating itself into the circuit of European values in the academic and scientific field (www.uaic.ro). With more than 38000 students and 900 teaching staff, the university enjoys an important prestige, having collaborations with over 250 universities and research institutes from abroad. The “Alexandru Ioan Cuza” University of Iasi is a member of some of the most important university associations and networks: the Coimbra Group, EUA – European University Association, Utrecht Network, IAU – International Association of Universities, AUF – the University Francophony Agency and RUFAC – Francophone Universities Network. These allow continuously undertaking the exchange experience, student, researchers and professor mobility and the combined achievement of some academic, research or strategic programs. The standard package of the university administrative strategy, usually offered to all visitors, will be available also for the ESC-Q-UAIC users. The package includes: 1) Assisting with all aspects of administrative management;

	2) Coordinating between departments and operating units in resolving day-to-day administrative and operational problems; office machines such as photocopiers and computer; 3) Scheduling meetings, events and other similar activities; 4) Sending out and receiving mail and packages; 5) Sending faxes and managing files; 6) Address resident concerns in accordance with university policies. For the logistic support required by users scientific purposes, ESC-Q-UAIC unit offers availability of exploiting: 1) the ESC-Q-UAIC, 780 L quartz glass reaction chamber; 2) the FT-IR spectrometer, Vertex 80 Bruker; 3) the PTR-TOF-MS spectrometer, KORE; 4) the HR-ToF-AMS spectrometer for aerosols chemical analysis, Aerodyne Research; 5) the Scanning Mobility Particle Size (SMPS) unit, TSI. The system consists of Particle Counter TSI 3936L87, an SMPS type-N mode classification particle size electrostatic with differential mobility analysis module type DMA 3081; 6) the GC-FID-MS-TDUG, Gas Chromatograph with flame ionisation and mass spectrometer detectors and thermal desorption unit, Gerstel type and Agilent Technologies; 7) the LC-DAD-FD or LC-ToF-MS, liquid chromatographs with various detectors, Agilent Technologies; 8) other necessary laboratory equipments; 9) available consumables (chemicals, filters, etc.); 10) computers, net connection, office equipment.
Person in charge of access provision at the infrastructure	Prof. dr. Romeo-Iulian OLARIU Professor in the Department of Chemistry, Coordinator of CERNESIM “Alexandru Ioan Cuza” University of Iasi, **oromeo@uaic.ro**
Extended technical information for ESC-Q-UAIC temperature control and regulation system	
Physical description	Additional our smog chamber is now equipped with a temperature control and regulation system that allows the desired experimental conditions to be maintained at a certain temperature value ranging from 5 to 40 degree Celsius. This system was developed during 2017 under a national project (PN-III-P2-2.1.-PED-2016-0924 contract no. 78PED/2017, https://sites.google.com/site/devtrec2017/) funded by Executive Unit for Financing Higher Education, Research, Development and Innovation (UEFISCDI) subordinated to the Ministry of National Education.

	- temperature range: from 275 to 310 K - RH range: difficult to work with the FT-IR if RH is higher than 4%, for that the optimum is from 0,01 to 4%.
Mechanical description	A schematic diagram of the new system is shown in the diagram below:  The system include a cooling fluid-fluid group, three cooling modules batteries (one for each quartz tube), a preparation and storage group for air, insulation and sealing the ESC-Q-UAIC chamber for forced ventilation and injection of dried and filtered air, an automat thermostats loop and air exchange.

Irradiation spectra	The average irradiation spectrum measured in the ESC-Q-UAIC camera using only 365 nm lamps is depicted in the figure below.  Typical irradiation spectrum measured in the ESC-Q-UAIC camera The data have been obtained by using a calibrated LICOR LI-1800 spectroradiometer borrowed from the CNRS-LISA laboratory. J(NO2)= (2,94±0,20) ×10^{-3} s^{-1} (measured by monitoring the loss of NO_2 (5.27ppmv) under irradiated conditions (365 nm lamps) in N2 using long path FT-IR spectroscopy as analytical tool);
Auxiliary mechanism	Ongoing
Description paper	-

MAC – MICC - General information	
Access mode	Physical access
Infrastructure name and acronym	Manchester Aerosol Chamber – Manchester Ice Cloud Chamber coupled facility (MAC-MICC)
Photos	 
Location	Manchester, United Kingdom
Website	http://www.cas.manchester.ac.uk/restools/aerosolchamber/ http://www.cas.manchester.ac.uk/restools/cloudchamber/
Legal name of organisation operating the infrastructure	University of Manchester
Description of the infrastructure	
Brief general description of the	The infrastructure comprises a pair of coupled chambers within the Centre of Atmospheric Sciences (CAS), at the University of Manchester that may be accessed together or as separate installations. The Manchester aerosol chamber (MAC) has been

