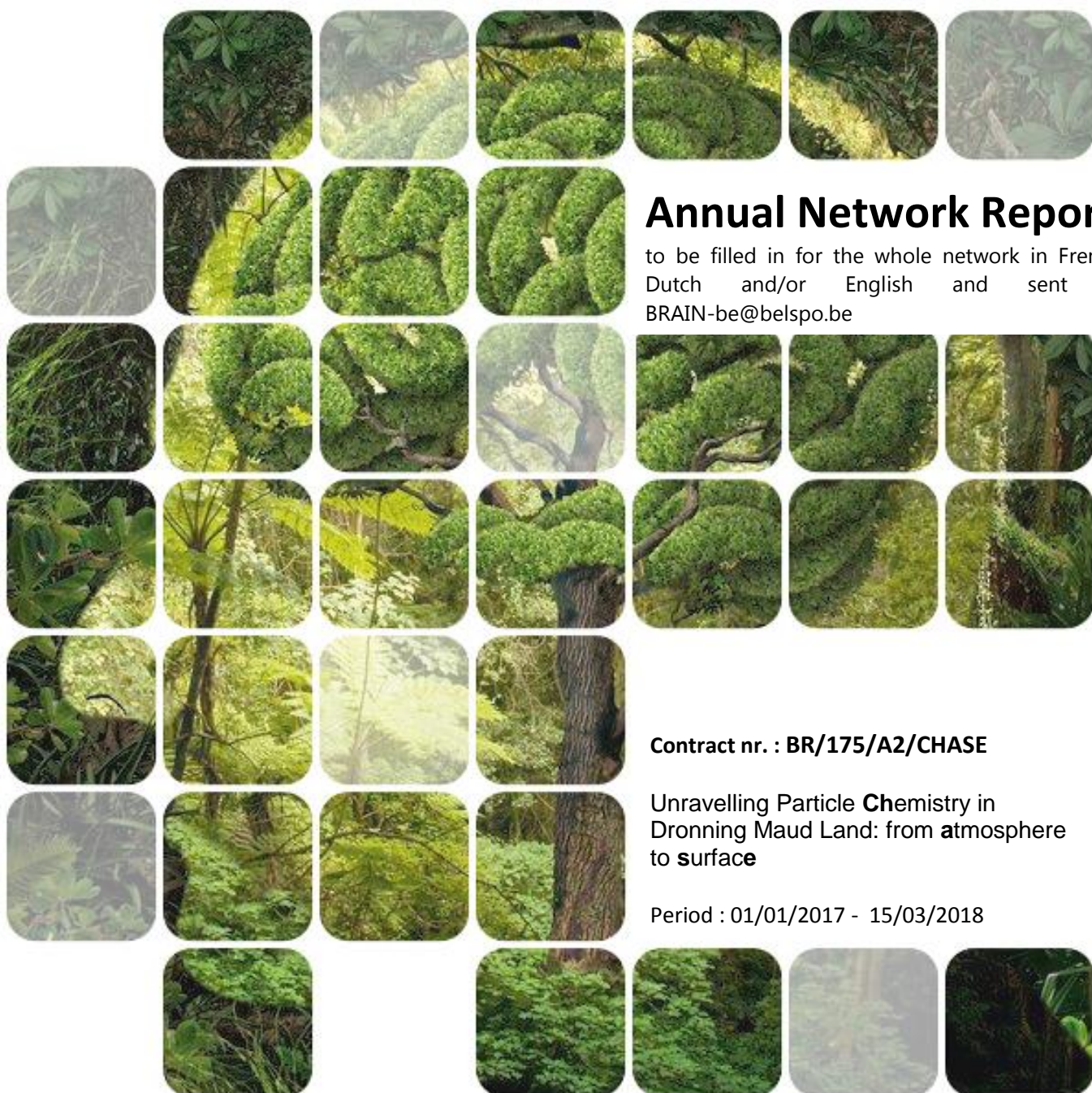


# BRAIN-be

BELGIAN RESEARCH ACTION THROUGH INTERDISCIPLINARY NETWORKS



## Annual Network Report

to be filled in for the whole network in French, Dutch and/or English and sent to [BRAIN-be@belspo.be](mailto:BRAIN-be@belspo.be)

Contract nr. : **BR/175/A2/CHASE**

Unravelling Particle **Chemistry** in Dronning Maud Land: from **atmosphere** to **surface**

Period : 01/01/2017 - 15/03/2018

## NETWORK

### COORDINATOR

Dr. Alexander Mangold and Dr. Andy Delcloo, Royal Meteorological Institute of Belgium

### PARTNERS

1. Dr. Alexander Mangold and Dr. Andy Delcloo, Royal Meteorological Institute of Belgium
2. Prof. Herman Van Langenhove and Prof. Kristof Demeestere, Ghent University
3. Prof. Nadine Mattielli, Université Libre de Bruxelles (ULB)
4. Prof. Philippe, Claeys, Vrije Universiteit Brussel (VUB)

