UNIVERSIDAD DE LA FRONTERA

FACULTAD DE INGENIERÍA Y CIENCIAS
DEPARTAMENTO DE CIENCIAS QUÍMICAS Y RECURSOS NATURALES

Organized by:

EMAlab – Laboratorio de Ecología Microbiana Aplicada – Universidad de la Frontera

The IDEC Institute Hiroshima University

BIOREN-UFRO
Scientific and Technological Bioresource Nucleus

International Bioaerosol Seminar

"Japan-Chile Multi-Institutional Seminar for Establishing Bioaerosol Research Network"

Tuesday 16th May, 2023

09:00-13:00 to 15:00-17:00
Auditorium Selva Saavedra
Universidad de La Frontera
Temuco, Chile

Financing by:

JSPS Bilateral Open Partnership Joint Seminars (Interuniversity Cooperation): JPJSBP220239905 (April 1st, 2023 - Mar 31th, 2024)

International joint research for elucidating the characteristics of local bioaerosol transmission on the anthropogenic activity" 22KK0174. 2022-10-07 – 2026-03-31

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ABSTRACT BOOK

Japan-Chile Multi-Institutional Seminar for Establishing Bioaerosol Research Network. International Bioaersol Seminar between the Department of Chemical Sciences and Natural Resources, Scientific and Technological Bioresource Nucleus (BIOREN-UFRO), Universidad de La Frontera and The IDEC Institute, Hiroshima University.

Place and year
Temuco and Hiroshima, 2023.

The publication is free of charge.

International Bioaerosol Seminar
"Japan-Chile Multi-Institutional Seminar for Establishing Bioaerosol Research Network"

Tuesday, May 16th 2023, 09:00 to 13:00 and 15:00 to 18:00
Auditorium Selva Saavedra
Universidad de La Frontera-Temuco, Chile
Program

Hour	*Title*	*Moderator/Speaker*
09:00–09:10 (10 min)	*Opening*	*Mg. Paulina Latorre, Dirección de Cooperación Internacional, Universidad de La Frontera (Chile)*
09:10-09:20 (10 min)	*Introducing the scientific-technological platform for interdisciplinary research in Aerobiology*	*Dr. Milko Jorquera, Universidad de La Frontera (Chile)*
09:20–09:50 (30 min)	*Effects of air pollutants on respiratory and immune systems*	*Dr. Akiko Honda, Kyoto University (Japan)*
09:50–10:20 (30 min)	*Micro (nano) plastics in aerosols need immediate clarification of sources and behavior*	*Dr. Tanaka, SMG of Water Environ., Ctr. for Environ. Sci. in Saitama (Japan)*
10:20-10:40 (20 min)	*Coffee break*	
10:40–11:10 (30 min)	*Atmospheric aerosol and its impact on the climate: with example of atmospheric observation in remote sites*	*~~Professor~~ Dr. Yoko Iwamoto, Hiroshima University (Japan)*
11:10–11:40 (30 min)	*Linking Urbanization and Microbiome*	*~~Assistant professor,~~ Dr. So Fujiyoshi, Hiroshima University (Japan)*
11:40–12:10 (30 min)	*Questions and conclusions*	*Moderator, Dr. Fumito Maruyama, Hiroshima University (Japan)*
Lunchtime (free lunch)		
15:00–15:30 (30 min)	*NUNATAK Laboratories as a flexible, international and collaborative platform to monitor the interaction between the atmospheric aerosols and the cryosphere of the Chilean central Andes mountain*	*Dr. Francisco Cereceda, Universidad Técnica Federico Santa María (Chile)*
15:30–16:00 (30 min)	*Urban monitoring of indoor and outdoor airborne pollution in insular and continental cities from Los Lagos region, Chile*	*Dr. Ricardo Fernández & Dr. Rodrigo Márquez, Universidad de Los Lagos (Chile)*
16:00–16:20 (20 min)	*Coffee break*	