infrastructure to which access is offered	designed to study atmospheric processes of multicomponent aerosols under controlled conditions. The Manchester Ice Cloud Chamber (MICC) is a fall-tube 10 m tall and 1 m in diameter, spanning 3 floors with a cold room on each, capable of reaching temperatures as low as -55°C. The chamber can also be pressure sealed and evacuated to as low as 50 mbar to simulate conditions found in the upper troposphere. Liquid water, mixed phase, or entirely glaciated clouds can be generated in the chamber, with cloud liquid water contents ranging from zero to the highest values found in nature.
Services currently offered by the infrastructure and its research environment	The service offered by the infrastructure include : - Access to a complete appropriate instrumentation payload to each / both chamber(s) - Technical assistance by highly trained staff - Scientific assistance by permanent research staff - Copy of all the level 0 data at the end of the campaign - Data treatment up to level 1 on request - Data archival (>10 years) on the secure UMAN data server - Guest office for up to 4 guests and internet access - >200 m2 ground floor lab space plus basement / 1st floor MICC lab, easy access to guest instrument with goods lift - 24h access to the lab if requested support for ordering chemicals and consumables.
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	Between 1 and 4 weeks. A typical experimental plan includes 2-3 days of careful experimental preparation (connection of potential external instruments and training on use of the chamber and the main instruments), then 10 days of experiments (1 experiment/day with 1 to 2 days of cleaning and blank experiments per week), then 1-2 days for debriefing and base data formatting, saving, and distributing among the users.
Community/user type served	The MAC-MICC chambers are predominantly used for research projects (academic sector) though we have conducted contract experiments (e.g. engine exhaust post-treatment) and instrument trialing with SMEs. We are in active discussion for further similar contract work.
Scientific and technical support offered	Training for the use of the infrastructure and the data treatment is offered. Depending on the degree of expertise of the guest, a data analysis of level 1 (AMS, corrected DMPS, HTDMA etc…) can be proposed to users. In addition, assistance in the definition of experimental conditions is offered to all groups.

Logistic and administrative support offered	Administrative support for ordering chemicals and consumables, logistic support for the management of chemicals, including gases.
Person in charge of access provision at the infrastructure	Dr. Rami Alfarra, NCAS Research Scientist and University Research Fellow, **rami.alfarra@manchester.ac.uk**
Extended technical information	
Physical description	MAC comprises an 18 m3 collapsible FEP Teflon film (3m (H) x 3m (L) x 2m (W)) in a temperature and relative humidity controlled housing. It has two arc lamps on opposite sides and a bank of halogen bulbs on one side. MICC is a 10 m tall, 1 m in diameter stainless steel cylinder housed in temperature-controlled rooms that can reach temperatures down to -55 oC for ice and mixed phase clouds and up to room temperature for liquid clouds. S/V ratio: (2.3 m^-1) Irradiation JNO2 & other J: (jNO2 = 1.54 x 10^-3 s^-1; jO1D = 1.23 x 10^-5 s^-1) RH range: (20 - 80%) MAC projected surface area: 6 m^2 MICC projected surface area: 28 m^2
Mechanical description	The MAC Teflon film is mounted on three horizontal rectangular aluminium frames. The central rigid frame is fixed, with the upper and lower frames free to move vertically, allowing the bag to expand and collapse as sample air is introduced and extracted. Air is supplied to the chamber by a blower at a flow of 3 $m^3 min^{-1}$. The air is dried and filtered for gaseous impurities and particles using a series of Purafil (Purafil Inc., USA), charcoal and HEPA filters (Donaldson Filtration, USA), prior to humidification with ultrapure deionised water.
Instruments' list	(see table below)

Instrument	Measured parameter(s)
C- & HR-TOF Aerodyne Aerosol Mass Spectrometers (AMS)	Quantitatively measure the composition and mass non-refractory components of particulate matter.
Soot Particle (SP)-AMS	A variant of the AMS that measures the BC fraction of the aerosol as well as the coatings
Droplet Measurement Technologies (DMT) Single Particle Soot Photometer (SP2)	Quantitative data on black carbon mass on a particle-by-particle basis and qualitative data on coating thicknesses and mixing state

	DMT 3-wavelength Photoacoustic Soot Spectrometer (PASS) - equipped with an integrating sphere	Measures the bulk absorption and scattering properties of the aerosol at 3 (visible) wavelengths
	Thermal denuder (Home built)	Removal of non-refractory material
	Centrifugal Particle Mass Analyser (CPMA)	Selection of particles by mass
	Aerodynamic Aerosol Classifier (AAC)	Selection of particles by size
	Sunset Labs online OC EC analyser	Measure of organic and elemental carbon.
	Differential Mobility Particle Sizer (DMPS)	Aerosol particle number size distribution
	TSI Scanning Mobility Particle Sizer (SMPS)	Aerosol particle number size distribution
	TSI Condensation Particle Counter (CPC)	Primary means of counting particles
	42i NOx analyser (Thermo)	NO, NO2 and NO_x mixing ratios
	49C O3 analyser (Thermo)	O3 mixing ratios
	LI-820 CO2 analyser (Li-cor)	CO2 mixing ratios
	48C CO analyser (Thermo)	CO mixing ratios
	Hygroscopicity Tandem Differential Mobility Analyser (HTDMA)	Aerosol growth factor as a function of RH
	DMT Cloud Condensation Nuclei Counter (CCNc 100)	Cloud activation potential as $f(D_p)$
Irradiation spectra	Figure 1: Shape of the MAC irradiation spectrum provided by high pressure xenon arc lamps operated at 4 Kw each and halogen bulbs (Solux, 4700K). The spectra were measured in the middle of chamber.	

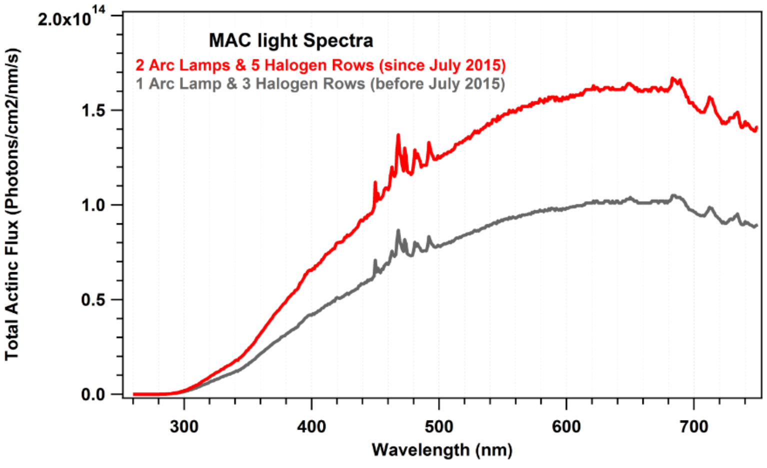


Figure 2: Shape of the MAC irradiation spectrum provided by high pressure xenon arc lamps operated at 4 Kw each and halogen bulbs (Solux, 4700K) compared to the solar spectrum measured in Manchester, UK at mid-day on a clear sky day in June.