### AUTHORS

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3. Prof. Herman Van Langenhove, Ghent University
4. Prof. Kristof Demeestere, Ghent University
5. Dr. Christophe Walgraeve, Ghent University
6. Preben Van Overmeiren, Ghent University
7. Prof. Nadine Mattielli, Université Libre de Bruxelles (ULB)
8. Dr. Stefania Gili, Université Libre de Bruxelles (ULB)
9. Prof. Philippe, Claeys, Vrije Universiteit Brussel (VUB)

### PROJECT WEBSITE:

Project website is under construction

Yearly, one report (max. 15-20 pages) should be filled in for the whole network in French, Dutch or English and sent to [BRAIN-be@belspo.be](mailto:BRAIN-be@belspo.be).

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## 1. EXECUTIVE SUMMARY OF THE REPORT

The CHASE project provides detailed physical-chemical analyses of both atmospheric and surface snow particles as well as of volatile organic compounds recovered near the Belgian research station Princess Elisabeth (PE), Dronning Maud Land, East Antarctica, and thoroughly investigates their atmospheric transport pathways. Such detailed studies have never occurred in the region where Princess Elisabeth station is located. The project consists of 4 components: (i) a particle and air sampling with physical-chemical analysis component, (ii) a data interpretation component, (iii) a synthesis component, and (iv) a valorisation component.

The work is subdivided in several tasks and deliverables, executed by the different partners of this project. Their progress regarding the different deliverables is listed in table 1. The start date of the project was the 1<sup>st</sup> January 2017. In the table below, the submission date is counted from the 15<sup>th</sup> April 2017 (48 months until end of project in contract 15/04/2021).

No.	Description	Partner	Subm. date	Status
D1.1	Active and passive sampling methods for the atmospheric organic composition analysis of both particulate and gaseous fraction	UGent	M12, M24, M36, M46	PROG
D1.2	Advanced analytical procedures enabling detailed molecular characterization of collected air samples by using highly innovative mass spectrometry based equipment	UGent	M12, M24, M36, M46	PROG
D1.3	Unique dataset on detection frequencies and concentration levels of organic micropollutants in both Austral Summer and Winter at Dronning Maud Land	UGent	M12, M24, M36, M48	NOT
D1.4	Analysis methods developed for stable isotopes C and N of the organic aerosol fraction and related dataset on isotopic composition of the organic fraction of particulate matter	VUB	M12, M24, M36, M48	NOT
D2.1	Active sampling and analysis methods developed for inorganic composition of atmospheric particles and related dataset of inorganic composition	ULB	M12, M24, M36, M48	PROG
D2.2	Passive sampling and analysis methods developed for inorganic composition of atmospheric particles and related dataset of inorganic composition	ULB	M12, M24, M36, M48	PROG
D2.3	Surface snow samples collected and analysis methods developed for inorganic composition of particles therein and related dataset of inorganic composition	ULB	M12, M24, M36, M48	PROG
D3.1	Air mass trajectories calculated, dispersion analysis of atmospheric pathways, clustering of source regions	RMI	M12, M24, M36, M42	PROG
D4.1	Source regions, transport pathways, seasonal variations and relative importance of trace elements, micronutrients and atmospheric pollutants, of natural and anthropogenic compounds	RMI	M18, M30, M48	NOT
D4.2	Cloud Condensation Nuclei and Ice Nuclei characterisation	RMI	M18, M30, M48	NOT
D5.1	Management of the network	RMI	Cont.	PROG
D5.2	Quality controlled chemistry database	RMI	Cont.	NOT
D5.3	Results published to scientific community, policy and public	RMI, UGent, ULB, VUB	Cont.	PROG
D5.4	Scientific workshop	RMI, UGent, ULB, VUB	M42.	NOT

**Table 1: List of intermediate and final deliverables and their dissemination. The first three columns give the number, the description and the partner responsible for the deliverable, the fourth column gives the submission date, counted from 15 April 2017, and the fifth column gives the status (finished (FIN), in progress (PROG), or not started (NOT)).**



After finalisation of the project contract during summer 2017, preparations started immediately in order to a) prepare the expedition campaign to Princess Elisabeth (PE) station Antarctica and to b) prepare job announcements for hiring staff.

The following preparations were undertaken for the 2017/18 field campaign:

- CHASE partners Nadine Mattielli, Christophe Walgraeve and Alexander Mangold met several times with the Station Operator in order to discuss the practical topics for the sampling campaign;
- Material for the sampling has been prepared and ordered (i.a. adaptations to the High Volume Pump of UGent; order of the pump for inorganic active sampling; ordering and preparation of filters and filter holders for both active and passive sampling; preparation of the bottles for sampling surface snow);
- Preparation of the necessary air cargo boxes and shipment forms;

Further details are described below within the progress per task section.

