Program Book

QOS 2021

Quadrennial Ozone Symposium

October 3 (Sunday) - **9** (Saturday), **2021**

Online Meeting

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QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

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Welcome to Seoul, Korea for the Quadrennial Ozone Symposium (QOS) 2021

I am very pleased to invite you to attend the Quadrennial Ozone Symposium (QOS) in South Korea, on October 3 (Sunday) - 9 (Saturday), 2021. Despite its tiny fraction, ozone is a crucial gas in the Earth Atmosphere. The ozone layer in the stratosphere protects life on Earth by filtering out damaging ultraviolet radiation from the sun. In the troposphere, ozone is an important greenhouse gas and a strong pollutant at ground level. Since the last QOS that took place in Edinburgh in 2016, a variety of new developments have taken place on all facets of atmospheric ozone, including its observation and impact on human health and ecosystems. The Symposium's program addresses all these aspects. Through the foreseen keynote talks, presentations at the sessions and discussions at poster sessions and side events, QOS 2021 is of high interest for all scientists throughout the world interested in atmospheric ozone and more generally in the study of the Earth's atmosphere.

Sophie Godin-Beekmann
President of International Ozone Commission

Seoul is a mega-city with advanced modern technologies, and has a long history as the capital of Korea since 1394. The first ozone layer observation in Korea was done by Prof. Emeritus Hi-Ku Cho with the Dobson spectrophotometer in 1984 at the Department of Atmospheric Sciences, Yonsei University. Since then, ozone observation has been continued with the addition of Brewer Spectrophotometers, and Pandora instruments throughout the country. Surface ozone concentration has been also measured by the Ministry of Environment since 1989. These missions are to be followed by the launch of Geostationary Environment Monitoring Spectrometer (GEMS) in early 2021. We, LOC members would like to extend a warm and hearty welcome to you all. Hope you enjoy the symposium.

Local Organizing Committee

II. Program

UTC Time Zone	Oct 3 (Sun)	Oct 4 (Mon)	Oct 5 (Tue)	Oct 6 (Wed)	Oct 7 (Thu)	Oct 8 (Fri)	Oct 9 (Sat)
12:00-12:10	Opening & Award Ceremony	**MON1 - Session A** - Keynote: Ulrike Langematz (15 min) - Oral Presentation (5 min each)	**TUE1 - Session A** - Oral Presentation (5 min each) - Q&A (10 min)	**WED1 - Session C** - Keynote: Yuanhang Zhang (15 min) - Oral Presentation (5 min each) - Q&A (15 min)	**THU1 - Session E** - Keynote: Natalya Kramarova (15 min) - Oral Presentation (5 min each)	**FRI1 - Session E** - Oral Presentation (5 min each) - Q&A (15 min)	**SAT1 Poster 6 - Session E** - Poster Presentation (2 min per 1 poster)
12:10-12:20							
12:20-12:30							
12:30-12:40							
12:40-12:50			Break (10 min)		Break (10 min)	Break (10 min)	
12:50-13:00	Break (10 min)	Break (10 min)	**TUE2 - Session B** - Keynote: Sunyoung Park (15 min) - Oral Presentation (5 min each) - Q&A (10 min)		**THU2 - Session E** - Oral Presentation (5 min each) - Q&A (20 min)	**FRI2 - Session F** - Keynote: Jason West (15 min) - Oral Presentation (5 min each) - Q&A (10 min)	
13:00-13:10	**SUN1 Poster 1 - Session A** - Poster Presentation (2 min per 1 poster)	**MON2- Session A** - Keynote: Neil Harris (15 min) - Oral Presentation (5 min each) - Q&A (20 min)					Break (10 min)
13:10-13:20							**SAT2 Poster 7 - Session E** - Poster Presentation (2 min per 1 poster)
13:20-13:30				Break (20 min)			
13:30-13:40							
13:40-13:50				**WED2 - Session D** - Keynote: Amanda Maycock (15 min) - Oral Presentation (5 min each) - Q&A (15 min)			
13:50-14:00			Break (10 min)		Break (10 min)	Break (10 min)	
14:00-14:10	Ice Breaker - An online meeting room for each session - Bring your own beverage to monitor - Video and chat available	Break (10 min)	**TUE3 Poster 3 - Session A&B** - Poster Presentation (2 min per 1 poster)		**THU3 Poster 4 - Session D** - Poster Presentation (2 min per 1 poster)	**FRI3 Poster 5 - Session C** - Poster Presentation (2 min per 1 poster)	
14:10-14:20		**MON3 Poster 2 - Session A** - Poster Presentation (2 min per 1 poster)					
14:20-14:30							
14:30-14:40							Break (10 min)
14:40-14:50							**SAT3 Poster 8 - Session F** - Poster Presentation (2 min per 1 poster)
14:50-15:00							
15:00							Closing Remark

Session A **Stratospheric ozone science**
Session B **Ozone-depleting substances, sources, sinks, and budgets**
Session C **Tropospheric ozone science**
Session D **Ozone, Climate, and Meteorology**
Session E **Ozone monitoring and measurement techniques**
Session F **Environmental and human health effects of atmospheric ozone and UV**

Opening & Awards Ceremony

Date / Time: (Sun.) October 3, 2021 / 12:00 – 12:50 (UTC)

Time (UTC)	Program	Speakers
12:00-12:10	Welcome Remark	Seoung Hwan Suh (President, Yonsei University)
12:10-12:20	Opening Remark	Sophie Godin-Beekmann (President, IO3C)
12:20-12:35	Awards Ceremony Award (Dobson and Farman Award) **- Dobson Award** William Ball **- Joseph C. Farman Award** P.K. Bhartia Stacey Frith Natalyna Kramarova Gordon Labow Richard McPeters Richard Stolarski	Irina Petropavlovskikh (Secretary, IO3C)
12:35-12:50	Announcement from LOC	Ja-Ho Koo (Yonsei University)

III. Sponsors and Supporters

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International Association of Meteorology and Atmospheric Sciences

SPARC Stratosphere-troposphere Processes And their Role in Climate

Stratosphere-troposphere Processes And their Role in Climate

WORLD METEOROLOGICAL ORGANIZATION

World Meteorological Organization

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IV. Committees

Local Organizing Committee

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Hana Lee, Dha Hyun Ahn, Songkang Kim

Keynote Speakers

Session A. Stratospheric ozone science

(Mon.) October 4, 2021 / 12:00-12:15 UTC

Polar Stratospheric Ozone: Recent Observations, Current Understanding, and Future Evolution

Ulrike Langematz
(Institute of Meteorology, Freie Universität Berlin, Germany)

Biography

Ulrike Langematz is a professor and the Director of the Atmospheric Dynamics Working Group at the Institute of Meteorology at Freie Universität Berlin. She received her Ph.D. degree (1991) in Natural Science at Freie Universität Berlin and had been Postdoctoral Fellow in the Stratospheric Research Group, Institut für Meteorologie, Freie Universität Berlin. She has been PI and member of several national and international research projects. She was a Chapter Lead Author on the 2010 and 2018 WMO/UNEP scientific assessments of ozone depletion. She was Vice-President of the IUGG-International Commission of the Atmosphere (ICMA), and a member of the SPARC-Working group on stratospheric temperature trends. Her research interests include dynamics, radiation and chemistry of the middle atmosphere, stratospheric ozone, stratosphere-troposphere coupling, past and future climate change, ozone, and solar impact on climate.

