AO INSU 2021, Section "Ocean-Atmosphere", LEFE

Atmospheric ChemistRy Of the Suburban foreSt – Ground Observations (ACROSS-GO)

Supplementary and Complementary Information

This document provides information to complement and supplement the main ACROSS-GO LEFE proposal. The contents of this annexe are outlined below.

1. Measurements planned during ACROSS-GO intensive campaign (Tables A2 to A4)
2. NO_3-BVOC chemistry (Figure A1)
3. Schematic diagram of relationship of components of ACROSS (Figure A2)
4. Budget plan for LEFE request (Table A5)
5. Other related projects and expected financial support (Table A6)
6. References in addition to those in the proposal (section 10)

A1. Measurements Planned for ACROSS-GO

Details of measurements planned for this project as complements to Table 1 in the proposal.

Instrumental details for the general categories of aerosol-related (WP3) measurements listed in Table 1.

Table A2. Details of aerosol instrumentation to be deployed during ACROSS-GO.

Species/Parameter	Instrument /Technique	Paris Urban	SIRTA	Rambouillet	Orléans	To be defined
Aerosol mass concentration	TEOM-FDMS		LSCE	LISA		EPOC
Aerosol mass concentration	BAM PM10				ICARE	
Aerosol number concentration	CPC			LISA		
Aerosol composition	PTRMS-CHARON	LCE : part time	LAMP	IMT / LCE: part time		
Aerosol composition	APIC-Orbitrap w/ aerosol			LPC2E		
Aerosol composition	ACSM		LSCE	LISA		
Aerosol composition	EC/OC semi-continuous		LSCE			
Aerosol composition	PILS-IC			LISA		
Aerosol composition	SFE-GC-MS/UPLC QTOF MS	LISA	LISA	LISA		
Aerosol composition	URG 9000		LSCE		ICARE	
Aerosol composition	FILTERS – EC/OC & Organic tracers			LISA, EPOC		
Aerosol composition	FILTERS – XRF			LISA		
Aerosol composition	FILTERS – TEM-EDX			LISA		
Aerosol size distribution (submicron)	SMPS	LCE: part time	LSCE	LISA / LCE: part time	ICARE	EPOC
Aerosol size distribution (coarse)	OPC	LISA	LISA	LISA	ICARE	
Aerosol hygroscopicity	HTDMA			LISA		
Refractory BC mass and number concentration, mixing state	SP2			IGE		
Aerosol IN	Ice Nuclei properties			LAMP		
Aerosol light scattering	Nephelometer		LSCE	LISA		
Aerosol light absorption	Aethalometer		LSCE	LISA		
Aerosol light absorption	MAAP	LCE part time		LCE: part time		
Aerosol light extinction	CAPS			LISA		
Bioaerosols number concentration or size distribution(?)	WIBS		LSCE	LAMP		
Aerosol hygroscopicity/viscosity	FILTERS – ISM			EPOC		
Aerosol vertical profile	LIDAR	LATMOS	LSCE	LISA		
CIMEL Sunphotometer	CIMEL		LSCE	LISA (tbc)		
Gas-phase organics						
NMHC	GC-FID		~~EPOC~~	LISA, EPOC	ICARE	
NMHC	MAVERIC	LATMOS				
(O)VOCs	PTRMS	LCE part time	LSCE, LAMP	LISA, IMT, EPOC / LCE: part time		
HOMS	TOFCIMS	(IRCELYON)	IRCELYON	LISA, LPC2E	ICARE, (IRCELYON)	

Details of instruments for dynamics-related measurements (WP4).