The progress with respect of hiring staff is described below in the respective section.

Nadine Mattielli and Christophe Walgraeve participated (on the CHASE project) in the BELARE 2017/2018 field campaign to Princess Elisabeth station and have been there from 23 November to 18 December 2017. In addition, Alexander Mangold has been at PE station during the same time period on behalf of the Brain-Be AEROCLOUD project and helped also with necessary work for the collection of samples for the CHASE project. The installation of the pumps for active sampling was successful and also five sites for passive sampling of atmospheric particles and volatile organic compounds could be set up. At all of these five sites, surface snow samples were collected. By April 2018, the snow and filter samples for analysis arrived via cold-chain sea cargo in Belgium. Further details are described below within the progress per task section.

## 2. ACHIEVED WORK

*Detailed description of the achieved work and tasks of the past reporting year*

### **Task 1: Characterisation of the organic atmospheric composition (particulate matter and VOCs) (UGent, VUB)**

#### **Task 1.1: Sampling and sample preparation of atmospheric particles for organic analysis (UGent)**

A Digitel DHA-80 High Volume Sampler (HVS, 500 l/min) for active sampling of atmospheric particles has been installed in a container around 300 m north of PE station. The active sampling is limited to the austral summer period (filter exchange, energy demand). Pre-baked quartz-fibre filters have been used for the collection of particulate matter. Active sampling started beginning of December 2017 (CHASE team) and continued through February 2018 (PE station staff). Besides blank samples, a total of 8 filter samples for the organic component analysis could be collected (due to the overall amount of atmospheric particles, sample time has to be at least 7 days continuously). These filter samples arrived in Belgium by April 2018 for laboratory analysis.

Simultaneously with the high volume active sampling, polyurethane foam disk passive samplers have been installed, to be able to identify trace organic semi-volatile and non-volatile micro-pollutants. In addition, polymer sheet type passive samplers have been installed to sample organic micro-pollutants. Both kinds of these passive samplers have been set up in November and December by Christophe Walgraeve and Nadine Mattielli on poles (around 2-3 m above ground) at five locations along a transect from the plateau to the coast: i) around 4 km eastward of PE station; ii) one site southward of PE, in the vicinity of the plateau; iii) near Romnoes, northward of PE; iv) between Romnoes and the coast; and v) at one site near the coast. These filters will stay a whole year until recovery and exchange of them in November, December 2018.

### **Task 1.2: Sampling and sample preparation for the analysis of Volatile Organic Compounds (UGent)**

Volatile Organic Compounds (VOCs) are sampled by passive sampling. Axial passive samplers have been installed on poles (around 2-3 m above ground) at the same five locations as the passive samplers for semi-volatile organic analysis mentioned before. These samplers will collect VOCs over a whole year until recovery and exchange of them in November, December 2018. Besides blank samples, a total of 30 (5 x 6) samples will be collected. Preliminary tests were performed to sample VOCs by pumped (active) sampling.

### **Task 1.3.1: Laboratory analysis for the molecular characterisation of the organic atmospheric composition (UGent)**

Not started yet.

### **Task 1.3.2: Laboratory analysis for the stable isotopes C and N of the organic aerosol fraction (VUB)**

Not started yet.

### **Task 1.4: Interpretation of the results for organic atmospheric composition (UGent, VUB)**

Not started yet.

## **Task 2: Characterisation of the inorganic composition of atmospheric particles (ULB)**

### **Task 2.1: Active sampling and analysis of inorganic composition of atmospheric particles (ULB)**

Active sampling on 47 mm Teflon filters has been done from December 2017 (CHASE team) through February 2018 (PE station staff). For this purpose, a strong pump (nominal flow rate of 330 L/min) has been installed in the same container as for the active sampling for organic analysis. The active sampling is limited to the austral summer period (due to filter exchange handling, energy demand). Besides several blank samples, a total of 10 filter samples could be collected (due to the overall amount of atmospheric particles, sample time had to be at least or more than 7 days continuously). These filter samples arrived by April 2018 in Belgium for laboratory analysis. They are currently stored in Asse in frozen controlled conditions. A specific transport is planned end of April 2018 to transfer the samples to ULB.

### **Task 2.2: Passive sampling and analysis of inorganic composition of atmospheric particles (ULB)**

Several passive atmospheric dust collectors have been installed by the CHASE team in November and December 2017, on poles (around 2-3 m above ground) at the same sites as the passive samplers for organic analysis and of VOCs: i) one Bergerhoff type dust trap and two Sigma-2 passive collectors, around 4 km eastward of PE station; ii) one Sigma-2 collector at the site southward of PE, in the vicinity of the plateau; iii) one Sigma-2 collector at the site near Romnoes, northward of PE; iv) one Sigma-2 collector at the site in between Romnoes and the coast; and v) one Sigma-2 collector on the western part of an ice rise at the coast. The samplers containing respectively one filter and a Savilex beaker at all sites have been installed for an atmospheric dust collection over a whole year until recovery and exchange of them in November, December 2018. It

was however possible to exchange two filters at the site eastward of PE station. These filters came back by end of February for laboratory analysis (thanks to the contribution of Steven Goderis and Matthias Van Ginneken of VUB/ULB; BELAM project).