Abstract

Polar stratospheric ozone has been changing during the last decades as a function of the atmospheric concentrations of man-made ozone depleting substances (ODSs). The most impressive phenomenon of this ozone change is the dramatic decrease in total ozone column, occurring regularly over Antarctica in spring time since the mid-1980s, also known as the Antarctic ozone hole. The reasons for this seasonally limited ozone reduction are well understood: chemical ozone depletion by reactive halogens in specific meteorological conditions (i.e. persistent low temperatures within the Antarctic polar vortex) that allow heterogeneous chemical reactions on polar stratospheric clouds (PSCs). A chemical ozone depletion comparable to weak Antarctic ozone holes was also observed in individual Arctic spring seasons, as for example in March 2011. However, as the Arctic polar vortex is dynamically more active than its Antarctic counterpart, temperatures in the Arctic winter stratosphere are usually higher, leading to a weaker ozone depletion in Arctic spring.

Since the year 2000, a decline in ODSs is observed in the polar stratosphere as a result of the regulations by the Montreal Protocol and its Amendments and adjustments [1]. Chemistry-Climate Models (CCMs) project a recovery of polar stratospheric ozone from ODSs– given full compliance with the Montreal Protocol –, with return dates to 1980 baseline values before mid-century (~2030s) for the Arctic and after mid-century (~2060s) for Antarctica. [2]

While CCMs agree on the pathway of future polar ozone, open questions remain, as for example the future control of stratospheric ozone abundances by rising greenhouse gas (GHG) concentrations. Models project a 'super-recovery' of Arctic ozone by the end of the 21st century due to GHG induced changes in stratospheric temperature and dynamics, which will depend on the scenario of future GHG emissions.

This presentation will update our state of knowledge about stratospheric ozone in the polar regions, based on a) observations and measurement campaigns in the most recent Arctic and Antarctic winter/spring seaons, b) progress in the understanding of the chemical and dynamical processes influencing polar ozone depletion and c) a wide range of modeling results from the SPARC/IGAC Chemistry-Climate Model initiaves (CCMI).

References

[1] WMO Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project-Report No.58, 588 pp., (2018).

[2] S. S. Dhomse et al., Atmos. Chem. Phys., 18, 8409–8438 (2018).

Session A. Stratospheric ozone science

(Mon.) October 4, 2021 / 13:00-13:15 UTC

Understanding Changes in Tropical and Mid-latitude Stratospheric Ozone

Neil Harris
(Centre for Environment and Agricultural Informatics, Cranfield University, United Kingdom)

Biography

Neil Harris is Professor of Atmospheric Informatics at Cranfield University. He obtained his B.S. degree in chemistry from Oxford University and Ph.D. degree (1989) in Chemistry at the University of California in Irvine. He joined the European Ozone Research Coordination Unit in Cambridge, where he was a NERC Advanced Research Fellow in the Dept of Chemistry until March 2016. He was awarded the NERC 50th anniversary International and the Overall Impact Awards for our role in successful development of the Montreal Protocol on Substances that Deplete the Ozone Layer. He was a Chapter Lead Author on the 1994 and 2014 WMO/UNEP ozone assessments and is a co-editor of Atmospheric Chemistry and Physics. He is co-chair of the Stratosphere-troposphere Processes and their Role in Climate of the World Climate Research Programme and has been involved in many international assessments of ozone depletion and climate change. His research interests include measurements of atmospheric halocarbons, the Tropical Tropopause Layer and emissions of trace gases as well as analyses of ozone trends.

Abstract

Advances in the understanding of trace gas chemistry and the importance of catalytic cycles has motivated scientific and societal interest in ozone depletion over the last 50 years. These built on early work using observations of ozone to understand the dynamical motions of the stratosphere on timescales from hours to years. The concerns about the human influence on stratospheric and on the UV-B penetrating through to the Earth's surface included exhaust emissions from supersonic aircraft, nitrous oxide from agriculture and other practices, atmospheric tests of nuclear bombs and the chlorine and bromine released from chlorofluorocarbons, Halons and the like. For the halogen compounds, the model calculations indicated changes in total column ozone of a few percent over a period of decades to centuries with the losses concentrated at particular altitudes. A critical question was whether they were being observed in the real world. Much of the early work was process-oriented and involved laboratory and field measurements and atmospheric modelling. Relatively little effort was put into analysing the available long-term measurements and, particularly, assessing their quality. With some notable exceptions, this work only really started in earnest after the discovery of the Ozone Hole in 1985.

This paper will summarise the development of our understanding of the tropical and mid-latitude stratospheric ozone and try to elucidate how the understanding changes relied jointly on the trends calculated from the observations, as well as on the chemical and dynamical processes. This work continues to the present day as we now try to understand the recovery of ozone as the concentrations of ozone-depleting substances decrease. It will end with a look to the future.

Session B. Ozone-depleting substances, sources, sinks, and budgets

(Tue.) October 5, 2021 / 12:55-13:10 UTC

Long-term Observations of Ozone-Depleting Substances and Their Substitutes from a Regional Background Site in East Asia

Sunyoung Park
(Kyungpook National University, Republic of Korea)

Biography

Sunyoung Park is professor of department of oceanography at Kyungpook National University. She obtained B.S. degree (1995) and M.S. degree (1997) from Seoul National University and Ph.D. degree (2005) in University of California, Berkeley. Her research interests are the biogeochemical cycles of the major greenhouse gases (GHGs), focusing on sources, sinks, and source/sink distributions of these gases, and the chemistry related to their formation and destruction. Her recent research topics also emphasize man-made halogenated compounds (CFCs, HCFCs, HFCs, and PFCs) - stratospheric ozone-depleting substances and/or GHGs by suggesting a significant increase in the emissions of most halocarbons in East Asia.

Abstract

Stratospheric ozone depletion has been caused by an increased abundance of stratospheric chlorine and bromine, which are derived from anthropogenically produced, chlorine-containing, and bromine-containing compounds, called ozone-depleting substances (ODSs). To mitigate the damage caused by ODSs, the Montreal Protocol (MP) signed in 1987 and several subsequent adjustments and amendments have controlled the production and consumption of all of the primary long-lived ODSs – such as chlorofluorocarbons (CFCs), CCl4, CH3CCl3, bromine-containing halons, and CH3Br. The phase-out schedule for these first-generation ODSs was completed with their global ban in 2010. The MP further agreed to freeze production of hydrochlorofluorocarbons (HCFCs) – transitional substitutes of the first-generation ODSs, in developing countries by 2013 and to bring forward the final phase-out date of these chemicals to 2030. With increasing restrictions of the MP, industry began introducing the new class of HFCs (hydrofluorocarbons) in the 1990s. These third-generation replacements contain no chlorine anymore, thereby not contributing to the stratospheric ozone depletion. However, they are potent greenhouse gases with high global warming potentials[1]. The significant concern about the growing market demand for these HFCs and their large contribution to global radiative forcing led to the Kigali Amendment, where the phase-down schedule of the production and consumption of HFCs was added under the MP controls.
Therefore, anticipated recovery of the stratospheric ozone layer in about 2050-2060 and preservation of the climate benefits achieved by the MP with further global controls on HFCs rely on widespread compliance with the controls in the Protocol and thereby continued reductions in atmospheric concentrations of ODSs and their substitutes. However, recent observations showed increased emissions of CFC-11, believed to be the result of new illicit production in eastern China. In addition, ODSs emissions could persist due to the release and/or use of banks produced before the production phase-out, and inadvertent by-product formation and fugitive emissions associated with permitted production of controlled ODSs (when allowed only for non-dispersive uses like feedstocks).
To detect these unexpected emission increases and also verify expected emission trends, continuous observations of atmospheric ODSs and their substitutes are crucial. In particular, atmospheric monitoring at well-positioned regional sites is widely recognized for its importance to identification of unexpected changes in regional emissions and associated emission sources.
This study presents 13-year records of real-time high-frequency atmospheric concentrations of a comprehensive suite of ODSs and the substitutes (CFCs, CCl4, CH3Br, HCFCs, HFCs, PFCs plus selected very-short lived substances) obtained at a remote coastal station of Gosan (33°N, 126°E, 79 m asl) in Jeju island, Korea for 2008 – 2020. The Gosan station run as part of the global AGAGE network (Advanced Global Atmospheric Gases Experiment) serves as a regional background site of East Asia for monitoring long-range transport of polluted air masses from the surrounding region. Gosan observations are used to derive regional emission estimates of major ODSs and the substitutes and annual trends in their emission rates, locate emission sources, identify associated industrial processes, and quantify eastern Asia's contributions to the global emissions.