Table A3. Ground-based instruments to be deployed (dynamics)

Species/Parameter	Instrument/Technique	Paris Urban	SIRTA	Rambouillet	Orléans	To be defined
O_3 profiles	UV DIAL Lidar	LATMOS	(LATMOS)	(INRAE)		
Wind/turbulence profiles	Lidar, radar	LATMOS, IPSL	IPSL			
PBL height	Lidar, radar	LATMOS, IPSL	IPSL	LISA		
Meteorology	Regional surface network and PTU measurements on the 40m tower, weather stations	CNRM, LISA	IPSL	CNRM, LISA, EPOC		
Fluxes Trace gases	Eddy covariance			INRAE, LPC2E		
Vertical Gradients of trace gases, aerosol	Lidar (aerosol), Rambouillet tower	LATMOS	IPSL	INRAE, LISA		

Table A4. Details of measurements related to daytime and night-time chemistry.

Species/Parameter	Instrument/Technique	Paris Urban	SIRTA	Rambouillet	Orléans	To be defined
Other ground-based remote	FTIR	UPMC				
NO, NO_2	NO_x analysers	LISA, LSCE	LISA, LSCE	LISA, EPOC, (LPC2E), ICARE	ICARE	
NO_3, N_2O_5	IBBCEAS			LISA, ICARE	ICARE	
NO_3 reactivity				(ICARE)		
NO_y	NO_y monitor			LISA		
HONO	IBBCEAS			LISA, ICARE		
NH_3	NH_3 analyser, FTIR		LSCE	INRAE, LISA		
NH_3	Mini-DOAS	LATMOS				
CO, CO_2	NDIR			LISA, (LPC2E)		
SO_2	Fluorescence	LISA		LISA, EPOC		
O_3	UV absorption	LISA, LSCE	LISA, LSCE	LISA, EPOC, (LPC2E), INRAE, ICARE	ICARE	
HO_x	CIMS			(PC2A), (LPC2E)		
OH reactivity	FAGE			PC2A		
CH_2O				(LaMP)	ICARE	
Actinic radiation	Spectroradiometer			EPOC, IMT		
H_2O				(LPC2E)		
HNO_3	Ion chromatography			LSCE	ICARE	
H_2SO_4	Ion chromatography, CIMS			LSCE, (LPC2E)	ICARE	
Alkyl nitrates				ICARE (PAN), (EPOC)		

A2. Figure showing NO_3 chemistry in a mixed urban-biogenic environment.

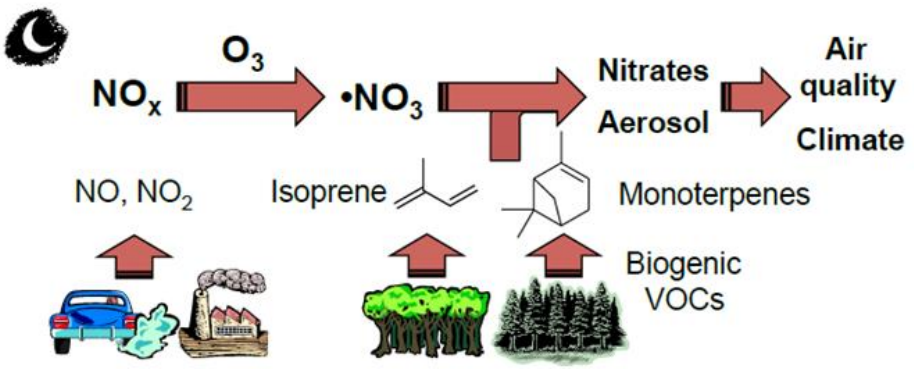

Figure A1: *Schematic of night-time NO_3-BVOC chemistry in mixed area (Ng et al. 2017).*

A3. Figure showing relationship between components of ACROSS

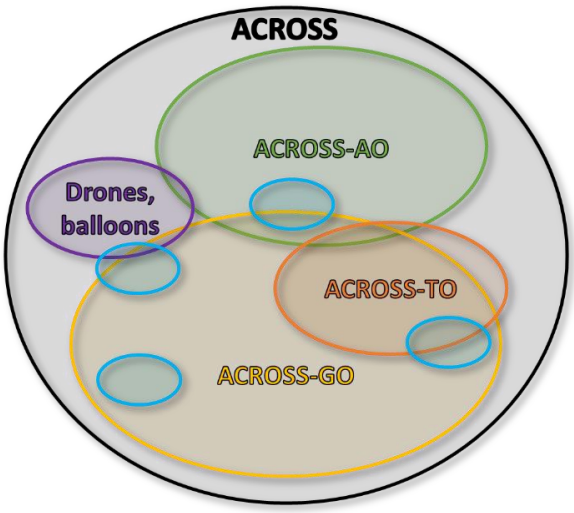

Figure A2. *Schematic depiction of the connections between ACROSS components (see text for discussion).*