In addition, two filter samples from passive samplers, installed during previous field campaigns, could be recovered and exchanged: one at the site around 4 km eastward of PE; and one at the site near Romnoes.

### **Task 2.3: Sampling of surface snow and analysis of inorganic composition of particles therein (ULB)**

Samples of surface snow have been taken in November and December 2017 by Nadine Mattielli at five locations: i) around 4 km eastward of PE station; ii) one site southward of PE, in the vicinity of the plateau; iii) near Romnoes, northward of PE; iv) in between Romnoes and the coast; and v) at one site at the western part of an ice rise at the coast. A total of 18 bottles of 10 L and 6 bottles of 5 L, i.e. a total of 210 L of surface snow, have been collected. The bottles have been shipped back and arrived in Belgium by April 2018 for laboratory analysis of the particles in the sampled snow. In addition, in an exploratory approach, three snow cores have been drilled on 1m depth at the vicinity of the ice drilling site of the Brain-Be project MASS2ANT (the same campground was shared between CHASE and MASS2ANT scientists) to investigate the potential variability of dust with depth at the subsurface.

In addition, another 3 bottles of 10 L of surface snow, which were collected during a previous field campaign in January-February 2016, could be recovered and have been shipped back to Belgium.

### **Task 2.4: Interpretation of the results for inorganic particle composition (ULB)**

First results of test samples from the active sampling brought directly back from the field campaign indicate that longer sampling times (> one week) will be necessary in order to have sufficient particles/mass for the laboratory analyses.

## **Task 3: Air mass tracing by dispersion analysis of atmospheric transport (RMI)**

### **Task 3.1: Calculation of air mass trajectories (RMI)**

First runs of the atmospheric transport and dispersion model FLEXPART have been done for a test case of particles collected in surface snow during a storm on 6 December 2014 at the coast (near Roi Baudouin ice shelf). That sample has been analysed by Aubry Vanderstraeten (PhD student of Nadine Mattielli) for trace element concentrations. The backward trajectories indicate that the air masses at the lowest atmospheric levels originated in the Southern Ocean and might be influenced by the outflow of the African continent.

## **Task 4: Implications of the found results for atmospheric transport of trace elements, micronutrients and pollutants towards Antarctica and its closely associated Southern Ocean (RMI)**

### **Task 4.1: Trace elements, micronutrients and atmospheric pollutants in Antarctica – their source regions, transport pathways, seasonal variations and relative importance of natural and anthropogenic compounds (RMI)**

Not started yet.

#### **Task 4.2: Implications of found particle chemistry on cloud condensation and ice nuclei (RMI)**

Not started yet.

#### **Task 5 Coordination, database management and valorisation (RMI, UGent, ULB, VUB)**

##### **Task 5.1: Network management (RMI)**

Project coordination is led by the Royal Meteorological Institute. The initial report has been delivered to Belspo in mid-October 2017. A meeting of the CHASE consortium is planned for spring 2018.

##### **Task 5.2: Management of the chemistry database (RMI)**

The database and the website are not started yet.

##### **Task 5.3: Publication of results to the scientific community, policy stakeholders and the general public (RMI, UGent, ULB, VUB)**

A blog was maintained during the field campaign by Nadine Mattielli and Christophe Walgraeve (on [www.bncar.be](http://www.bncar.be)) and by Alexander Mangold ([belatmos.blogspot.be](http://belatmos.blogspot.be)). Further communications will be prepared when first results of the collected samples are available.

An abstract has been submitted by Stefania Gili (CHASE post-doctoral fellow at ULB) to the Goldschmidt Conference (Boston, August 2018) – the main annual international conference in geochemistry.

For publications, please refer also to section 7.

##### **Task 5.4: Scientific workshop (RMI, UGent, ULB, VUB)**

Not started yet.

### **3. INTERMEDIARY RESULTS**

#### **Task 1.1: Sampling and sample preparation of atmospheric particles for organic analysis (UGent)**

Different samples were taken during the 2017-18 Antarctic summer using both active and passive sampling methodologies (High volume active sampling, passive sampling employing PUF disk samplers and polymer sheet samplers). The samples arrived in Belgium by April 2018 but were not analysed yet. The focus was put on the method development to ensure that each step in the analytical process is fully understood and characterised. Particular focus was put on the avoidance of contamination during the transport of the (blank) filters, PUFs and polymer sheets. Preliminary tests were conducted to assess the extraction efficiency of the target compounds.