References

[1] S. A. Montzka, G. J. M. Velders, World Meteorological Organization Global Ozone Research and Monitoring Project - Report No. 55, Scientific Assessment of Ozone Depletion, Chap.2 (2018).

Session C. Tropospheric ozone science

(Wed.) October 6, 2021 / 12:00-12:15 UTC

Ozone Pollution and Research Program in China: An Overview

Yuanhang Zhang
(Peking University, China)

Biography

Yuanhang Zhang is professor of Peking University at China. He graduated from Peking University with B.S. degree (1982) and M.S. degree (1985) in Technical Physics. He received the Ph.D. degree (1990) from Center for Environmental Sciences, Peking University and had been Post Doctoral Fellow in Environmental Department, the Netherlands Energy Research Foundation for two years (1993-1995). He was Associate Professor, Director of the Division of Atmospheric Chemistry, Center for Environmental Sciences, Peking University (1995-1996) and Professor, Director (1996-2002). In addition, He was Committee member of Science and Technology, Ministry of Environment Protection, China, Vice-Chairman, Chinese Society of Environmental Sciences (2006) and Vice Chair, UNEP ABC-Asia Science Team (2009). His research interests include atmospheric chemistry, urban and regional air quality, air pollution and climate change.

Abstract

Air pollution problem in China has received great attention by social community and government for decades. Especially, stringent control strategies and national action plans were implemented during 2013-2020 to reduce emissions of major primary pollutants. As a consequence, significant air quality improvements were achieved in most of Chinese cities. National annual average concentrations decreased by 29% for PM2.5 and by 56% for SO2 from 2015 to 2020. However, O3 pollution was getting severe, with not only rising O3 concentration levels, but also increasing numbers of pollution days and cities in general. Further the frequency of heavy episodes that last several days was increasing in a broad regional scale. Currently, air pollution complex in China is characterized as concurrence of high levels of PM2.5 and O3, in which atmospheric oxidation capacity and O3 pollution control will play central roles for continuous air quality improvement.
China has a long history to study O3 pollution and control strategy. The pioneer study could be traced to the Lanzhou Xigu photochemical smog project as early as 1974. In this study, a first version of research framework including field measurement, indoor and outdoor smog chamber, and numerical model was established to support decision making. Thereafter, intensive campaigns were set up in Beijing, Guangzhou, Shanghai cities and BTH, PRD and YRD regions in the last century. Starting from 2000s, regional air pollution was listed as a focal issue of national scientific and technical research program. Major projects were initial in 2006, then national programs were setup in 2011 and 2016 by Ministry of Science and technology (MOST), with focus on O3 and PM2.5 formation mechanism, regional measurement network and supersite, emission inventory and ensemble air quality forecasting, etc.. In the coming five years, O3 pollution will be paid much more attention than before in term of both pollution control and scientific research
This presentation will give an overview of O3 pollution status and trend in China, scientific research framework and progress in recent years, and practices of control strategies in typical cities and regions, and will provide a brief outlook for future O3 pollution control strategy integrating carbon reduction and clean air.

Session D. Ozone, Climate, and Meteorology

(Wed.) October 6, 2021 / 13:40-13:55 UTC

The Impacts of Ozone on Climate Across Timescales

Amanda Maycock
(Institute for Atmospheric and Climate Science (ICAS), University of Leeds, United Kingdom)

Biography

Amanda Maycock is Associate Professor in Climate Dynamics of Institute for Atmospheric and Climate Science (ICAS), University of Leeds. She graduated from University of Manchester, with B.S. degree (2006). She received the M.S. degree (2008) and Ph.D. (2011) degree from Atmosphere, Oceans and Climate, University of Reading. She had been Post Doctoral Fellow in National Centre for Atmospheric Science, University of Cambridge. Her research interests include climate science, climate change, climate modelling, midlatitude dynamics, tropical widening, Stratosphere-troposphere interactions, and ozone layer.

Abstract

The talk will provide an overview of the myriad impacts of tropospheric and stratospheric ozone variability and trends on global and regional climates. I will discuss the latest science on ozone radiative forcing as synthesised in the Intergovernmental Panel on Climate Change Sixth Assessment Report, and the latest science on regional climate impacts of ozone that will inform the WMO/UNEP 2022 Scientific Assessment of Ozone Depletion. This includes the effect of ozone on climate variability and trends in the Northern and Southern hemispheres from seasonal to multi-decadal timescales. I will close with a forward look to the role of ozone trends for climate over the coming decades.

Session E. Ozone monitoring and measurement techniques

(Thu.) October 7, 2021 / 12:00-12:15 UTC

Ozone Monitoring and Measurement Techniques

Natalya Kramarova
(NASA, Goddard Space Flight Center, Greenbelt, Maryland, USA)

Biography

Natalya Kramarova is a research scientist at the Atmospheric Chemistry and Dynamics Lab in NASA Goddard Space Flight Center (GSFC). She received her M.S. degree (2000) in physics and later a Ph.D. degree (2007) in Physics and Mathematics from Moscow State University, Russia. She worked on developing a radiative transfer algorithm and studying long-term ozone variability. In 2010-2017 Dr. Kramarova worked for Science Systems and Applications Inc. at NASA GSFC, characterizing ozone profile retrievals from NASA's UV sensors (SBUV, OMPS). In January 2018 she joined NASA GSFC. Dr. Kramarova is a member of the OMPS (Ozone Mapping and Profiler Suite) Science Team. She is working on improvements for the ozone profile retrieval algorithm and on characterization of the retrieval errors.

Abstract

In this keynote presentation I will talk about ozone measuring sensors and retrieval techniques with a focus on satellite observations. Monitoring of atmospheric ozone from space started in the 1970s, and by now we have a 50+ year long record that consists of observations acquired from multiple satellite sensors. The satellite measurements are extensively used to understand global patterns of ozone distribution and for monitoring changes of ozone levels. I will talk about approaches for instrument cross-calibrations that are critical for creating consistent climate quality records from multi-sensors observations.

There are several techniques of measuring ozone from space, and during the last two decades observations from various types of instruments (sometimes mounted on the same satellite platform) have been available. I will talk about lessons learned from comparisons and analysis of retrievals from multiple techniques and how we can use the synergy of limb and nadir sensors to improve calibrations, ozone retrievals and to produce new products, such as tropospheric ozone maps. There are numerous challenges in retrieving tropospheric ozone from space. Therefore, it is important to understand and properly attribute the sources of uncertainties in tropospheric ozone retrievals from space. Understanding the requirements for data as well as limitations of the measurements is a key to ensuring the optimal usage of space-borne tropospheric ozone data in various scientific applications.

Session F. Environmental and human health effects of atmospheric ozone and UV

(Fri.) October 8, 2021 / 12:55-13:10 UTC

Mapping Global Ground-Level Ozone Concentrations for 1990 to 2017 to Support Health Impact Assessment

Jason West

(Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, North Carolina, USA)

Biography

Dr. J. Jason West conducts interdisciplinary research addressing air pollution and climate change by using models of atmospheric chemistry and transport and tools for quantitative policy analysis. His work aims to understand the relationships between air pollution and climate change and their relevance for science and policy on local through global scales.
Using computer models, Dr. West is currently exploring the effects of changes in emissions on global air quality (ozone and particulate matter), the international transport of air pollutants, the health effects of air pollution, the effects of climate change on air quality and the radiative forcing of climate.
Recently, Dr. West led the first study of the co-benefits of greenhouse gas (GHG) mitigation for air quality and human health to use global atmospheric models and future scenarios; results showed that the monetized co-benefits exceeded previous co-benefits estimates and exceeded the global costs of GHG mitigation through 2050.