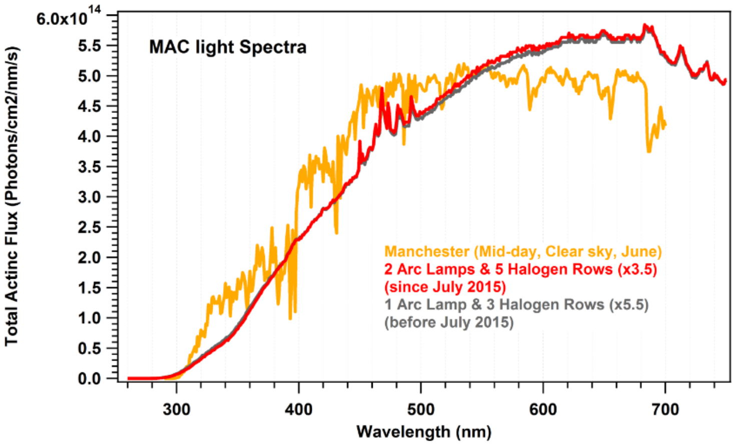
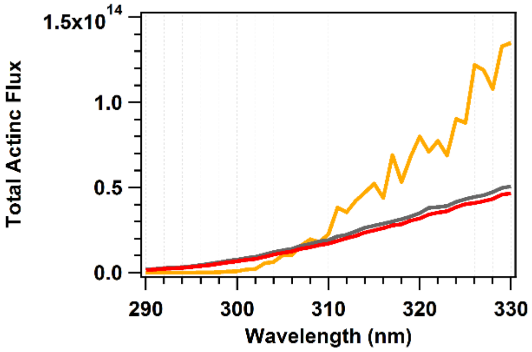
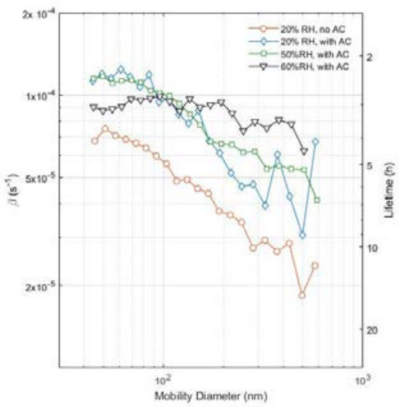
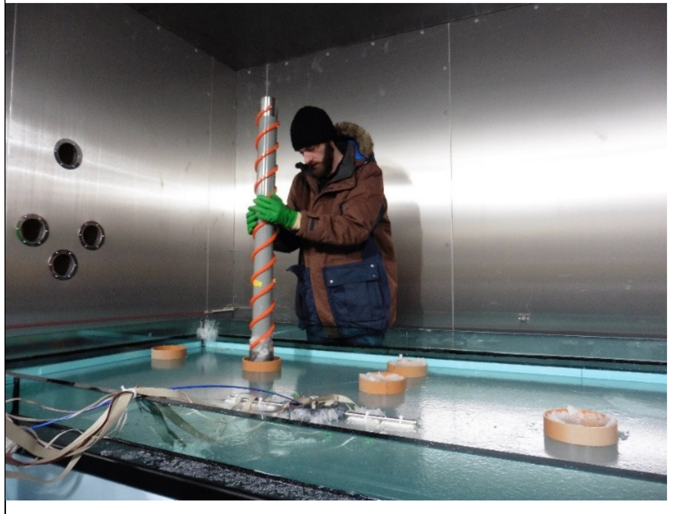
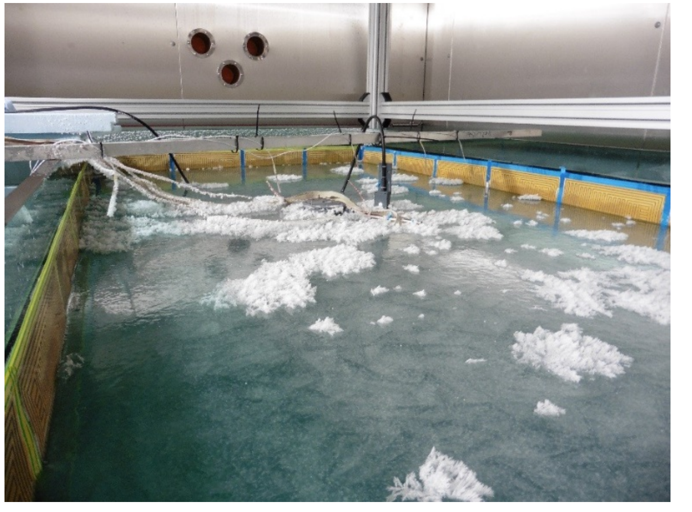


Figure 3: An illustration of the divergence between the illumination in MAC and sunlight between 290 and 330 nm using a zoomed in section of Figure 2.