#### **Task 1.2: Sampling and sample preparation for the analysis of Volatile Organic Compounds (UGent)**

Volatile Organic Compounds (VOCs) were sampled by passive sampling. Axial passive samplers have been installed on poles (around 2-3 m above ground) at the same five locations as the



passive samplers for semi-volatile organic analysis mentioned before. These samplers will collect VOCs over a whole year until recovery and exchange of them in November, December 2018. Besides blank samples, a total of 30 (5 x 6) samples will be collected. Preliminary tests were performed to sample VOCs by pumped (active) sampling.

### **Task 1.3.1: Laboratory analysis for the molecular characterisation of the organic atmospheric composition (UGent)**

Preben van Overmeiren (PhD working on CHASE) started on the 15<sup>th</sup> of March 2018 on his PhD research. Samples arrived in April 2018, but are not analysed yet, because the focus is now on the analytical method development and method validation. Given the scientific relevance of the collected samples, it is of paramount importance that first all steps in the analytical procedure (extraction, purification, separation and detection) are well characterised.

### **Task 2.1: Active sampling and analysis of inorganic composition of atmospheric particles (ULB)**

According to the first observations of the filters collected during the BELARE 2017/18 campaign, active sampling requires at least 7 days to gather enough particles per filter. A strong storm happened at the station PEA in January 2018 and caused snow entering inside the tubing protecting the filters. Improvements are therefore required to optimize the active sampling system used on the top of the scientific container used for Dust studies at the station PEA.

### **Task 2.2: Passive sampling and analysis of inorganic composition of atmospheric particles (ULB)**

The preliminary observations seem to show that salts can easily precipitate inside the passive sampler (during storm events) and accumulate on the filter. A slight bending of the filter can concentrate the salts at some specific spots of the filter and isolate the atmospheric particles.

### **Task 2.3: Sampling of surface snow and analysis of inorganic composition of particles therein (ULB)**

The preliminary trace element concentration analyses by HR-ICP-MS show clear interesting contrasts between the snow collected at the coast and the snows collected inland. In addition to traditional metals, the REE appear to be a sensitive tool to discriminate local versus distal dust sources, as well as the continents from which originate the distal dusts.

### **Task 3.1: Calculation of air mass trajectories (RMI)**

First runs of the atmospheric transport and dispersion model FLEXPART have been done for a test case of particles collected in surface snow during a storm on 6 December 2014 at the coast (near Roi Baudouin ice shelf). That sample has been analysed by Aubry Vanderstraeten (PhD student of Nadine Mattielli) for trace element concentrations. The backward trajectories indicate that the air masses at the lowest atmospheric levels originated in the Southern Ocean and might be influenced by the outflow of the African continent.

### **Task 5.1 : Network management (RMI)**

See section 2.

### **Task 5.2: Management of the chemistry database (RMI)**

See section 2.

**Task 5.3: Publication of results to the scientific community, policy stakeholders and the general public (RMI, UGent, ULB, VUB)**

See section 7 for an overview list of publications.

**Task 5.4: Scientific workshop (RMI, UGent, ULB, VUB)**

See section 2.

## 4. PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

**Work package 1: Characterisation of the organic atmospheric composition (particulate matter and VOCs)**

The active sampling could be set up successfully and several filters could be collected for laboratory analysis. Also, at five locations on a transect from the plateau to the coast, samplers for passive collection of particles and VOCs could be set up successfully.

Experience was gained on the sampling of VOCs and semi volatiles in severe weather conditions in Antarctica. Adjustments to the High volume sampler will be made for next season (extend the sampling wind direction angle) and improve the sampling inlet to avoid the entrance of snow during storm events.

**Work package 2 Characterisation of the inorganic composition of atmospheric particles:**

The expedition BELARE 2017/18 (and the stay of CHASE staff during November 14 – December 23, 2017) was extremely successful. The transect for the sampling of dust in suspension (through 6 Sigma-2 and 1 Bergenhoof passive samplers) and deposition (snow samples) was established from the plateau to the coast with 5 equipped sites. For each site, for the analyses of dust inorganic composition, one filter and one savilex beaker were installed in the sigma passive samplers, and between 10 and 150L of snow (depending on the sampling site) were collected. At the coast, three short (1m) snow cores were sampled for comparative tests. All the samples (filters, 210L of snow and 3 short snow cores) safely arrived in Belgium, stored in frozen conditions. End of April, the filters and snow samples will be repatriated to ULB and stored in freezers, before being processed for trace element (and isotopic) analyses. The filters will be analysed by SEM/EDS for individual particle chemical analyses (in addition to the morphology and size characterization). Thanks to the contribution of S. Goderis and M. Van Ginneken (VUB/ULB), two filters from the Sigma-2 were replaced in February 2018 (effectively two months sampling) at the site close the Station PEA and brought back to ULB. Those samples complement the collection of the two previous filters, retrieved by Ch. Walgrave and N. Mattielli, from the same spot and the Romnoes site (set up during Belare season 2015/2016).