EDUCATION

PhD, Civil and Environmental Engineering / Engineering and Public Policy, Carnegie Mellon University, 1998
MPhil, Environment and Development (Geography), University of Cambridge, 1995
MS, Civil and Environmental Engineering, Carnegie Mellon University, 1994
BSE (with honors), Civil and Environmental Engineering, Duke University, 1993

RESEARCH ACTIVITIES

Global climate change; air pollution; atmospheric modeling; ozone; fine particulate matter; human health impact assessment; risk assessment; quantitative policy analysis; radiative climate forcing; long-range air pollutant transport

Abstract

Exposure to ground-level ozone is detrimental to human health, and is associated with premature mortality. In the past, estimates of the global burden of ozone on health have been limited by a lack of understanding of ozone concentrations in many populated world regions that have few ozone monitors. Here we conduct a data fusion of ground observations and nine global chemistry-climate models to produce fine resolution global surface ozone estimates for each year 1990–2017. Ozone is estimated annually for the 6-month ozone season average of 8-hr. daily maximum values, to support health impact studies. We use ozone observations from the Tropospheric Ozone Assessment Report and the Chinese National Environmental Monitoring Center Network (8834 stations total), and global model simulation output conducted for the Chemistry-Climate Model Initiative and the Aerosols and Chemistry Model Intercomparison Project with specified meteorology. We first find the linear combination of nine global models that best reproduces observations in each world region and year to create a multi-model composite. We then use the Bayesian Maximum Entropy (BME) framework to integrate surface observations with the multi-model composite in both space and time. The BME estimate matches observations at each monitoring site, with the influence of an observation decreasing across space and time according to the covariance; far from observations, the output matches the multi-model composite. BME use of observations over time is seen in the years prior to the China data coming online starting in 2013. After estimating ozone globally at 0.5° resolution using BME, we add fine spatial detail based on a fine resolution global atmospheric model to 0.1°. Our final product improves substantially upon the simple multi-model mean (R2=0.81 vs. 0.28) and multi-model composite. Our annual ozone estimates were used in the Global Burden of Disease 2019 study, which estimated roughly 365,000 premature deaths globally in 2019 from ambient ozone exposure, or 0.65% of all deaths globally. We further improve upon these estimates by using the Regionalized Air Quality Model Performance (RAMP) method to perform a regional and non-linear bias correction before BME data fusion, based on model performance with respect to the nearest observation stations. We demonstrate that including RAMP improves model performance, particularly far from observations, through a checkerboard cross-validation. Results suggest that global ozone exposure is increasing, driven by ozone increases in highly populated regions of Asia and Africa, and despite decreases in the United States and Russia. We hope that our global ozone maps will be used for a variety of applications including atmospheric science, epidemiology, and studies of crop and ecosystem impacts.

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Sun.) October 3

(Sun.) October 3

[POSTER 1]

Date / Time **(Sun.) October 3, 2021 / 13:00-14:00 (UTC)**

Session Code **SUN1**

Session Chair **Wolfgang Steinbrecht, Ja-Ho Koo, Birgit Hassler**

[SUN1_1] 13:00-13:02

Interannual Variability of Antarctic Ozone using Ozonesonde Measurements from 2015 to 2020

Hana Lee[1], Seong-Joong Kim[2], Taejin Choi[2], Jhoon Kim[1], and Ja-Ho Koo[1]

[1]Yonsei University, Republic of Korea, [2]KOPRI, Republic of Korea

[SUN1_2] 13:02-13:04

Spatiotemporal Differences in Recovery of the Antarctic Ozone Hole using Satellite Observations

Dha Hyun Ahn[1] , Seong-Joong Kim[2] , Taejin Choi[2] , Jhoon Kim[1], and Ja-Ho Koo[1]

[1]Yonsei University, Republic of Korea, [2]KOPRI, Republic of Korea

[SUN1_4] 13:06-13:08

The Cause of the Spring Strengthening of the Antarctic Polar Vortex

Vladimir V. Zuev and Ekaterina Savelieva

IMCES SB RAS, Russia

[SUN1_5] 13:08-13:10

Relationships between Unusual Antarctic Ozone Hole in 2019 and Dynamical Fields

Guangyu Liu[1], Toshihiko Hirooka[1], Nawo Eguchi[1], and Krüger Kirstin[2]

[1]Kyushu University, Japan, [2]University of Oslo, Norway

[SUN1_6] 13:10-13:12

The Sudden Stratospheric Warming and Polar Processing of the Antarctic Winter 2019: Comparison with the Winters of 1988 and 2002

R. Roy[1,2], J. Kuttippurath[1], F. Lefèvre[3], S. Raj[1], and P. Kumar[1]

[1]Indian Institute of Technology Kharagpur, India, [2]Cochin University of Science and Technology, India, [3]LATMOS/IPSL, Sorbonne Université, UVSQ, CNRS, France

[SUN1_7] 13:12-13:14

A CCM Forecast Experiments of the Ozone Reduction Event over the Southern Tip of South America in November 2009 using Ozone Assimilated Initial Data

Haruna Nakamura[1,2], Toshihiko Hoirooka[1], Hideharu Akiyoshi[3], Takafumi Sugita[3], and Akira Mizuno[4]

[1]Kyushu University, Japan, [2]Fujitsu Japan Corporation, Japan, [3]National Institute for Environmental Studies, Japan, [4]Nagoya University, Japan

V. Program Schedule

[SUN1_8] 13:14-13:16

Evaluation of Various Total Ozone Column Measurements at the King-Sejong and Jang Bogo station, Antarctica

Songkang Kim[1], Taejin Choi[2], Seong-Joong Kim[2], and Ja-Ho Koo[1]
[1]Yonsei University, Republic of Korea, [2]KOPRI, Republic of Korea

[SUN1_9] 13:16-13:18

Study on Antarctic Ozone Hole Influence over the Southern Brazil, by Combining Ground-Based, Satellite Observations and Model Simulations

Lucas Vaz Peres[1], Damaris Kirsch Pinheiro[2], Hassan Bencherif[3], Gabriela Dornelles Bittencourt[2], Thierry Portafaix[3], Nelson Bègue[3], José Valentin Bageston[4], Vagner Anabor[2], and Maria Paulete Pereira Martins[4]
[1]UFOPA, Brazil, [2]UFSM, Brazil, [3]LACy, France, [4]INPE, Brazil

[SUN1_10] 13:18-13:20

Evolution of the Stratospheric Polar Vortex in the Southern and Northern Hemispheres over the 1979–2020 Period

Audrey Lecouffe, Sophie Godin-Beekmann, Andrea Pazmiño, and Alain Hauchecorne
Sorbonne University, France

[SUN1_11] 13:20-13:22

Polar Stratospheric Clouds Detection over Belgrano II Antarctic Station from Ground-Based Visible DOAS Measurements

Laura Gomez-Martin[1], Daniel Toledo[1], Cristina Prados-Roman[1], Jose Antonio Adame[1], H. Ochoa[2], and Margarita Yela[1]
[1]National Institute for Aerospace Technology, Spain, [2]Argentinian Antarctic Institute, Argentina

[SUN1_12] 13:22-13:24

Investigation of Spring Breakup Dates and Polar Stratospheric Clouds Interannual Variability in Arctic stratosphere

P. Vargin[1], S. Kostrykin[2], E. Rakushina[3], E. Volodin[2], and A. Pogoreltsev[3]
[1]Central Aerological Observatory, Russia, [2]INM RAS, Russia, [3]Russian State Hydrometeorological University, Russia