	 No illumination in MICC
Size dependent aerosol loss/lifetime	

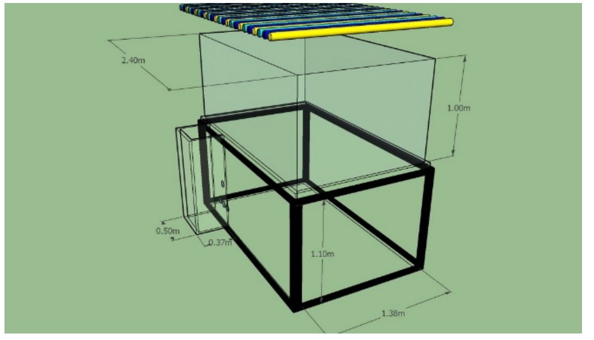
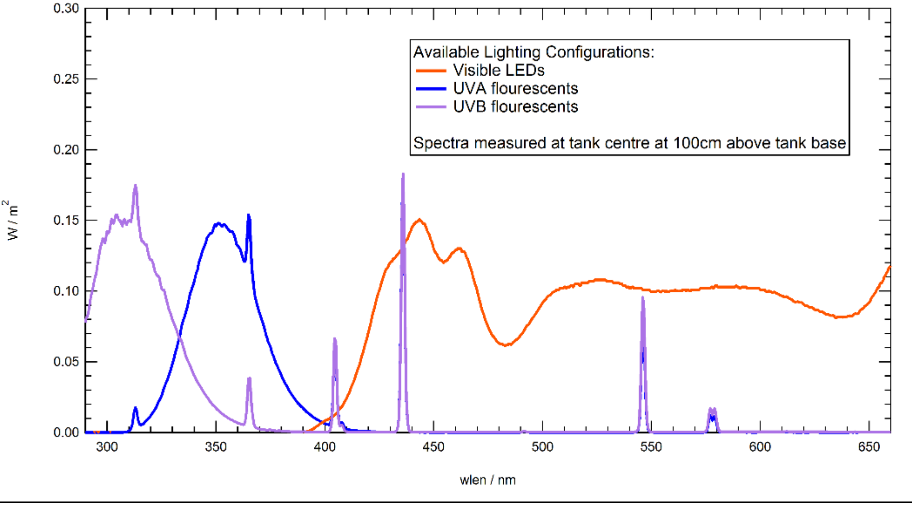
<table>
<tr>
<td>Auxiliary mechanism (only for MAC)</td>
<td>
<table>
<tr><th>Parameter</th><th>Rate</th><th>Experiment</th></tr>
<tr><td>Dilution</td><td>X + DIL →</td><td>MAC is run as a batch reactor. In typical experiments, no dilution is applied.</td></tr>
<tr><td>Wall loss</td><td></td><td></td></tr>
<tr><td>O_3 loss</td><td>O_3 → wO_3
$k = 1.08 \times 10^{-6} s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>NO_2 loss</td><td>NO_2 → wNO_2
$k = 1.34 \times 10^{-6} s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>Toluene loss</td><td>Tol → wTol
$k = 2.12 \times 10^{-7} s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>α-pinene loss</td><td>a-pin → w a-pin
$k = 1.97 \times 10^{-7} s^{-1}$</td><td>Determined in reference experiments</td></tr>
<tr><td>1,3,5-TMB</td><td>TMB→ wTMB
$k = 2.45 \times 10^{-7} s^{-1}$</td><td>Determined in reference experiments</td></tr>
</table>
</td>
</tr>
<tr>
<td>Description paper</td>
<td>MAC:
Alfarra, M. R., Hamilton, J. F., Wyche, K. P., Good, N., Ward, M. W., Carr, T., Barley, M. H., Monks, P. S., Jenkin, M. E., Lewis, A. C., and McFiggans, G. B.: The effect of photochemical ageing and initial precursor concentration on the composition and hygroscopic properties of β-caryophyllene secondary organic aerosol, Atmos. Chem. Phys., 12, 6417-6436, https://doi.org/10.5194/acp-12-6417-2012, 2012

MICC:
Connolly, P. J., Emersic, C., and Field, P. R.: A laboratory investigation into the aggregation efficiency of small ice crystals, Atmos. Chem. Phys., 12, 2055–2076, doi:10.5194/acp-12-2055-2012, http://www.atmos-chem-phys.net/12/2055/2012/, 2012</td>
</tr>
</table>

ChAMBRe - General information	
Access mode	Physical access
Infrastructure name and acronym	Roland von Glasow Air-Sea-Ice Chamber (RvG-ASIC)
Photos	  Picture 1: Frost flower fields on artificial sea-ice. The temperature in the facility here is –28°C Picture 2: Ice-coring of artificial sea-ice
Location	School of Environmental Sciences, University of East Anglia, Norwich, NR4 7TJ, United Kingdom
Website	https://www.uea.ac.uk/environmental-sciences/sea-ice-chamber
Legal name of organisation operating the infrastructure	University of East Anglia (UEA)
Description of the infrastructure	