16:20–16:50 (30 min)	*Observations of Aerosols and Clouds at Punta Arenas, a measurement site in the middle latitudes of the Southern Hemisphere.*	*Dr. Boris Barja, Universidad de Magallanes (Chile)*
16:50–17:20 (30 min)	*Desert-Coastal Zone of the Antofagasta Region: an important natural laboratory for the study of bioaerosols.*	*Dr. Rubén Araya, Universidad de Antofagasta (Chile)*
17:20-17:30 (10 min)	*Questions and conclusion*	*Moderator, Dr. Jacquelinne Acuña, Universidad de La Frontera (Chile)*
17:30-17:40 (10 min)	*Closing*	*Mg. Paulina Latorre, Dirección de Cooperación Internacional, Universidad de La Frontera (Chile)*

Organized by:
-Laboratorio de Ecología Microbiana Aplicada (EMALAB), Departamento de Coiencias Químicas y Recursos Naturales, Facultad de Ingeniería y Ciencias, Universidad de La Frontera, Chile.
-Implementación de una plataforma científico-tecnológica dirigida al desarrollo de investigación interdisciplinaria en Aerobiología, Concurso de Equipamiento Científico y Tecnológico Mediano FONDEQUIP 2022: EQM22063 (2022-11-21 - 2026-05-21), Scientific and Technological Bioresource Nucleus (BIOREN-UFRO), Universidad de La Frontera, Chile.
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-International joint research for elucidating the characteristics of local bioaerosol transmission on the anthropogenic activity" 22KK0174. (2022-10-07 – 2026-03-31).

CONTENTS

PREFACE

Greetings,

It is with great pleasure and anticipation that we welcome you to the International Bioaerosol Seminar “Japan-Chile Multi-Institutional Seminar for Establishing Bioaerosol Research Network.” Taking place on Tuesday, May 16th, 2023, this seminal event represents a significant step forward in the rapidly emerging domain of bioaerosol research.

Bioaerosols, or airborne particles that are biological or of biological origin, are a critical yet often overlooked element of our environment. Understanding their role in various biological and atmospheric processes is of paramount importance. The seminar's central focus is to pave the way for a robust network of researchers, fostering international collaboration between Japan and Chile to enhance our collective understanding of bioaerosols.

Bioaerosols play a pivotal role in public health, and their study has far-reaching implications. Their role in disease transmission, particularly respiratory ailments, is of increasing concern given the global health challenges we have recently faced. By bringing together researchers from diverse geographical and cultural backgrounds, this seminar aims to generate new insights into bioaerosol behavior and transmission mechanisms, which can potentially lead to improved public health strategies and interventions.

Moreover, bioaerosols significantly impact our environment. They are integral to atmospheric processes, influencing cloud formation, precipitation, and even global climate patterns. They also interact with various ecosystems, affecting the survival, distribution, and evolution of many organisms. Hence, this seminar underscores the importance of bioaerosols not just in human health, but in the broader context of global climate change and biodiversity.

International collaboration is the backbone of scientific advancement. It provides a platform for the exchange of ideas, research methodologies, and innovative solutions. This Japan-Chile partnership brings together diverse ecological and epidemiological insights, thereby offering a comprehensive understanding of bioaerosols. This collaborative approach ensures that our exploration of bioaerosols reflects the global and interconnected nature of the challenges they present.

Our distinguished speakers and organizers, including Dr. Fumito Maruyama, Dr. So Fujiyoshi, Dr. Milko Jorquera, and Dr. Jacquelinne Acuña, and others, are luminaries in their respective fields. They bring to the table a wealth of expertise and experience that will undoubtedly enrich our discussions and deepen our understanding of bioaerosols.

This seminar is made possible by the generous support of the JSPS Bilateral Open Partnership Joint Seminars and the project for elucidating the characteristics of local bioaerosol transmission on the anthropogenic activity. Their financial support underscores the importance of this area of research and the potential for groundbreaking discoveries.

We invite you to actively participate in the discussions, share your insights, and contribute to the collective body of knowledge. This seminar provides an opportunity to shape the future of bioaerosol research and address some of the most pressing health and environmental challenges of our time. Together, we can advance our understanding of bioaerosols and their impact on our world, leading to a healthier and more sustainable future for all.

Invited Talk

XI Concurso de Equipamiento Científico y Tecnológico Mediano FONDEQUIP 2022, ANID
Implementation of a scientific-technological platform for the development of interdisciplinary research in Aerobiology (code EQM220063)

Milko Jorquera

Laboratorio de Ecologia Microbiana Aplicada (EMALAB), Departamento de Ciencias Quimicas y Recursos Naturales, Universidad de La Frontera, Temuco, Chile.