**Work package 3 Air mass tracing by dispersion analysis of atmospheric transport:**

First runs of the atmospheric transport and dispersion model FLEXPART have been done for a test case of particles collected in surface snow during a storm on 6 December 2014 at the coast (near Roi Baudouin ice shelf). With this, the platform to calculate the necessary back trajectories is in place.

**Work package 4 Implications of the found results for atmospheric transport of trace elements, micronutrients and pollutants towards Antarctica and its closely associated Southern Ocean:**

Not started yet.

**Work package 5 Coordination, database management and valorisation:**

See section achieved work.

**General recommendations:**

The installation of both the active and passive sampling was successful. However, given the long sampling times, it is essential that the sampling can continue as planned over four seasons. Also, particular attention will be paid to avoid contamination and to avoid disturbances of the samples, e.g., by snow intrusion during storm conditions.

## 5. FUTURE PROSPECTS AND PLANNING

*Overview of the foreseen activities and planning for next reporting year, taking into account the actual state of the work and the intermediary results*

**Work package 1: Characterisation of the organic atmospheric composition (particulate matter and VOCs) (UGent, VUB):**

Analytical methods will be developed to quantify organic micro-pollutants in the gas and particulate phase of Antarctica. All steps in the analytical sequence will be evaluated (sampling, sample preparation and analysis). Method characteristics (recoveries, matrix effects, limits of detection, limits of quantification) will be determined. Specific research will be conducted to ascertain the reliable sampling, transport and analysis of the samples. Methods will be adjusted and modified based on the experiences obtained during the first season. The results of the first samples will be available.

**Work package 2: Characterisation of the inorganic composition of atmospheric particles (ULB) :**

New freezers have been bought and are ready to welcome the new snow bottles (and test cores) at ULB. As soon as the samples will arrive at the G-Time Laboratory, the filtration experiments will start, as well as the trace element analyses by HR-ICP-MS.

On May 18, a full day is going to be devoted to a workshop (talks and discussions) organized at the Université Lille-Côte d'Opale (Dunkerque) for gathering people from ULB and Dunkerque involved in the dust collection and SEM-EDS analyses of the atmospheric particles. Firstly, the filters from the Sigma passive samplers will be analysed, secondly filters from the active sampling system and eventually the dust filtered from the snow samples.

In parallel, when the atmospheric particles will be separated from the snow by filtration, they will be processed (total dissolution) for trace element analyses on the HR-ICP-MS at the VUB.

**Work package 3: Air mass tracing by dispersion analysis of atmospheric transport: (RMI):**

Backward trajectories will be calculated for the period of the sampling at both the sites for active and passive sampling. For the passive sampling with very long time intervals, a special clustering will have to be applied.

**Work package 4: Implications of the found results for atmospheric transport of trace elements, micronutrients and pollutants towards Antarctica and its closely associated Southern Ocean (RMI):**

The first results of the laboratory analyses of organic and inorganic samples from work packages 1 and 2 will be combined with the calculated back trajectories. Further, the first results for the composition of atmospheric particles will be used to better constrain potential numbers of cloud condensation nuclei and of ice nuclei.

**Work package 5: Coordination, database management and valorisation (RMI, UGent, ULB, VUB):**

- The next Belgian Research Expedition to the Princess Elisabeth station (November 2018 – February 2019) will host probably again two CHASE scientists. They will proceed to do the active sampling, exchange the samples at the passive sampling site and collect the snow samples.
- A CHASE website will be created and first work will be done to create a Chase database.
- A paper on first results will be prepared.
- Further outreach activities like talks, poster presentations, blogs, will be continued.
- Philippe Claeys and Alexander Mangold will attend the meetings of the Belgian National Committee on Antarctic Research.

## 6. FOLLOW-UP COMMITTEE

*Dates of the meetings and overview of the concrete contributions of the follow-up committee*

Nadine Mattielli has been in email contact with Profs. Karine Deboudt and Pascal Flament (Laboratory of Physics and Chemistry of the Atmosphere (LPCA), Université du Littoral – Côte d'Opale, Dunkerque, France). They will provide their expertise in aerosol characterisation by applying single-particle analysis (SEM-EDX) on the suspended atmospheric particles collected directly on filters (Sigma-2 and active pump samplers) and dust deposits (snow samples).

Nadine Mattielli has also been in email contact with Dr. Volker Dietze (German Meteorological Service, Research Centre Human Biometeorology, Air Quality Department, Freiburg, Germany) who provided the passive sampler equipment. They discussed the installation of the samplers.