A4. Budget Detail and Plan

The proposed budget for this project is summarized in the proposal in Table 3 and in the Tableau Recapitulatif. The table below corresponds with the left panel of Table 3.

Table A5. Details of expenditures by partner for the ACROSS-GO project

Partner	2021		2022	
	Amount	**Description**	**Amount**	**Description**
LISA	9500 €	Manifold install - 3500, pre-campaign site prep - 3000, coordination & meeting - 3000	9500 €	consumables and gases - 3500/tubing, small equipment - 6000
EPOC	0 €		9000 €	
IMT	3000 €	T&S cost 1p, consumables	8000 €	T&S cost, consumables
LSCE	0 €		4000 €	consumables
LaMP	0 €		9000 €	T&S cost, consumables
ICARE	0 €		4000 €	consumables (gas incl.)
LCE	0 €		9000 €	T&S cost, consumables
CNRM	0 €		2000 €	T&S cost
INRAE	3000 €	consumables	6000 €	S cost, consumables
LATMOS	5000 €	consumables, preparation	5000 €	ALTO install.
PC2A	0 €		8000 €	T&S cost, consumables
IRCELYON	0 €		6000 €	T&S cost, consumables
LPC2E	0 €		6000 €	T&S cost, consumables
Totals	20500 €		85500 €	

A5. Other related projects and expected financial support

Other projects that are related to this project are presented in Table A6.

Table A6. Other funding sources that will contribute to activities of the ACROSS-GO project.

Source	2021		2022	
	Amount	**Description**	**Amount**	**Description**
MOPGA (Cantrell)	25000 €	Site & tower safety certif., container, crane, elevator, electricity, internet	9000 €	additional container and equipment lifting
	18000 €	PEGASUS & MILEAGE shipping cost and field supplies (inc. gases), T&S cost	2000 €	Meeting
	31000 €	PhD grant (UPEC)	31000 €	PhD grant (UPEC)
	2000 €	Ancillary measurement installation	37000 €	Shipping costs and field supplies, T&S cost
LABEX VOLTAIRE (LPC2E)	3000 €	HOx measurements		
TRAC-AOS-A (Gratien)	6600 €	Identification of tracers for ACROSS project, lab studies	4400 €	Collection of filters; analysis of results
ACROSS-TO (IMT)			TBD	Preparation and measurements at Rambouillet, data analysis & modeling

A6. References relevant to this project in addition to those in the ACROSS-GO proposal (section 10)

Airparif, private communication, 2020.

Aumont, B. et al., Atmos. Chem. Phys., 5, 2497–2517, doi : 10.5194/acp-5-2497-2005, 2005.

Baklanov, A., et al., Adv. Sci. Res., 4, 115-120, 2010.

Benarie, M., et al., Pollution Atmospherique, 81, 44-53, 1979.

Bianchi, F., et al., Chem Rev., 119(6):3472-3509. doi:10.1021/acs.chemrev.8b00395, 2019.

Bryant, D. J., et al., Atmos. Chem. Phys., doi: 10.5194/acp-2019-929, 2019.

Chan et al., Air pollution in mega cities in China, Atmos. Environ., 42, 1–42, 2008.

Chiappini, L., et al., Anal & Bioanal Chem, 386(6), 1749-1759, doi: 10.1007/s00216-006-0744-32006, 2006.

Cuesta, J., et al., Atmos. Chem. Phys., 13(19), 9675-9693, doi: 10.5194/acp-13-9675-20132013, 2013.

Daellenbach, K. R., et al., Atmos. Chem. Phys., 19, 5973-5991, doi: 10.5194/acp-19-5973-2019, 2019.