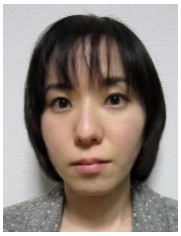
Dr. Milko Jorquera has a degree in Aquaculture Engineering from the University of Antofagasta in Chile, and a Ph.D. in Pharmaceutical Sciences from the Osaka University in Japan. Dr. Jorquera has training in the fields of microbial ecology and environmental microbiology. He is currently the researcher in charge of the Applied Microbial Ecology Laboratory (EMALAB) at the Universidad de La Frontera (Temuco, Chile). The main objective at EMALAB is to generate knowledge about the ecology and biotechnological potential of microorganisms present in terrestrial and aquatic ecosystems in Chile. Dr. Jorquera's research activities are mainly focused on i) elucidating the role of microbial communities in nutrient recycling and their influence on higher organisms, ii) deciphering the diversity and dynamics of microorganisms in Chilean ecosystems subject to changes induced by climate and anthropogenic activities, iii) characterize the genetic and biochemical mechanisms involved in microbial interactions with their environment, and iv) develop biological resource management strategies based on the genetic and metabolic potential of microorganisms in their habitat.

The proposed scientific-technological platform for Interdisciplinary Research in Aerobiology is composed of the following equipment is proposed: (1) A dry cyclonic air sampler for indoor and outdoor environments (Coriolis® compact), (2) An identifier of real-time bioaerosols with laser analysis for indoor and outdoor environments (Rapid E+), (3) High volume filtered air sampler with particle size selector (Sibata HV500-R), (4) A viable cascaded Andersen impactor 6-stage viable bioaerosol counter with size separation for indoor and outdoor environments (TE10800 Six Stage), and (5) A clean indoor viable particle counter with particle collector (Biotrak® 9510), (6) and a digital PCR kit for the absolute quantification of bioaerosols based on nucleic acids from complex samples and/or with low concentration of particles (QIAcuity One 5plex).

The scientific-technological platform integrates equipment for sampling through filtration, impaction, cyclonic, and laser technologies for the detection, counting, and real-time monitoring of bioaerosols through fluorescence and genetic material. The platform equipment's was selected for the development of studies in both indoor and outdoor environments, as well as polluted and clean environments, integrating culture-dependent and culture-independent approaches for a wide range of science areas in natural resources, environmental, public health, among other. It is expected that the platform will be a pivotal part of a Aerobiology Unit at the Scientific and Technological Bioresources Nucleus of the Universidad de La Frontera (BIOREN-UFRO; https://bioren.ufro.cl/), complementary to the equipment currently contained in the five units that comprise it: (1) Microscopy Unit, (2) Flow Cytometry Unit, (3) Genomics Unit, (4) Proteomics and Metabolomics Unit, and (5) Materials and Physics Unit -Chemistry. Thus, the proposed scientific-technological platform will serve as the basis for the development of interdisciplinary research in Aerobiology by researchers, and undergraduate and graduate students associated with the BIOREN-UFRO ecosystem. In this sense, the platform has the support of the directors of undergraduate courses at the Universidad of La Frontera, where it will strengthen the formation of human capital in the study plan (and/or extracurricular activities) through the creation of courses electives in the area of Aerobiology, as well as promoting theses and/or internships in the area of bioaerosols. In the same field, the platform has the support of UFRO postgraduate program directors, where the study plan (and/or extracurricular activities) through the creation of a line of research and/or elective courses in the area of Aerobiology, as well as promoting theses and/or research internships in the area of Aerobiology.

It should be noted that currently studies and research in Aerobiology at a national and global level, both in external and internal environments, mostly lack an interdisciplinary perspective where different disciplines and methodological approaches are integrated to solve research questions that cover various spheres, such as ecology, health animal, public health, occupational health, industrial hygiene, biotechnology, among others. In the same way, a greater number of studies, professionals and researchers with an interdisciplinary perspective will be able in the future to lay the foundations for the generation of new research questions that can be addressed from a transdisciplinary perspective, combining different disciplines and actors (academy-industry-government).