Nadine Mattielli, Christophe Walgraeve and Alexander Mangold have been in email contact with Prof Annick Wilmotte (University of Liège, Belgium). Her group and collaborators (e.g. of UGent, Brain-Be Microbian project) are studying the microbial diversity on deglaciated rocks, nunataks, or ridges in Antarctica. They are interested in how such taxa are distributed in Antarctica, e.g. via air transport. Our filter material might therefore be useful for microorganisms analysis. A meeting with colleagues of the Microbian project is envisaged. In addition, she is member of the Belgian delegation to the Committee for Environmental Protection to the Antarctic Treaty and is preparing a document to protect some of the biological soil crusts in the Sor Rondane Mountains and to keep a reference area non-violated for future studies. We will discuss with her if we can give input (arguments, areas) with respect of our needs to sample non-disturbed atmospheric particles or re-distributed soil dust.

Christophe Walgraeve has met in summer 2017 with Dr. Willy Maenhaut (former Dept of Analytical Chemistry, Ghent University, Belgium) who is a reknown international expert on aerosol chemistry and measurement techniques and has performed aerosol chemistry measurements at the South

Pole. They discussed the practical details of the setup of the active filter sampling.

The employment of Preben van Overmeiren (see Staff-section) opens the perspective to (renew) the collaboration with Prof. Laszlo Vincze UGENT), the former supervisor of Preben. Prof Vincze is doing research on (interstellar) dust characterisation using Synchrotron X-Ray analysis.

Alexander Mangold met before and after the Antarctic field campaign with Prof. Nicole Van Lipzig (KU Leuven). Within the Brain-Be Aerocloud project they are both collaborating on investigating the relationship between clouds, precipitation and aerosols in Antarctica. The results of CHASE on the chemical nature of atmospheric particles will be helpful for understanding the formation of clouds.

Alexander Mangold has been in email contact with Dr. Heike Wex (Leibniz Institute for tropospheric research, TROPOS, Germany) who is doing research on cloud formation, cloud processes and the aerosol particles involved in it. Her group will be interested in the chemistry of the particles sampled within CHASE. A specific sampling setup has been sent to PE station for the period of the stay of Alexander Mangold there and several filters dedicated to analyses on the ice nucleating capabilities of the particles have been collected in December 2017. The samples are now in Leipzig for analysis.

The employment of Stefania Gili (see Staff-section) opens the perspective to collaborate with Prof. Diego Gaiero (National University of Cordoba, Argentina), the former supervisor of Stefania Gili. He is doing research on dust characterisation and genesis in Chili and Argentine, the areas foreseen as the main sources of dust deposits in Antarctica. His research is complementary to the CHASE objectives and the exchange of expertise and results will be beneficial for the outcome of the project.

## 7. VALORISATION ACTIVITIES

### 7.1 PUBLICATIONS

Publications in peer-reviewed scientific journals:

- Herenz, Wex, Mangold, Laffineur, Gorodetskaya, Fleming, Panagi, Stratmann, CCN measurements at the Princess Elisabeth Antarctica Research station during three austral summers, *Atmos. Chem. Phys. Discuss.*, 2018.
- A manuscript has been written and is in last pre-review by the co-authors before the submission to the *Atmosphere Journal* in August at the latest: *Is the Argentinean Loess a primary dust source in the Southern Hemisphere?*, by S. Gili, D. Gaiero, N. Mattielli, G. Torre, S. Goldstein, F. Chemale and E. Koester.
- A manuscript has been written and is in last pre-review by the co-authors before the submission to *ACP journal* (in July 2018): *Pb-Sr-Nd-Zn-Cu-Fe multi-isotope analytical protocols adapted for dust studies*, by A. Vandertsraeten, N. Mattielli, S. Bonneville.

### 7.2 PARTICIPATION/ORGANISATION OF SEMINARS (NATIONAL/INTERNATIONAL)

*Oral presentation, poster... and/or organisation of workshops, symposia etc.*



#### Oral presentations:

- Mangold, A., Q. Laffineur, A. Delcloo, C. Hermans, F. Hendrick, A. Gossart, N. Souverijns, P. Herenz, H. Wex, N. Van Lipzig and H. De Backer, Aerosol variability linked to clouds and precipitation in the Sor Rondane area, POLAR2018, SCAR/IASC Open Science Conference, Davos, Switzerland, 19-23 June 2018.
- Mangold, A., Q. Laffineur, H. De Backer, A. Delcloo, P. Herenz, H. Wex, A. Gossart, N. Souverijns, I. Gorodetskaya, N. Van Lipzig, CCN and aerosol properties at Princess Elisabeth station, East Antarctica, combined with cloud and precipitation observations and air mass origin, European Geosciences Union General Assembly 2017, 23 - 28 April 2017, Vienna, Austria..