[SUN1_13] 13:24-13:26

Mountain-Wave-Induced Polar Stratospheric Clouds and Their Representation in the Global Chemistry Model ICON-ART

Michael Weimer[1,2], Jennifer Buchmüller[2], Lars Hoffmann[3], Ole Kirner[2], Beiping Luo[4], Roland Ruhnke[2], Michael Steiner[5], Ines Tritscher[6], and Peter Braesicke[2]
[1]MIT, USA, [2]Karlsruhe Institute of Technology, Germany, [3]Jülich Supercomputing Centre, Germany, [4]ETH Zurich, Switzerland, [5]EMPA, Switzerland, [6]Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany

[SUN1_14] 13:26-13:28

Record Low Ozone Values Observed in the Arctic in Spring 2020

Ingo Wohltmann[1], Peter von der Gathen[1], Ralph Lehmann[1], Marion Maturilli[1], Holger Deckelmann[1], Gloria Manney[2,3], Jonathan Davies[4], David Tarasick[4], Nis Jepsen[5], Rigel Kivi[6], Norrie Lyall[7], and Markus Rex[1]

[1]Alfred Wegener Institute for Polar and Marine Research, Germany, [2]Northwest Research Associates, USA, [3]New Mexico Tech, USA [4]Environment and Climate Change Canada, Canada, [5]Danish Meteorological Institute, Denmark, [6]Finnish Meteorological Institute, Finland, [7]Met Office, UK

[SUN1_15] 13:28-13:30

Simulation of Record Arctic Stratospheric Ozone Depletion in 2020

Jens-Uwe Grooß and Rolf Müller

Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany

[SUN1_16] 13:30-13:32

Low Ozone VMR over the Northern Hemisphere in Winter 2019/20 - Effects of a Strong PSC Winter -

U. Raffalski[1], K.Blazaki[2], J. Gross[3], R. E. Kajtar[2], and M. Milz[2]

[1]Swedish Institute of Space Physics, Sweden, [2]Luleå Technical University, Sweden, [3]Karlsruhe Institute of Technology, Germany

[SUN1_17] 13:32-13:34

Observations of the 2020 Record-Breaking Ozone Holes and the Canadian Brewer and Pandora Programs

Xiaoyi Zhao[1], Vitali Fioletov[1], Michael Brohart[1], Volodya Savastiouk[2], Ihab Abboud[1], Akira Ogyu[1], Jonathan Davies[1], Reno Sit[1], Sum Chi Lee[1], Alexander Cede[3,4], Martin Tiefengraber[4,5], Moritz Müller[4,5], David Tarasick[1], Kristof Bognar[6], Ramina Alwarda[1,6,7], Kimberly Strong[6], Tim Holland[7], Joseph Samaniego[7], Marisa Gedney[7], and Johan Booth[7]

[1]Environment and Climate Change Canada, Canada, [2]International Ozone Services Inc., Canada, [3]NASA, USA, [4]LuftBlick, Austria, [5]University of Innsbruck, Austria, [6]University of Toronto, Canada, [7]NOAA, USA

[SUN1_18] 12:34-12:36

Evolution of Low Total Column Ozone Anomalies in Summer 2020 in the Northern Hemisphere Extratropics

Stacey M. Frith[1,2], Natalya Kramarova[2], Paul Newman[2], Eric Nash[1,2], Jerald Ziemke[2,3], and Susan E. Strahan[2,4]

[1]Science Systems and Applications, Inc., USA, [2]NASA, USA, [3]Morgan State University, USA, [4]USRA, USA

[SUN1_19] 13:36-13:38

Simulation of a 2020 Arctic Ozone Hole in the World Avoided by the Montreal Protocol

Catherine Wilka[1], Susan Solomon[2], Doug Kinnison[3], and David Tarasick[4]

[1]Stanford University, USA, [2]MIT, USA, [3]NCAR, USA, [4]Environment and Climate Change Canada, Canada

[SUN1_21] 13:40-13:42

Insights into the Linear Relationship between Extratropical Eddy Heat Flux and Polar Ozone Build-Up

Fumio Hasebe[1], Sayaka Kodera[2], and Hideharu Akiyoshi[3]

[1]Hokkaido University, Japan, [2]JMA, Japan, [3]National Institute for Environmental Studies, Japan

V. Program Schedule

[SUN1_22] 13:42-13:44

Analysis of Arctic Spring Ozone Anomaly in the Phases of QBO and 11-Year Solar Cycle for 1979–2017

Yousuke Yamashita[1,2], Hideharu Akiyoshi[1], and Masaaki Takahashi[1]
[1]National Institute for Environmental Studies, Japan, [2]JAMSTEC, Japan

[SUN1_23] 13:44-13:46

Dynamical Mechanism of QBO Modulation of Ozone Interannual Variability in the High-Latitude Upper Stratosphere in Boreal Spring

Jihoon Seo and Wookap Choi
Seoul National University, Republic of Korea

[SUN1_24] 13:46-13:48

High Vertical Resolution Modeling and its Impact on QBO Induced Changes in Ozone and Other Dynamically Important Trace Gases

Luke Oman[1], Olga Tweedy[1,2], and Susan Strahan[2]
[1]NASA, USA, [2]USRA, USA

[SUN1_25] 13:48-13:50

OMPS LP V2.0 Stratospheric Aerosol Extinction Profile Data Records

Ghassan Taha[1,3], Robert Loughman[2], and Tong Zhu[4]
[1]USRA, USA, [2]Hampton University, USA, [3]NASA, USA, [4]Science Systems and Applications Inc., USA

[SUN1_26] 13:50-13:52

O3as: An Ozone Trend Analysis Service within EOSC-Synergy

Tobias Kerzenmacher, Valentin Kozlov, Borja Esteban Sanchis, Ugur Cayoglu, Marcus Hardt, and Peter Braesicke
Karlsruhe Institute of Technology, Germany

[SUN1_27] 13:52-13:54

Stratospheric and Total Column Ozone from the Copernicus Atmosphere Monitoring Service (CAMS) Reanalysis of Atmospheric Composition

Antje Inness[1], Simon ASB, Richard Engelen[1], Johannes Flemming[1], Vincent Huijnen[3], Bavo Langenrock[2], Julien Nicolas[1], Vincent-Henri Peuch[1], Inna Polichtchouk[1], and Miha Razinger[1]
[1]ECMWF, UK, [2]BIRA-IASB, Belgium, [3]KNMI, The Netherlands

[SUN1_28] 13:54-13:56

AI for Fast Stratospheric Ozone Predictions

Helge Mohn[1], Daniel Kreyling[1], Ingo Wohltmann[1], Peter Maass[2], and Markus Rex[1]
[1]Alfred Wegener Institute Helmholtz-Center for Polar and Marine Research, Germany, [2]University of Bremen, Germany

[SUN1_29] 13:56-13:58

Deep Learning Forecast of Stratospheric Ozone Advection

Luiz-Angelo Steffenel[1], Vagner Anabor[2], Damaris Kirsch-Pinheiro[2], and Hassan Bencherif[3]
[1]University of Reims Champagne Ardenne, France, [2]UFSM, Brazil, [3]University of Reunion Island, France

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Mon.) October 4

V. Program Schedule

(Mon.) October 4

[ORAL] Session A. Stratospheric Ozone Science

Date / Time **(Mon.) October 4, 2021 / 12:00-12:50 (UTC)**

Session Code **MON1**

Session Chair **Wolfgang Steinbrecht, Ja-Ho Koo, Karin Kreher**

[MON1_K] 12:00-12:15

Keynote **Polar Stratospheric Ozone: Recent Observations, Current Understanding, and Future Evolution**

Ulrike Langematz

Institute of Meteorology, Freie Universität Berlin, Germany

[MON1_1] 12:15-12:20

Polar Stratospheric Clouds: Satellite Observations, Processes, and Role in Ozone Depletion