Effects of air pollutants on respiratory and immune systems



Akiko Honda

Environmental Health Division, Department of Environmental Engineering, Graduate School of Engineering, Kyoto University, Kyoto, Japan

Dr. Akiko Honda is ~~doctor~~ Doctor of Pharmacology, Gifu Pharmaceutical University. ~~Since~~ 2011, Akiko Honda ~~become~~ a postdoctoral researcher and assistant professor at Kyoto University. She is working on environmental toxicology, effects of environmental pollutants on diseases such as asthma and atopic dermatitis, air pollution, PM2.5, Asian sand dust particle.Particularly, evaluating the health effects of environmental pollutants and their chemical/biological components using in vitro and in vivo assays, identifying the contributing factors of the health effects, and elucidating the underlying mechanisms.

Particulate matter (PM) is an aggregate of particles and chemical and biological components. At least some of its components contain harmful substances, and fine PM easily reaches the bronchiole and alveoli when inhaled, so their health effects are likely to appear in the respiratory and immune system. Exacerbation of respiratory diseases such as bronchial asthma is considered to be one of the representative case. However, due to the diversity of PM components, the main components that contribute to exacerbation of respiratory diseases have not been clarified. In addition, the dynamics of PMs after they enter the body and the molecular events induced around them have not been fully elucidated. In this presentation, I will introduce the effects of PM itself and its components on health focusing on the respiratory and immune systems, from the perspective of an experimental approach using cell and animal.

Micro (nano) plastics in aerosols need immediate clarification of source and behavior

Hitoshi Tanaka

Ph.D. in Engineering, Tohoku University, Japan. Senior Manager of Water Environment Group at the Center for Environmental Science, Saitama

Dr. TANAKA Hitoshi holds a Ph.D. in Engineering from Tohoku University, Japan, and is a Senior Manager of Water Environment Group at the Center for Environmental Science in Saitama, established by Saitama prefecture in Kazo-City in April 2000. His research includes various topics in environmental biology, ecological engineering, aquatic conservation and environmental education. Dr. TANAKA bases his research on the monitoring of water quality, ecology of plankton and benthos, and other organisms in rivers and lakes. For the last few years he has been investigating inland rivers to combat marine pollution from microplastics. Of particular interest is the importance of environmental education for residents to reduce plastic waste, which is the source of microplastics. He had participated in international collaborative research projects on river ecosystem conservation in China, bioaerosols and groundwater in South Korea.

Microplastics (MPs, less than 5 mm) contamination has become a global problem, and there is concern about its impact on ecosystems, as it has been detected in various organisms. According to the document by World Economic Forum in 2016, the best research currently available estimates that there are over 150 million tonnes of plastic waste in the ocean today. Without significant action, there may be more plastic than fish in the ocean, by weight, by 2050. At the G20 Osaka Summit held in Japan in 2019, 87 countries shared “the Osaka Blue Ocean Vision”, which aims to reduce additional pollution from marine plastic waste to zero by 2050. It is also important to take measures against MPs not only in the ocean but also in inland rivers that connect to the ocean. In Japan, a survey of MPs in a river in Saitama Prefecture, an urbanized area near Tokyo, found microplastics at all 10 sites surveyed in 2019. In the future, it is suggested that nanoplastics (NPs, less than 1μm) exhibit cytotoxicity to living organisms, and it is important to investigate smaller-sized plastics.

On the other hand, MPs have been detected not only in urban areas, but also in air samples from the French Pyrenees and in snow collected in the Arctic and Japan. Because MPs and NPs pollution is thought to be diffused via the atmosphere. However, data on microplastics in the atmosphere are very limited compared to those in the ocean. It is necessary to establish a monitoring system as soon as possible. International efforts to address atmospheric MPs and NPs pollution have been slow. The Republic of Chile is one of the few regions suitable for the identification of sources of atmospheric MPs and NPs and their relationship to bioaerosols, as it ranges from extremely anthropogenic sources to almost pristine natural areas. The collaboration between Japan and Chile is expected to contribute to the rapid elucidation of the dynamics of MPs and NPs and to international contributions to pollution control.