Brief general description of the infrastructure to which access is offered	The Roland von Glasow Air-Sea-Ice Chamber (RvG-ASIC) facility at the University of East Anglia (UEA) comprises a coupled atmosphere–ocean–sea-ice simulation chamber designed to investigate the role of first-year sea-ice in tropospheric chemistry. The temperature of the chamber can be controlled within the range –55 to +30 °C, with a stability of ±0.3 °C. The chamber can also be run in ocean-atmosphere mode (above –2 ºC), snow-atmosphere mode (no liquid water) or in dry mode for purely atmospheric investigations. It therefore provides a platform for a diverse range of multi-disciplinary experiments to study physical, chemical and biological between interactions between atmosphere, ocean, ice and snow. The chamber comprises a glass tank "ocean" (2.4 m × 1.4 m × 1.1 m; 3.5 m^3 water volume) with a removable FEP film-enclosed "atmosphere" above (2.4 m × 1.4 m × (0.1–1 m); 0.3 to 3.3 m^3 air volume). The "ocean" is equipped with a wave generator and circulation pump. Controlled illumination is provided by sun-simulating LED bands and UVA and UVB fluorescent light tubes (280 to 700 nm). All light sources can be adjusted individually. In situ actinic fluxes can be measured with a 2π spectral radiometer. The facility is equipped with a range of analytical instruments for atmosphere, ice and ocean. In the atmosphere, gas mole fractions of CH_4, CO_2, H_2O, O_3, NO_x, NO and NO_2 can be measured continuously, together with temperature, humidity and wind speed. The ocean is sampled with conductivity-temperature (CT) probes. A "salinity harp" can be used to obtain CT profiles in ice and across the ice-ocean interface. Additional pressure (stress) and UV-VIS light sensors (fibre-optic tree) measure in ice at 1-2 cm depth intervals. Post-experiment sampling and analysis are possible through ice-core and ice block section collection, via a field-deployable ice corer, a bandsaw and a microtome for thin sections. For chemical analyses of ice, a H_2O_2 chemiluminescence analyser and optical absorption spectrometer are available. All data are centrally collected on a dedicated data acquisition and visualisation server. Two camera systems above and below water provide time-lapse photography and continuous video feeds.
Services currently offered by the infrastructure and its research environment	Full access to the RvG-ASIC, including: - induction to chamber and all instruments - training on data acquisition and visualisation server - preparatory work (e.g. chamber filling, cleaning, emptying, installation of atmospheric enclosure)
Modalities of access and support offered under EUROCHAMP-2020	

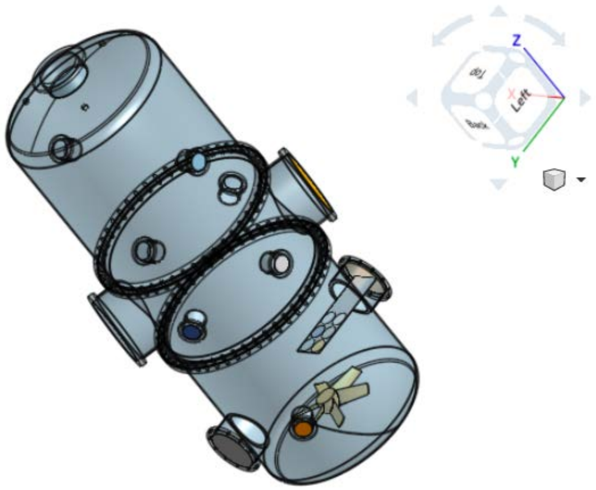
Typical duration of work	10 days per experiment, including 3 days for set up and ice-growth, 5 days experiment and 2 days clean-up / packing up / data distribution. Variations may occur, depending on starting conditions required and how much ice is required to be grown. Please contact the facility prior to access application to discuss required access periods for specific experiment conditions.
Community/user type served	RvG-ASIC is mainly used for academic research, but there are opportunities for industrial users / SMEs for sensor and other equipment testing in a variety of extreme polar and ocean simulated conditions, e.g. In / under ice, cold seawater or freshwater, cold atmospheric conditions, under natural lighting conditions or enhanced UV conditions.
Scientific and technical support offered	Training for the general use of the facility along with data processing will be provided as needed. Advice on set up / experimental conditions will be offered if requested. Technical and scientific assistance by affiliated researchers within UEA. Data storage and access to data remotely post experiment.
Logistic and administrative support offered	Administrative support for ordering chemicals and consumables, logistic support for the management of chemicals. Guest office space. Help with accommodation (available on campus or nearby).
Person in charge of access provision at the infrastructure	Prof. Jan Kaiser, Professor of Biogeochemistry **j.kaiser@uea.ac.uk**
Extended technical information	
Physical description	The RvG ASIC is a glass tank construction housed in a predominantly stainless steel environmental chamber. The tank can have a Teflon FEP atmospheric enclosure attached to the top of the tank if the experiment requires. S/V ratio: 4.3 m-1 Pressure range: 950 to 1050 mbar Temperature range for environmental chamber -55 °C to +30 °C. No pressure control. RH range: 20 to 100%

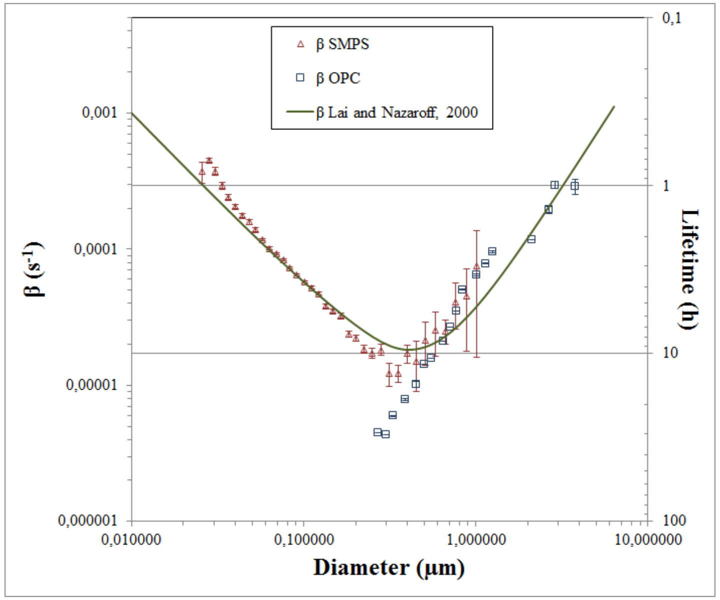
Mechanical description (image)	
Mechanical description	Volume: Glass tank, maximum capacity: 3500 litres of water Width: 1.38 m Depth: 1.1 m Length: 2.4 m Maximum atmospheric enclosure size: 1 m x 2.4 m x 1.38 m
Auxiliary mechanism	Work in progress
Irradiation spectra	
Description paper	December 2019