EGU 2019, Vienna, ACROSS dedicated “Town Hall Meeting”.

Freney, E. J., et al., Atmos. Chem. Phys., 14, 1397-1412, doi: 10.5194/acp-14-1397-2014, 2014.

Fuchs, H., et al., Nature Geoscience, 6, 1023, doi: 10.1038/ngeo1964, 2013.

Gentner, D. R., et al., Environ. Sci. Technol., 51, 1074-1093, 2017.

Haagen-Smit, A. J., Indust. Engin. Chem., 44(6), 1342-1349, 1952.

Jimenez, J. L., et al., Science, 326(5959), 1525-1529, 2009.

Kalabokas, P., et al., Atmos. Environ., 22(1), 147-155, 1988.

Kiendler-Scharr, A., et al., Nature, 461, 381–384, 2009.

Kleinman et al., Ozone formation at a rural site in the southeastern United States. J. Geophys. Res., 99, 3469-3482, 1994.

Kumar, N. K.; Corbin, J. C.; Bruns, E. A.; Massabó, D.; Slowik, J. G.; Drinovec, L.; Močnik, G.; Prati, P.; Vlachou, A.; Baltensperger, U.; et al. Production of Particulate Brown Carbon during Atmospheric Aging of Residential Wood-Burning Emissions. *Atmos. Chem. Phys.* **2018**, *18* (24), 17843–17861. https://doi.org/10.5194/acp-18-17843-2018.

Lannuque, V., et al., Atmos. Chem. Phys., 20, 4905–4931, doi :10.5194/acp-20-4905-2020, 2020.

Menut, L., et al., Ann. Geophysicae, 18, 1467-1481, 2000.

Messina et al., Atmos. Chem. Phys., 16, 14169-14202, doi: 10.5194/acp-16-14169-2016, 2016.

MILEAGE: http://www.lisa.u-pec.fr/fr/activites-techniques/41-pole-terrain/108-mileage.

Molina et al., An overview of the MILAGRO 2006 Campaign: Mexico City emissions, transport and transformation, Atmos. Chem. Phys., 10, 8697–8760, 2010.

Newland, M. J., et al., Atmos. Chem Phys., doi: 10.5194/acp-2020-35, 2020.

Parrish et al., Air quality progress in North American megacities: A review, Atmos. Environ., 45, 7015–7025, 2011.

PEGASUS: http://www.lisa.u-pec.fr/fr/activites-techniques/41-pole-terrain/109-pegasus.

Shilling et Al., Enhanced SOA formation from mixed anthropogenic and biogenic emissions during the CARES campaign, Atmos. Chem. Phys., 13, 2091-2113, 2013.

Sillman, The relation between ozone, NOx and hydrocarbons in urban and polluted rural environments, Atmos. Environ., 33, 1821-1845, 1999.

Solmon, F., et al., Atmos. Environ., 38(23), 3853-3865, doi: 10.1016/j.atmosenv.2004.03.054, 2004.

Sumlin, B. J.; Pandey, A.; Walker, M. J.; Pattison, R. S.; Williams, B. J.; Chakrabarty, R. K. Atmospheric Photooxidation Diminishes Light Absorption by Primary Brown Carbon Aerosol from Biomass Burning. *Environ. Sci. Technol. Lett.* **2017**, *4* (12), 540–545. https://doi.org/10.1021/acs.estlett.7b00393.

Tack, F., et al., Atmos. Meas. Tech., 12, 211-236, 10.5194/amt-12-211-2019, 2019.

Trainer, et al., Correlation of ozone with NOy in photochemically aged air, J. Geophys. Res., 98, 2917-2926, 1993.

Tsalkani, C. N., et al., Atmos. Environ., 25(9), 1941-1949 doi: 10.1016/0960-1686(91)90275, 1991.

Zaveri, R. A., et al., Atmos. Chem. Phys., 12, 7647–7687, doi:10.5194/acp-12-7647-2012, 2012.