Atmospheric aerosol and its impact on the climate: with example of atmospheric observation in remote sites

Yoko Iwamoto

Graduate School of Integrated Sciences for Life, Hiroshima University, Japan.

In 2009, after completing a Ph.D. program in Earth and Planetary Sciences, Graduate School of Science, the University of Tokyo, Yoko Iwamoto became a postdoctoral researcher and assistant professor at Nagoya University, Kanazawa University, and Tokyo University of Science. Since 2017, She has been an assistant professor (currently an associate professor) of the Graduate School of Biosphere Sciences of Hiroshima University (now the Graduate School of Integrated Sciences for Life). She is working on physical measurement and chemical analysis of particulate matter present in the atmosphere and oceans, elucidation of biogeochemical cycles between the atmosphere and the oceans through the particulate matter, and elucidation of the interaction between atmospheric aerosol, cloud, and precipitation.

Atmospheric aerosols play an important role in controlling the Earth's climate by acting as cloud condensation nuclei (CCN). An accurate understanding of the cooling effects of the earth due to interactions between aerosol and clouds is important to refine the prediction of future global climate. Whether an aerosol particle acts as a CCN depends on the water vapor supersaturation of the surrounding atmosphere, the size of the particle, and the chemical composition of the particle. Since these factors have large spatiotemporal variations, it is necessary to measure them at various locations, including remote sites. In this lecture, I will talk about the role of aerosol particles as CCN, which were measured at the summit of Mt. Fuji (a.s.l 3776 m, the highest mountain in Japan), at the tip of Noto Peninsula in Japan and over the Pacific Ocean, with examples of atmospheric observations.

Linking Urbanization and Microbiome

So Fujiyoshi

PHIS, The IDEC Institute, Hiroshima University, Hiroshima, 739-8530, Japan

So Fujiyoshi is an Assistant Professor at PHIS, the IDEC Institute, Hiroshima University where she conducts research in microbial ecology, with a focus on biotic-abiotic and biotic-biotic interactions. Her research involves a combination of fieldwork, lab experimentation, and bioinformatics analysis. She has held several academic positions in Japan, including Assistant Professor at Graduate School of Medicine and Graduate School of Human and Environmental Studies, Kyoto University, and Assistant Professor at Office of Academic Research and Academia-Government Collaboration, Hiroshima University. She has also worked as a JICA expert on the JST/JICA SATREPS project from 2018 to 2022. Her research interests span several disciplines, including environmental microbiology, agricultural sciences, genome science, public health, and environmental science. Her research has been published in a range of scientific journals, including Frontiers in Microbiology, Atmosphere, and Bioscience, Biotechnology, and Biochemistry. Some of her recent research publications include studying the effects of ventilation on airborne microorganisms in build environments, fabricating a new microfluidic chip for living cell separation, characterizing PM2.5 pollution in Chile, monitoring harmful algal blooms in Chile by metagenomic analysis, and analyzing the structure of bacterial communities in Japanese-style bathrooms.

Urbanization has a significant impact on the composition and diversity of the microbiome, both in human bodies and in the environment. As cities grow, they alter the surrounding natural ecosystems, leading to changes in microbial communities. For example, the increase in pollution associated with urbanization can lead to changes in the types and abundance of microorganisms present in the air. Additionally, urbanization can alter the types of surfaces present in the urban environment, which can affect the deposition and resuspension of microorganisms in the air. Furthermore, the movement of people and goods associated with urbanization can also affect the airborne microbiome. For instance, the movement of people can lead to the introduction of new microorganisms from different regions, while the transportation of goods can lead to the spread of microorganisms associated with food and other products. The airborne microbiome is also of concern for human health, as exposure to certain microorganisms in the air can lead to respiratory and other health problems. Understanding the links between urbanization and the airborne microbiome is therefore important for developing strategies to promote healthy air quality in urban environments.

So far, we collected air samples from suburban sites and urban sites both in Chile and Japan. And almost all the results indicate that there are regional differences not only the composition of particulate matter but also bacterial communities in the air. Urbanization may affect the chemical composition and thus the microbial composition of the air, however, currently there is no direct link in evidence between urbanization and changes in microbial communities or ecology. Further research is needed to explore the health implications of these local differences.