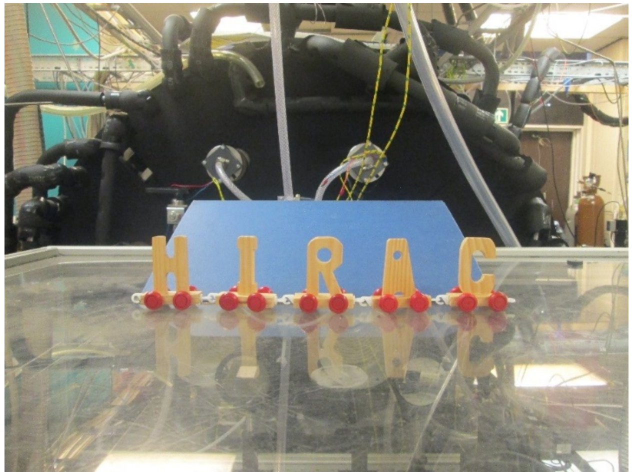
General information	
Access mode	Physical access: "hands-on" access to ENV chamber Remote access: instrument calibration
Infrastructure name and acronym	Chamber for Aerosol Modelling and Bio-aerosol Research (ChAMBRe)
Photos	
Location	Genoa, Italy
Website	https://labfisa.ge.infn.it/
Legal name of organisation operating the infrastructure	Istituto Nazionale di Fisica Nucleare (INFN) – Sezione di Genova
Description of the infrastructure	

Brief general description of the infrastructure to which access is offered	A stainless steel atmospheric simulation chamber (volume approximately 3 m3) has been recently installed at the National Institute of Nuclear Physics in Genoa (INFN-Genova, www.ge.infn.it) in collaboration with the Environmental Physics Laboratory at the Physics Department of Genoa University (www.labfisa.ge.infn.it). ChAMBRe presents unique characteristics in the Italian scientific framework and is equipped with a set of instruments/tools for atmospheric measurements, in particular: - Relative humidity, temperature and pressure gauges - Gas and aerosol inlets (Blaustein Atomizer – BLAM by CH-Technologies) - Vacuum system - Sampling ports for filters and two-stage continuous Streaker samplers - Light source reproducing the solar spectrum - Gas analyzers (O3, NOx and SOx) - Real-time aerosol monitoring (OPC-Grimm, Aethalometer) - Aerosol samplers (Battelle Cascade impactor, 13-stage Nano-Moudi rotating cascade impactor for size segregated analysis) - Bio-aerosol-specific samplers (Andersen-type cascade impactor)
Services currently offered by the infrastructure and its research environment	• Test of aerosol samplers • Test and development of real-time bio-aerosols monitors • Test to study the correlation between bacteria viability and atmospheric pollutants • Measurement of bacteria viability versus suspension time • Preparation of artificial aerosol samples deposited on different media • Full compositional analysis of aerosol samples
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	A typical experiment comprises a number of maintenance and setup activities such as cleaning, filling and emptying the chamber; prepare and cultivate bacteria strains to inject, sterilize all the equipment. Normally, when operating with bacteria, one experiment per day can be performed. For experimental efficiency, access to the chamber is best provided in "campaign mode" over 5 days or more.
Community/user type served	• Academic sector (expert and early stage researchers) • Industrial users / SMEs for sensors and other equipment testing
Scientific and technical support offered	- Technicians and Technologists - Mechanical and electronic workshop (included 3D printing of plastic and metallic objects), computers farm for scientific calculation

	- Research scientists - Access to expertise of senior scientists: • Prof. Paolo Prati: atmospheric aerosol characterization, instruments set-up and validation, source apportionment. • Prof. Camilla Costa: chemistry of atmospheric aerosol, FESEM microscopy, nanoparticles • Dr. Dario Massabò: optical properties of atmospheric aerosols, multi-wavelength absorbance analyses • Dr. Elena Gatta: bacteria and cellular biology, microbiology.
Logistic and administrative support offered	• Instrument shipping • Booking of accommodation
Person in charge of the infrastructure	Prof. Paolo Prati, group leader, **prati@ge.infn.it**
Extended technical information	
Physical	ChAMBRe is a cylindrical stainless steel simulation chamber. **Dimensions:** Diameter: 0.997 m Height: 2.940 m Volume: 2140 litres S/V ratio: 4.4 m-1 Projected surface area: 0.785 m2 **Temperature range:** 18 - 25 °C **Pressure range:** 10-5 - 1030 mbar **Relative Humidity range:** 0 to 99 %

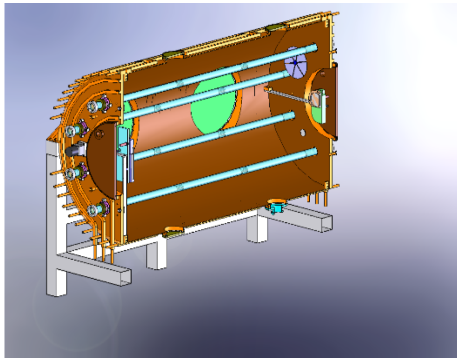
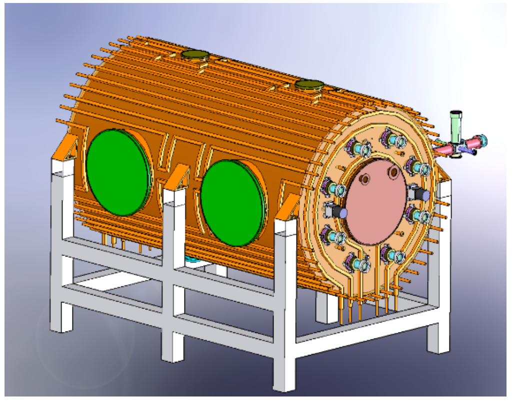
Mechanical description (image)	
Irradiation spectra	N/A