Ines Tritscher[1], Michael C. Pitts[2], Lamont R. Poole[3], Simon P. Alexander[4], Francesco Cairo[5], Martyn P. Chipperfield[6], Jens-Uwe Grooß[1], Michael Höpfner[7], Alyn Lambert[8], Beiping Luo[9], Sergey Molleker[10], Andrew Orr[11], Ross Salawitch[12], Marcel Snels[5], Reinhol Spang[1], Wolfgang Woiwode[7], and Thomas Peter[9]

[1]Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany, [2]NASA, USA, [3]Science Systems and Applications, Inc., USA, [4]Australian Antarctic Division, Australia, [5]Istituto di Scienze dell'Atmosfera e del Clima, Italy, [6]University of Leeds, UK, [7]Institute of Meteorology and Climate Research, Germany, [8]CalTech, USA, [9]ETH Zurich, Switzerland, [10]Max Planck Institute for Chemistry, Germany, [11]British Antarctic Survey, UK, [12]University of Maryland, USA

[MON1_2] 12:20-12:25

Variability and Trends in the Antarctic Ozone Hole: MLS Observations and Model Comparisons

Michael J. Schwartz[1], Lucien Froidevaux[1], Douglas E. Kinnison[2], Charles G. Bardeen[2], Nathaniel J. Livesey[1], Michelle L. Santee[1], Gloria L. Manney[3,4], Alyn Lambert[1], and Ryan A. Fuller[1]

[1]CalTech, USA, [2]NCAR, USA, [3]NorthWest Research Associates, USA, [4]New Mexico Tech, USA

[MON1_3] 12:25-12:30

Evaluation of Interannual Variability of Arctic and Antarctic Ozone Loss Since 1989

Andrea Pazmiño[1], Florence Goutail[1], Jean-Pierre Pommereau[1], Franck Lefèvre[1], Sophie Godin-Beekmann[1], Alain Hauchecorne[1], Audrey Lecouffe[1], Martyn Chipperfield[2], Wuhu Feng[2], Michel Van Roozendael[3], Nis Jepsen[4], Georg Hansen[5], Rigel Kivi[6], Kristof Bognar[7], Kimberly Strong[7], Kaley Walker[7], and Steve Colwell[8]

[1]LATMOS/IPSL, UVSQ, Université Paris-Saclay, Sorbonne Université, CNRS, France, [2]University of Leeds, UK, [3]BIRA-IASB, Belgium, [4]Danish Meteorological Institute, Denmark, [5]NILU, Norway, [6]Finnish Meteorological Institute, Finland, [7]University of Toronto, Canada, [8]British Antarctic Survey, UK

[MON1_4] 12:30-12:35

Arctic Ozone Depletion in 2019/20: Roles of Chemistry, Dynamics and the Montreal Protocol

Wuhu Feng[1,2], Sandip S. Dhomse[1,3], Carlo Arosio[4], Mark Weber[4], John P. Burrows[4], Michelle L. Santee[5], and Martyn P. Chipperfield[1,3]

[1]University of Leeds, UK, [2]NCAS, UK, [3]NCEO, UK, [4]University of Bremen, Germany, [5]CalTech, USA

[MON1_5] 12:35-12:40

Recovery of Polar Stratospheric Ozone: Updated Metrics from Chemistry-Climate Simulations

Martyn Chipperfeld[1], Sandip S. Dhomse[1], and Doug Kinnison[2]

[1]University of Leeds, UK, [2]NCAR, USA

[MON1_6] 12:40-12:45

The Conundrum of the Recent Variations in Lower Stratospheric Ozone: An Update

Andreas Chrysanthou[1], Sandip S. Dhomse[1], Wuhu Feng[1], Yajuan Li[2], Ryan Hossaini[3], William T. Ball[4], and Martyn Chipperfield[1]

[1]University of Leeds, UK, [2]Nanjing Xiaozhuang University, China, [3]University of Lancaster, UK, [4]TU Delft, The Netherlands

[MON1_7] 12:45-12:50

Evidence that Tropical Total Column Ozone no Longer Represents Stratospheric Changes

William T. Ball[1,2], Gabriel Chiodo[3], Justin Alsing[4], Thomas Peter[3], Jerald Ziemke[5,6], Sean Davis[7], Mohamadou Diallo[8], Lucien Froidevaux[9], Birgit Hassler[10], Till Hoffmann[11], Daan Hubert[12], and James Keeble[13,14]

[1]TU Delft, The Netherlands, [2]De Bilt, The Netherlands, [3]ETH Zurich, Switzerland, [4]Stockholm University, Sweden, [5]NASA, USA, [6]Morgan State University, USA, [7]NOAA, USA, [8]Forschungszentrum Jülich, Germany, [9]CalTech, USA, [10]DLR, Germany, [11]Imperial College London, UK, [12]BIRA-IASB, Belgium, [13]University of Cambridge, UK, [14]NCAS, University of Cambridge, UK

V. Program Schedule

[ORAL] Session A. Stratospheric Ozone Science

Date / Time (Mon.) October 4, 2021 / 13:00-14:00 (UTC)

Session Code MON2

Session Chair Mark Weber, Ja-Ho Koo

[MON2_K] 13:00-13:15

Keynote

Understanding Changes in Tropical and Mid-latitude Stratospheric Ozone

Neil Harris

Centre for Environment and Agricultural Informatics, Cranfield University, United Kingdom

[MON2_1] 13:15-13:20

Regional and Seasonal Trends in tropical Ozone from SHADOZ Profiles: Reference for Models and Satellite Products

Anne M. Thompson[1], Ryan M. Stauffer[1], Krzysztof Wargan[1,2], Jacquelyn C. Witte[3], Debra E. Kollonige[1,2], and Jerald R. Ziemke[1,4]

[1]NASA, USA, [2]Science Systems and Applications, Inc., USA, [3]NCAR, USA, [4]Morgan State University, USA

[MON2_2] 13:20-13:25

Atmospheric Impacts of Short-Lived Chlorinated Species over the Recent Past: a Chemistry-Climate Perspective

Ewa Bednarz[6], Ryan Hossaini[1], Luke Abraham[2,3], Peter Braesicke[4], and Martyn Chipperfield[5]

[1]Lancaster University, UK, [2]University of Cambridge, UK, [3]NCAS, UK, [4]Karlsruhe Institute of Technology, Germany, [5]University of Leeds, UK, [6]Cornell University, USA

[MON2_3] 13:25-13:30

The Importance of Very Short Lived Halogens for the Recovery of Stratospheric Ozone

Laura A. McBride[1], Walter R. Tribett[1], Brian F. Bennett[1], Timothy P. Canty[1], Greta Easthom[2], Stacey Frith[3], and Ross J. Salawitch[1,4]

[1]University of Maryland, USA, [2]NC State University, USA, [3]NASA, USA, [4]Earth System Science Interdisciplinary Center, USA

[MON2_4] 13:30-13:35

Quantification of Very Short Lived Halogens Reaching the Stratosphere

Ross J. Salawitch[1,2], Laura A. McBride[1], Walter R. Tribett[1], Timothy P. Canty[1], Brian F. Bennett[1], Pamela A. Wales[3,4], James W. Hannigan[5], Emmanuel Mahieu[6], Maxime Prignon[6], John Daniel[7], Bradley Hall[7], Stephen A. Montzka[7], Elena Spinei[8], George H. Mount[9], Kelly Chance[10], Raid M. Suleiman[10], Sungyeon Choi[3,11], Deanna Donohoue[12], Thomas P. Kurosu[3], and William R. Simpson[3]

[1]University of Maryland-College Park, USA, [2]ESSIC, USA, [3]NASA, USA, [4]USRA, USA, [5]UCAR, USA, [6]University of Liège, Belgium, [7]NOAA, USA, [8]Virginia Tech, USA, [9]Washington State University, USA, [10]Harvard-Smithsonian Center for Astrophysics, USA, [11]Science Systems and Applications, Inc., USA, [12]Lawrence University, USA, [13]CalTech, USA