NUNATAK Laboratories as a flexible, international and collaborative platform to monitor the interaction between the atmospheric aerosols and the cryosphere of the Chilean central Andes mountain

Francisco Cereceda-Balic

Department of Chemistry, Director of the Centre for Environmental Technologies (CETAM), Universidad Técnica Federico Santa Maria (UTFSM)

Dr. Francisco Cereceda-Balic is Dr.rer.nat in Chemistry, specialty Environmental Analytical Chemistry from the University of Düsseldorf, Germany. He did his doctoral research at the Institute for Applied Physical Chemistry at the Research Center Jülich in Germany, funded by a grant from the German Academic Exchange Service (DAAD). Dr. Cereceda-Balic is currently Full Professor in the Department of Chemistry at the Universidad Técnica Federico Santa María (UTFSM) in Valparaíso, Chile and Director of the Laboratory of Environmental Chemistry (LQA), and the Centre for Environmental Technologies (CETAM) at the same university. The research led by Dr. Cereceda-Balic correspond to basic research in environmental analytical chemistry and atmospheric chemistry as well to applied research in the development of collecting and treatment systems for environmental samples, emission and toxicology analysis associated to combustion processes, physical chemistry of snow and aerosols (BC/BrC) and its impact on the albedo of the Andean cryosphere, as well as its effects on the hydrological cycle and climate change. He is the author of more than 270 presentations in national and international conferences, over 110 publications and book chapters, 12 patents granted in Chile, Germany, Austria, Italy, England and USA, plus 8 pending patents, both in Chile and internationally and 13 trademark. Dr. Cereceda-Balic has established an extensive international collaboration with universities, research centers and companies from several countries in Latin American, Europe, Asia and USA. He is scientific reviewer in different financing programs of the National Research and Development Agency (ANID, Chile), member of the Chilean Society of Chemistry and advisor member of its Analytical and Environmental Chemistry Division. He also participates in the Board of Directors of the Iberoamerican Society of Environmental Chemistry and Physics. Between 2012-2016 was appointed Vice Chairman (AB-2 Chemistry Vice-Chair) of the Basic Sciences Division area in the Technical Council of the Air & Waste Management Association, USA; and member of the European Geoscience Union.

The Centre of Environmental Technology (CETAM) belong to the UTFSM, Valparaíso, Chile, in the last 17 years has promoted a pioneering line of research, where the relationships between the problems of atmospheric chemical pollution and climate change are studied. One of its objectives is to evaluate the transport of pollutants from urban / industrial areas to the glaciers of the Andes mountain range. For this, the chemical fingerprint of snow, ice and aerosol samples, present in mountain glaciers, is analyzed, developing on-site monitoring campaigns together with other national and international research institutions. This research already includes sampling in the Chilean Central Andes (CCA) of our country, carrying out a monitoring sampling program that includes a transect of more than 7000 km, from the existing glaciers in the Metropolitan Region (MR) to Antarctica Peninsula. This is a pioneering research in South America since there are very scarse data or studies made or published on this subject, especially on chemistry of ice, snow and aerosols collected in Los Andes glaciers and their impact on the albedo, melting of glaciers and global climate change. In this conference the project named "NUNATAK-CHILE First Natural Laboratory on Glacial Pollution and Climate Change: Baseline Survey for Climate Change" will be presented. Thanks to this project, CETAM currently has two Laboratories Refuge in the Cordillera de los Andes Centrales de Chile (CCA), NUNATAK-1 at 3,000 masl in the Aconcagua Basin (Valparaíso Region) and NUNATAK-2 at 2,500 masl in the Maipo Basin (MR), in which the impact of environmental pollution through the atmosphere-cryosphere interaction in the Andes mountains is studied.

Urban monitoring of indoor and outdoor airborne pollution in insular and continental cities from the Los Lagos region, Chile.