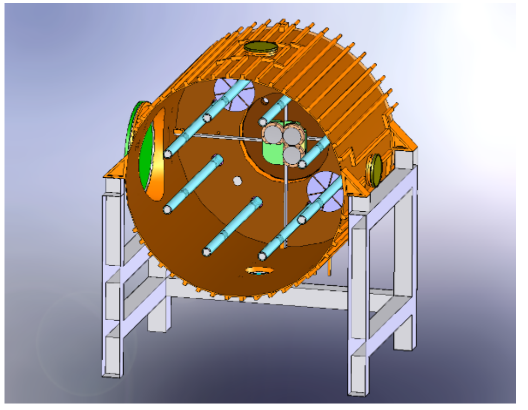
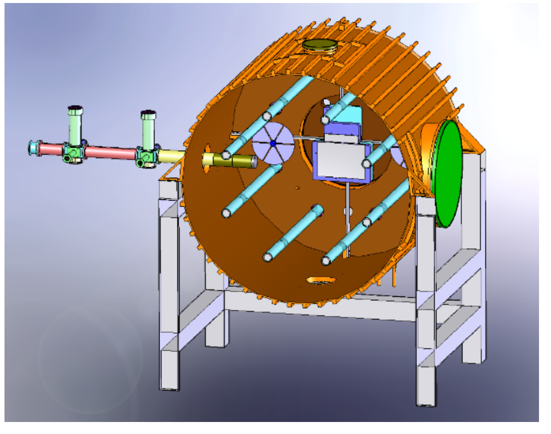
Size dependent aerosol loss/lifetime (image)	
Auxiliary mechanism	**Reactions** — **constants** — **Note** $O_3 \rightarrow O_{3\_Wall}$ — $3.04 \pm 0.40 \times 10^{-5}$ s^{-1} — depending on the cleaning procedure
Description paper	Dario Massabò, Silvia Giulia Danelli, Paolo Brotto, Antonio Comite, Camilla Costa, Andrea Di Cesare, Jean François Doussin, Federico Ferraro, Paola Formenti, Elena Gatta, Laura Negretti, Maddalena Oliva, Franco Parodi, Luigi Vezzulli, and Paolo Prati. **ChAMBRe: a new atmospheric simulation Chamber for Aerosol Modelling and Bio-aerosol Research.** Atmos. Meas. Tech., 11, 5885–5900, 2018, DOI: 10.5194/amt-11-5885-2018.

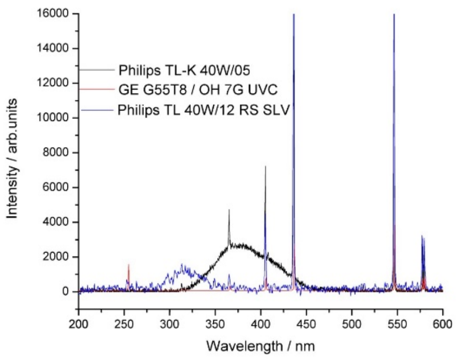
HIRAC - General information	
Access mode	-
Infrastructure name and acronym	Highly Instrumented Reactor for Atmospheric Chemistry (HIRAC)
Photos	 
Location	School of Chemistry, University of Leeds, Leeds, LS2 9JT, United Kingdom
Website	**https://hirac.leeds.ac.uk**
Legal name of organisation operating the infrastructure	University of Leeds
Description of the infrastructure	
Brief general description of the infrastructure to which access is offered	HIRAC is a stainless steel, 2 m^3 cylindrical simulation chamber equipped with a variety of instrumentation to monitor both radicals and stable species. The focus of HIRAC is on gas phase chemistry. The major advantages of HIRAC include:

	1) As the chamber can be heated and evacuated to very low pressures it is possible to operate under very low NOx conditions with no wall production from HONO emissions. 2) HIRAC can be operated over a range of temperatures (~250 – 350 K) and pressures (50 – 1000 mbar). 3) Stable species can be monitored by FTIR, GC, PTR-MS (under development), NOx and O3 analysers. 4) HO, HO_2 and **CH_3O_2** can be detected by the FAGE technique and CRDS methods are currently being validated for **HO_2** and RO_2 species. 5) **OH reactivity instrumentation** is available. 6) The metal construction with a variety of access flanges readily allows the coupling of other instrumentation to HIRAC. No design of simulation chamber is perfect, the metal construction means that the lamps must be housed inside the chamber and therefore there are photon flux gradients in the chamber, however, the instrumentation (including radical measurements by FAGE) can monitor at a variety of locations allowing us to test the homogeneity of the system. Wall loss rates can be more significant in metal chambers. Our loss rates are generally comparable with other types of chambers and can generally be measured directly.
Services currently offered by the infrastructure and its research environment	N/A
Modalities of access and support offered under EUROCHAMP-2020	
Typical duration of work	N/A
Community/user type served	N/A
Scientific and technical support offered	N/A
Logistic and administrative support offered	N/A
Person in charge of the infrastructure	Prof. Paul Seakins, School of Chemistry, University of Leeds, **p.w.seakins@leeds.ac.uk**