[MON2_5] 13:35-13:40

An Overview of the Asian Summer Monsoon Chemical and Climate Impact Project (ACCLIP)

Laura Pan[1], Paul Newman[2], Elliot Atlas[3], Troy Thornberry[4], Brian Toon[5], Bill Randel[1], Doug Kinnison[1], Qing Liang[2], and Ken Jucks[2]

[1]NCAR, USA, [2]NASA, USA, [3]Univeristy of Miami, USA, [4]NOAA, USA, [5]Univerisity of Colorado, USA

Q&A 13:40-14:00

V. Program Schedule

[POSTER 2]

Date / Time (Mon.) October 4, 2021 / 14:10-15:00 (UTC)

Session Code MON3

Session Chair Mark Weber, Alexander Gruzdev

[MON3_1] 14:10-14:12

Prognostic Ozone for ICON: Enabling UV Forecasts(POF)

Simon Weber[1], Roland Ruhnke[1], Christian Scharun[1], Axel Seifert[2], and Peter Braesicke[1]

[1]Karlsruhe Institute of Technology, Germany, [2]German Weather Service, Germany

[MON3_2] 14:12-14:14

The Long-Term Historical Ozone Changes Detected in SOCOLv4 Simulations and Observations

Arseniy Karagodin[1,2], Eugene Rozanov[1,2,3], Timofei Sukhodolov[1,2,3], Tatiana Egorova[1], William Ball[4], and Thomas Peter[2]

[1]PMOD/WRC, Switzerland, [2]ETH Zurich, Switzerland, [3]St. Petersburg State University, Russia, [4]TU Delft, The Netherlands

[MON3_3] 14:14-14:16

Comparison of Stratospheric Ozone Trends from Satellite Data and Model Simulations

Kristof Bognar[1], Doug Degenstein[1], Susann Tegtmeier[1], Adam Bourassa[1], David Plummer[2], Chris Roth[1], and Daniel Zawada[1]

[1]University of Saskatchewan, Canada, [2]Environment and Climate Change Canada, Canada

[MON3_4] 14:16-14:18

Recent Lower-Stratospheric Ozone Trends in Chemistry Climate Models

Simone Dietmüller[1], Hella Garny[1,2], Roland Eichinger[1,3], and William Ball[4]

[1]DLR, Germany, [2]Ludwig Maximilian University of Munich, Germany, [3]Charles University, Czech Republic, [4]TU Delft, The Netherlands

[MON3_5] 14:18-14:20

The Influence of Gravity Waves on Stratospheric Ozone at Low and Middle Latitudes in Summer

Shujie Chang, Yongchi Li, Peng Chen, and Yanzhu Zheng

Guangdong Ocean University, China

[MON3_6] 14:20-14:22

Seasonal and Regional Stratospheric Ozone Trends Evaluated using Merged Satellite Datasets

Viktoria F. Sofieva[1], Monika Szelag[1], Johanna Tamminen[1], Erkki Kyrölä[1], Doug Degenstein[2], Chris Roth[2], Daniel Zawada[2], Alexei Rozanov[3], Carlo Arosio[3], John P. Burrows[3], Mark Weber[3], Alexandra Laeng[4], Gabriele P. Stiller[4], Thomas von Clarmann[4], Lucien Froidevaux[5], Nathaniel Livesey[5], Sean Davis[6], Michel van Roozendael[7], and Christian Retscher[8]

[1]Finnish Meteorological Institute, Finland, [2]University of Saskatchewan, Canada, [3]University of Bremen, Germany, [4]Institute of Meteorology and Climate Research, Germany, [5]CalTech, USA, [6]NOAA, USA, [7]BIRA-IASB, Belgium, [8]ESA/ESRIN, Italy

[MON3_7] 14:22-14:24

Long-Term Variability (1980-2020) of Total Column Ozone in Northern Hemisphere from the Reanalyses (MSR2, MERRA2, and ERA5), and a Comparison with the Dobson Data Taken at Belsk (51.84N, 20.79E), Poland

Janusz Krzyścin and Bonawentura Rajewska-Więch
Polish Academy of Sciences, Poland

[MON3_8] 14:24-14:26

Effects of ECMWF Reanalysis (ERA-Interim and ERA5) Forcing Fields on Stratospheric Ozone in the TOMCAT/SLIMCAT Chemical Transport Model

Yajuan Li[1], Sandip Dhomse[2,3], Martyn Chipperfield[2,3], Wuhu Feng[2,4], Andreas Chrysanthou[2], and Dong Guo[5]
[1]Nanjing Xiaozhuang University, China, [2]University of Leeds, UK, [3]NCEO, UK, [4]NCAS, UK, [5]NUIST, China

[MON3_9] 14:26-14:28

Recent Lower Stratospheric Ozone Trends in Satellite Data and Specified Dynamics Model Simulations

Sean M. Davis[1], Nicholas Davis[2], Karen Rosenlof[1], Pengfei Yu[3], and Robert Portmann[1]
[1]NOAA, USA, [2]NCAR, USA, [3]Jinan University, China

[MON3_10] 14:28-14:30

Influence of Natural Variability and Stratospheric Circulation Changes on Ozone Variability and Trends

Mohamadou MDiallo[1], Felix Ploeger[1,2], William T. Ball[3], Michaela I. Hegglin[4], Gabriel Chiodo[5], and Martin Riese[1]
[1]Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany, [2]University of Wuppertal, Germany, [3]TU Delft, The Netherlands, [4]University of Reading, UK, [5]ETH Zurich, Switzerland

[MON3_11] 14:30-14:32

Trends and Variability of Ozone Total, Stratospheric, and Tropospheric Columns from Long-Term FTIR Measurements of the NDACC Network

Vigouroux, C.[1], Blumenstock, T.[2], De Mazière, M.[1], Errera, Q.[1], García, O. E.[3], Grutter, M.[4], Hannigan, J.[5], Hase, F.[2], Jones, N.[6], Mahieu, E.[7], Ortega, I.[5], Palm, M.[8], Röhling, A.[2], Smale, D.[9], Stremme, W.[4], Strong, K.[10], Thölix, L.[11], Virolainen, Y.[12], and Wizenberg, T.[9]
[1]BIRA-IASB, Belgium, [2]Institute for Meteorology and Climate Research, Germany, [3]Izaña Atmospheric Research Centre, Spain, [4]UNAM, México, [5]NCAR, USA, [6]University of Wollongong, Australia, [7]University of Liège, Belgium, [8]University of Bremen, Germany, [9]NIWA, New Zealand, [10]University of Toronto, Canada, [11]Finnish Meteorological Institute, Finland, [12]Saint Petersburg State University, Russia

[MON3_12] 14:32-14:34

DLM Estimation of Long-Term Ozone Trends from Dobson and Brewer Umkehr Profiles

Eliane Maillard Barras[1], Alexander Haefele[1], Achille Jouberton[2], René Stübi[1], Irina Petropavlovskikh[3], Koji Miyagawa[4], and Martin Stanek[5]
[1]MeteoSwiss, Switzerland, [2]Swiss Federal Institute for Forest, Snow and Landscape Research, Switzerland, [3]CIRES, USA, [3]NOAA, USA, [5]Czech Hydrometeorological Institute, Czech Republic

V. Program Schedule

[MON3_13] 14:34-14:36

Ozone Trend Analysis from 22-Years of Observations in Natal (5.83°S, 35.20°W), by the Use of Multi-Linear and Empirical Decomposition Methods