Rodrigo Márquez-Reyes

Departamento de Ciencias Sociales, Universidad de Los Lagos, Osorno, Chile

Dr. Rodrigo Márquez-Reyes is a Teacher of Secondary Education (History and Geography) with a Diploma in Geographic Information Systems, Magister in Territorial Planning, and a Ph.D. in Geography from the Universidad Nacional de Sur, Bahía Blanca, Argentina. Dr. Marquez-Reyes is an Associated Professor at the Department of Social Sciences, Universidad de Los Lagos, Chile, and Visiting Professor of Postgraduate Studies at the School of Public Health of the Faculty of Medicine, Universidad de La Frontera, Chile. Research activities are focused on geography and socio-environmental risks and disasters, migratory processes, and environmental air pollution by PM2.5

Ricardo Fernández

Departamento de Salud, Universidad de Los Lagos, Osorno, Chile

Dr. Ricardo Fernandez is a Biochemist with a Ph.D. in Biological Sciences (Physiological Sciences) from the P. Catholic University of Chile. Dr. Fernandez is an Associated Professor at the Department of Health, Universidad de Los Lagos, Chile. The main objective of his work is to contribute to the knowledge of environmental factors that affect the accumulation of PM2.5 produced by domestic biomass combustion and its effect on the epidemiology of chronic and infectious respiratory diseases. Research activities are mainly focused on monitoring air quality in the Los Lagos region, determining of chemical and microbiological composition of PM2.5, epidemiological surveillance of respiratory diseases induced by air pollution, and territorial distribution of susceptible population to air pollution.

To advance towards the development of integrated air quality management, in January 2021 the North-Central Macrozone of the Los Lagos Region, which includes the communes of San Pablo, Osorno, Frutillar, and Llanquihue, and specific areas of the communes of Puerto Varas, Puerto Montt, Río Negro, Purranque, and Puerto Octay, was declared a Saturated Zone for fine particulate matter PM2.5. This area is about a 5,400 km2 extension, with an approximate population of 540,000 inhabitants. The Ministry of the Environment, through the National Air Quality Information System (SINCA), continuously measures the air quality to which the population is exposed just in Osorno, Puerto Varas, and Puerto Montt (83% of the population of the macrozone). On the other hand, and despite not being in the Saturated Zone, the city of Castro, on the Isla Grande of the Chiloe Archipelago, with about 44,000 inhabitants, is also an interesting place for air quality studies, since in Chile does not exist, to date, measurement of PM2.5 in island territories.

Using an e-Sampler analyzer (MetOne, Inc.), we will determine the indoor and outdoor air quality in different areas from Osorno, Puerto Varas, Puerto Montt, and Castro. From the PM2.5 analyzer, we will get Teflon and/or quartz filters, which will be used to characterize the biochemical composition of particulate matter. Chemical analysis will be carried out through a scanning electron microscope (ZEISS EVO® 15) coupled with an X-ray dispersion detector (EDS, Oxford Instruments), and in association with the Public, Environmental,

and Labor Health Laboratory, from the Health Ministry's regional office. The biological characterization will be carried out in collaboration with Japanese researchers.

akFine PM has a long residence time in the atmosphere and deep pulmonary penetration. It can penetrate and lodge deep inside the lungs, increasing host susceptibility to respiratory diseases. Also, PM2.5 can translocate to blood circulation, affecting the cardiovascular, nervous, and reproductive systems. Because of its great surface area per unit mass, the PM could create a suitable environment for microorganisms transporting or accumulating heavy metals, whose adverse effects on human health remain uncertain.

Observations of Aerosols and Clouds at Punta Arenas, a measurement site in the middle latitudes of the Southern Hemisphere

Boris Barja Gonzalez

Atmospheric Research Laboratory, Department of Mathematic and Physic University of Magallanes

Dr. Boris Barja González did his Doctoral studies at the Cuban Meteorological Institute in the Atmosphericcompleted in 2010. He spent four years as a postdoctoral researcher at the Institute of Physics of the University of São Paulo from 2012 to 2016. Dr. Barja currently holds the position of Associate Professor in the Department of Mathematics and Physics at the University of Magallanes. He is also the Head of the Atmospheric Research Laboratory at the same University. Dr. Barja's research themes are oriented towards the study of the physical characteristics, behavior and interaction of atmospheric components such as aerosols, water vapor, radiation and clouds. In the study of these atmospheric components he uses data measured with both in-situ and remote techniques, at fixed measurement sites as well as in measurement campaigns. He is the author of around 100 presentations in national and international conferences, and over 50 publications and book chapters. He has participated as co-researcher in more than 30 research projects and directed more than 15 as principal investigator. He is reviewer of different scientific publication. Dr. Barja has established an extensive international collaboration with universities, research centers and companies from several countries in Latin American, Europe, and Asia. He is member of the American Meteorological Society and American Geophysical Union.