Extended technical information	
Physical description	The HIRAC chamber is a 2 m3 cylindrical simulation chamber constructed from grade 304 stainless steel which allows operation over a range of temperatures and pressures with several flanges to allow access for instrumentation and sampling. **Dimensions:** Length: 2 m Width: 1.2 m Volume: 2.25 m3 Internal surface area: ~10 m2 S/V ratio: 5.8 m-1 **Temperature range:** 250 – 350 K **Pressure range:** 50 – 1000 mbar (potential to operate at higher pressures, but would require certification) **Access:** 2 x ISO-K500 access flanges on the end walls. 2 x ISO-K500 access flanges on one side 6 x ISO-K160 access flanges (2 x top, 2 x bottom, 2 on the sides directly opposite the K500 access flanges. These flanges can be adapted (e.g. inclusion of smaller sub-flanges have been used for mounting CRDS mirrors). **Pumping and Mixing:** Base pressure ~2.5 x 10-3 mbar with rotary backed roots blower system (Leybold Trivac D40B, RUVAC AWU251). Mixing – 4 stainless steel fans, coupled to motors with magnetic feedthrough. Mixing time ~60 s at 1 bar.

Mechanical drawings	 Figure 1: Solidworks cutaway to show the half the lighting system, the large ISO-K500 access flanges, one of the fans and the mounting of the FTIR mirros.  Figure 2: External view of HIRAC mounted on its frame. The design of the cooling/heating system can be seen. On the far side is the FAGE instrument for OH, HO2 and CH3O2 detection.

	 Figure 3 Solidworks, end-on view showing the distribution of internal lamps, 2 fans and the Chernin objective mirrors  Figure 4: Solidworks, end-on view showing the location of the FAGE inlet (can be moved across the diameter of HIRAC), lights, fans and field mirrors of the Chernin cell.

Irradiation spectra	 Lamp spectra for HIRAC.
Instrumentation	1. FTIR – Bruker IFS/66 spectrometer, coupled to modified Chernin multipass cell (Glowacki et al. Applied Optics 46, 7872-83, 2007), pathlength 128.5 m 2. OH, HO2 detection via FAGE. (Winiberg et al. Atmos Meas. Tech 8, 523-40, 2015) 3. CH3O2 via modified FAGE (Onel et al. Atmos. Meas. Tech.10, 3985-4000, 2017) 4. HO2 via CRDS (Onel et al. Atmos. Meas. Tech. 10, 4877-94, 2017) 5. OH reactivity (Stone et al. Atmos. Meas. Tech. 9, 2827-44, 2016) 6. O3 – Thermo Electron UV model 49C 7. NO, NO2, Thermo Electron Model 42C, ~50 pptv 8. GC – HP6890 GCs with FID. 9. PTR-MS – Kore, to be added in 2018
Auxiliary mechanism	In general most of the photolysis rates and wall loss rates will be checked prior to any experiments. The values of the parameters given below are typical examples, but will depend on the condition of the walls and the chamber temperature. **Photolysis Rate Coefficients** JNO2 ~ 2 x 10-3 s-1 (Philips,TL-D36W/BLB) JCl2 ~ 1.5 x 10-4 s-1 (Philips,TL-D36W/BLB) JHCHO ~ 3.6 x 10-5 s-1 (Philips, TL40W/12RS) Jt-ButOOH ~ 3 x 10-5 s-1 (254 nm lamps GE Optica) **Wall Production of HOx**

	Depends strongly on the condition of the walls and typically insignificant following cleaning (either manual cleaning or heating the walls with pumping and illumination). Production rates can be measured in the absence of the photolysis precursor and even in the worse cases are <10% of gas phase production. **Wall Loss Rate Coefficients** O3 = (1.5 – 4) x 10-5 s-1 (at room temperature, increases with T) NO2 = ~4 x 10-5 s-1 HO2 = (0.03 – 0.07) s-1 VOC – non polar VOC such as alkanes are stable over periods of >30 mins (less than 1% loss giving kwall < 5 x 10-6 s-1). Polar species (e.g. organic acids) do have measurable loss rates over these timescales with kwall ~ (2-7) x 10-5 s-1. Determined by direct measurements of pure compounds or, if these are not available, estimated by analogy with structurally similar compounds

Parameter	Rate	Experiment
Dilution	X + DIL $\longrightarrow$ Typical $k = 4 \times 10^{-5}$ s^{-1}	flow from flow controller monitoring
Wall loss		
O_3, NO, NO_2 loss	X $\longrightarrow$ wX Typical $k \leq 1 \times 10^{-5}$ s^{-1}	Determined in reference experiments Highly dependent on wall cleaning and previous experiments
VOC loss	VOC $\longrightarrow$ loss	Monitored in real time via GC or FTIR. Dilution is often dominant loss term.
HO_2 loss	HO_2 $\longrightarrow$ loss	Determined from HO_2 mixed order decays (see Figure 8, Glowacki et al. (2008))
Wall sources		
HOx production	hv $\longrightarrow$ HOx Minor	FAGE used to monitor HOx production in synthetic air with lights on.

Instrumentation papers	1. Design and initial results – Glowacki et al. ACP 7, 5371-5390, 2007. 2. FTIR Multipass Optics – Glowacki et al. Applied Optics 46, 7872-83, 2007 3. OH, HO2 detection and calibration via FAGE. (Winiberg et al. Atmos Meas. Tech 8, 523-40, 2015) 4. OH reactivity instrument (Stone et al. Atmos. Meas. Tech. 9, 2827-44, 2016) 5. CH3O2 via modified FAGE (Onel et al. Atmos. Meas. Tech.10, 3985-4000, 2017) 6. HO2 via CRDS (Onel et al. Atmos. Meas. Tech. 10, 4877-94, 2017)