#### Poster presentations:

- Mangold, A., Laffineur, Q., De Backer, H., De Bock, V., Delcloo, A., Hermans, C., Gielen, C., Herenz, P., Wex, H. (2017). Atmospheric aerosol and CCN properties in Dronning Maud Land, East Antarctica, European Aerosol Conference 2017, Zürich, Switzerland.

#### Oral or Poster:

- An abstract untitled "Is the Argentinean Loess a primary dust source in southern South America?" has been submitted by Stefania Gili, D. Gaiero, N. Mattielli, G. Torre, S. Goldstein, F. Chemale and E. Koester, for an oral or poster contribution at the Goldschmidt Conference (Boston, August 2018)

### 7.3 SUPPORT TO DECISION MAKING (IF APPLICABLE)

The connection between scientific research on Antarctica and policy is largely managed by the Scientific Committee on Antarctic Research (SCAR). Belgium is a Full Member of SCAR, represented by the Belgian National Committee on Antarctic Research (BNCAR, <http://dev.ulb.ac.be/glaciol/BNCAR/>). Prof. Philippe Claeys and Dr. Alexander Mangold are members of BNCAR and have been attending the meetings to ensure that all scientists involved are aware of the ongoing research. This is further strengthened via discussions with members of the follow up committee. CHASE scientists will attend and give presentations at the XXXV SCAR Biennial Meeting and the associated symposium POLAR2018 co-organized between SCAR and the International Arctic Science Committee IASC (June 2018, Davos, Switzerland).

### 7.4 OTHER

- Blog on RMI's activities at Princess Elisabeth station: [belatmos.blogspot.be](http://belatmos.blogspot.be)
- Report on the various research activities of RMI at the Antarctic research station in the RMI newsletter
- Blog of Nadine Mattielli and Christophe Walgraeve on their research activities during Belare 2017/18: [www.bncar.be](http://www.bncar.be)

## 8. ENCOUNTERED PROBLEMS AND SOLUTIONS

*Encountered problems/obstacles, adopted and/or envisaged solutions, unsolved problems*

The official start of CHASE was 1<sup>st</sup> January 2017. However, effective work started during summer 2017 after finalisation of the contract with BELSPO. To take this time-shift into account, we choose the start date for the deliverables to be 15/04/2017 (48 months before official end date of CHASE).

The localisation of the 'Atmos' shelter for active sampling is not ideal with respect to avoid as much as possible contamination of the filter samples. Although the main station is downwind of the main wind direction, the distance to it is still only around 300 m. Also, the fuel platform where full fuel drums are stored is at less than 100 m distance. This meant bulldozer traffic from time to time with the need to interrupt the active sampling. Although the pumping was mostly interrupted in time, this cannot be guaranteed always. Chase partners will discuss with the station operator possible improvements and adaptations in order to assure to the most possible non-contaminated measurements.

Items for the active sampling setup were sent back by the station operator at the end of season 2017/18, although clearly marked and communicated that these items had to stay. It means an extra cargo cost as around 60 kg were shipped back and have to be shipped in coming season 2018/19. This will be discussed with the operator.

## 9. MODIFICATIONS COMPARED TO THE PREVIOUS REPORT (IF APPLICABLE)

### 9.1 PERSONNEL

Partner	Name	Nationality	Gender	Date of birth	Certificate	Year of graduation	Statute	Time implication in the project financed by BELSPO (in FTE)	Type of labour contract	Annual gross salary	Time implication in the project financed by other source(s) (in FTE)	Name(s) of the other funding source(s)	Remarks

## 9.2 COMPOSITION OF THE FOLLOW-UP COMMITTEE

n/a

## 10. REMARKS AND SUGGESTIONS

*Concerning for example: the coordination, the use or valorisation of the results, personnel change ...*

### **Hiring of staff for the CHASE project**

#### ULB:

For the PostDoc position at ULB within CHASE, Dr. Stefania Gili has been appointed. She started at ULB on February 2, 2018 with a Postdoctoral fellowship grant contract. Her PhD thesis research dedicated to the provenance of atmospheric dust and surface sediments in the Southern South America and their relationships with the fingerprints of different paleo-records (Loess, marine sediments from the Southern Ocean and Antarctic ice cores) will allow to improve our knowledge of the dust produced in the South of America and add a complementary approach for a in-depth investigation of the dust input variability through time in the Antarctica subsurface. The scientific background and the connections of Stefania Gili to her former supervisor at the University of Cordoba (Argentina) will be extremely positive for the CHASE outcome. In addition, she increases the female collaborators within the CHASE network.

#### UGent:

A first round of solicitations for a PhD student was hold in September and October 2017. However, the final candidate chose another position. A new round of solicitations was hold in January and February 2018. A Master of science in chemistry, Preben Van Overmeiren was selected for starting a PhD within the Chase project. He started by 15 March 2018.

#### KMI:

KMI will hire a new staff member either in the course of 2018 or beginning of 2019. This staff member should have expertise in atmospheric trajectory and dispersion modelling.