Aerosols and cloudiness, although long studied, remain a source of uncertainty when represented in climate models, especially in the southern hemisphere. This can be mitigated by using ground-based instrument observations. In this paper we present instruments installed at two sites in Punta Arenas, Chile. The first one, the Laboratory for Atmospheric Research (LIA) located at the University of Magallanes (53°S, 71°W), was established in 1991, but aerosol and cloud measurements began in 2016 with the installation of a lidar instrument. The second site was established in 2019 at "Cerro Mirador", located 10 km west of the city and 620 masl. There, some instruments were installed to perform in situ measurements of aerosols. For three years (from November 2018 to November 2021), the land mobile supersite Leipzig Aerosol and Clouds Remote Observations System (LACROS) of the Leibniz Institute for Tropospheric Research (TROPOS) was installed at the LIA site of Punta Arenas to carry out the Dynamics, Aerosol, Cloud and Precipitation Observations in the Pristine Environment of the Southern Ocean (DACAPO-PESO) project. Some results already published and others in process on recent research related to clouds and aerosols carried out in our region are shown. The studies related to cirrus clouds show the seasonal behavior of their frequency of occurrence and their optical properties. The properties of mixed-phase clouds in our region and the influence of the gravity wave on these clouds are shown. Smoke aerosol intrusions into the troposphere and stratosphere of our pristine region are documented. The troposphere received the contribution of biomass burning from south-central Chile. The stratosphere received contribution from Australian wildfire burning occurred during the summer of 2019 and 2020.

Desert-Coastal Zone of the Antofagasta Region: an important natural laboratory for the study of bioaerosols.

Rubén Araya Valencia

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Dr. Rubén Araya Valencia is an aquaculture engineer from the Universidad de Antofagasta and holds a PhD in Microbiology from the University of Osaka (Japan). He is currently an associate professor at the Institute of Natural Sciences, Faculty of Marine Sciences and Biological Resources, Universidad de Antofagasta. His main line of research since 2012 to date, is related to the development of technologies for the production of commercial pearls in abalone for the diversification of national aquaculture, product of this challenge have been obtained intellectual property patents both in Chile and other abalone producing countries (Australia, South Africa and Hong Kong). He is currently scientific advisor to the technology-based company Abalone Pearl Technology, a company associated with the University of Antofagasta for the licensing of the technology and marketing of the gems to the West Coast market of California (UAS) supported by ANID through its funding Startup Science 2022. In the field of microbial ecology, he is actively collaborating with the University of Guadalajara studying the microbiome of corals in the northeastern Pacific of Mexico. This workshop establishes the interest to establish the first interaction with different researchers in the area of bioaerosols addressing particularities of northern Chile and its desertic coastal characteristics.

The coastal-desert zone of the north of Chile in the Atacama Desert, has particular characteristics with respect to the factors that control its climatic conditions. This zone is characterized for being one of the most arid areas of the planet, where these particularities are given mainly by certain characteristics such as the Pacific anticyclone that generates a system of high pressure, the Humboldt current system that runs along the coast of Chile in all its extension and the high mountains of the Andes, which prevent the constant circulation of air masses from the Atlantic. This particular environment experiences anthropogenic and natural disturbances. In recent decades, the great development of industrial activities associated with mining has resulted in the deposition of large mine tailings along the coast, with potential effects on the settled communities that inhabit the large cities of northern Chile, mainly due to the aeolian entrainment of these tailings in bioaerosols. Additionally, and in a natural and cyclical way, these environments are affected by the El Niño Southern Oscillation system (ENSO) with implications at different scales of impact on coastal systems. Among some of these impacts related to public health, there is scientific evidence that this climatic phenomenon has been related to the occurrence of diseases associated with pathogens such as influenza virus and cholera, among others in different latitudes of the planet. Consequently, addressing the effect of bioaerosols in the coastal-desert zone of the Antofagasta Region constitutes an important niche of study to be developed by researchers of the Universidad de Antofagasta in this collaborative network.

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