Hassan Bencherif[1], Lucas Vaz Peres[2], Olivier Delage[1], Nelson Bègue[1], Gabriela Dornelles Bittencourt[1,4], Maria Paulete Pereira Martins[3], Francisco Raimundo da Silva[3], Thierry Portafaix[1], and Damaris Kirsch Pinheiro[4]

[1]LACy, France, [2]UFOPA, Brazil, [3]INPE, Brazil, [4]UFSM, Brazil

[MON3_14] 14:36-14:38

Three-Decade Measurements of Vertical Distribution and Column Content of NO_2 at Zvenigorod, Russia: Long-Term Trends and Interannual Variations

Aleksandr N. Gruzdev and Aleksandr S. Elokhov

A. M. Obukhov Institute of Atmospheric Physics, Russia

[MON3_15] 14:38-14:40

Total Ozone Trends in East Asia Using Long-Term Satellite and Ground Observations

Daegeun Shin[1], Yong-suk Oh[1], Wonick Seo[1], Chu-Yong Chung[1], and Hi Ku Cho[2]

[1]National Institute of Meteorological Sciences, Republic of Korea, [2]Yonsei University, Republic of Korea

[MON3_16] 14:40-14:42

Trends and Variations in the Total Ozone Content over the Northern Caucasus

Vladimir V. Savinykh, Nikolai F. Elansky, and Aleksandr N. Gruzdev

Russian Academy of Sciences, Russia

[MON3_17] 14:42-14:44

Total Ozone Trends at Northern High Latitudes from Ground-Based Measurements

Leonie Bernet[1], Arne Dahlback[2], Florence Goutail[3], Georg Hansen[1], Yvan Orsolini[1,4], Andrea Pazmiño[3], and Tove Svendby[1]

[1]NILU, Norway, [2]University of Oslo, Norway, [3]LATMOS/IPSL/UVSQ-CNRS, France, [4]NTNU, Norway

[MON3_18] 14:44-14:46

Overview of the Stratospheric O_3 Measurements from IASI (2008-2020): Validation, Variability, Events, Evolution, Recovery and Radiative Effect

Catherine Wespes[1], Daniel Hurtmans[1], Anne Boynard[2,4], Sarah Safieddine[2], Marie Bouillon[2], Simon Chabrillat[3], Stamatia Doniki[1], Cathy Clerbaux[2,1], and Pierre-François Coheur[1]

[1]Université libre de Bruxelles, Belgium, [2]Sorbonne Université, France, [3]BIRA-IASB, Belgium, [4]SPASCIA, France

[MON3_19] 14:46-14:48

Pattern Analysis of Seven Total Ozone Column Measuring Stations in the Center, Southern of South America and Antarctica

Gerardo Carbajal Benítez[1], Héctor Estevéz[2], Eduaro Luccini[3], Facundo Orte[5], Héctor Ochoa[4], Elian Wolfram[1,5], María Elea Barlasina[1], Lino Condori[1], and Fernando Nollas[1]

[1]Servicio Meteorológico Nacional, Argentina, [2]UNAM, México, [3]CEPROCOR-CONICET, Argentina, [4]Argentine Antarctic Institute, Argentina, [5]CEILAP, UNIDEF (CITEDEF-CONICET), Argentina

[MON3_20] 14:48-14:50

The Contribution of the Czech Republic to the Detection of the State of the Earth's Ozone Layer and Solar UV-radiation in Antarctica – the Contribution of the Czech Republic to the Vienna Convention and the Montreal Protocol in 2010-2020

Michal Janouch[1], Ladislav Sieger[2], and Hector Ochoa[3]
[1]Czech Geographical Society, Czech Republic, [2]Czech Technical University in Prague, Czech Republic, [3]Instituto Antártico Argentino, Argentina

[MON3_21] 14:50-14:52

Analysis of the Ozone Transport and Seasonal Variability in the Tropical Tropopause Layer using Reanalysis Data

Hosun Ryu and Joowan Kim
Kongju National University, Republic of Korea

[MON3_22] 14:52-14:54

Multi-Level Stratospheric Ozone Variability from SHADOZ Network Data

Marinete da Silva Ferreira[1], David Mendes[1], Lucas Vaz Peres[2], Ana Caroline Rodrigues Castro[2], Damaris Kirsch Pinheiro[3], Gabriela Dornelles Bittencourt[3], Nelson Bègue[4], Hassan Bencherif[4], Maria Paulete Pereira Martins[5], Francisco Raimundo da Silva[5], Ryan Stauffer[6], and Anne M. Thompson[6]
[1]Federal University of Rio Grande do Norte, Brazil, [2]UFOPA, Brazil, [3]UFSM, Brazil, [4]LACy, France, [5]INPE, Brazil, [6]NASA, USA

[MON3_23] 14:54-14:56

Characteristics of Ozone Profile Distribution over Korean Peninsula during the Asian Summer Monsoon using Multiple Satellite Measurements and Reanalysis Data

Song Eun-Ji[1], Bak Juseon[1], Hyo-Jung Lee[1], Cheol-Hee Kim[1], and Ja-Ho Koo[2]
[1]Pusan National University, Republic of Korea, [2]Yonsei University, Republic of Korea

[MON3_24] 14:56-14:58

Using Aura Microwave Limb Sounder Measurements to Place Recent Asian Summer Monsoon Seasons into Climatological Context

Michelle L. Santee[1], Gloria L. Manney[2,3], Nathaniel J. Livesey[1], Jessica L. Neu[1], Michael J. Schwartz[1], and Luis F. Millán[1]
[1]CalTech, USA, [2]NorthWest Research Associates, USA, [3]New Mexico Tech, USA

[MON3_25] 14:58-15:00

Lauder BrO Timeseries (1995-2021)

Richard Querel[1], Paul Johnston[1], Martyn Chipperfield[2], and Francois Hendrick[3]
[1]NIWA, New Zealand, [2]University of Leeds, UK, [3]BIRA-IASB, Belgium

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Tue.) October 5

(Tue.) October 5

[ORAL] Session A. Stratospheric Ozone Science

Date / Time **(Tue.) October 5, 2021 / 12:00-12:45 (UTC)**

Session Code **TUE1**

Session Chair **Birgit Hassler, Matt Tully**

[TUE1_1] 12:00-12:05

Evaluating Stratospheric Ozone Changes in CMIP6 Models from 1850 to 2100

James Keeble[1,2], Birgit Hassler[3], Antara Banerjee[4,5], Ramiro Checa-Garcia[6], Gabriel Chiodo[7,8], Sean Davis[4], Veronika Eyring[3,9], Paul T. Griffiths[1,2], Olaf Morgenstern[10], Peer Nowack[11,12], Guang Zeng[10], Jiankai Zhang[13], Greg Bodeker[14,15], Susannah Burrows[16], Philip Cameron-Smith[17], David Cugnet[18], Christopher Danek[19], Makoto Deushi[20], Larry W. Horowitz[21], Anne Kubin[22], Lijuan Li[23], Gerrit Lohmann[19], Martine Michou[24], Michael J. Mills[25], Pierre Nabat[24], Dirk Olivié[26], Sungsu Park[27], Øyvind Seland[26], Jens Stoll[22], Karl-Hermann Wieners[28], and Tongwen Wu[29]

[1]University of Cambridge, UK, [2]NCAS, University of Cambridge, UK, [3]DLR, Germany, [4]NOAA, USA, [5]University of Colorado Boulder, USA, [6]LSCE, France, [7]ETH Zurich, Switzerland, [8]Columbia University, USA, [9]University of Bremen, Germany, [10]NIWA, New Zealand, [11]Imperial College London, UK, [12]University of East Anglia, UK, [13]Lanzhou University, China, [14]Bodeker Scientific, New Zealand, [15]Victoria University of Wellington, New Zealand, [16]PNNL, USA, [17]Lawrence Livermore National Laboratory, USA, [18]IP Paris, France, [19]Alfred Wegener Institute, Germany, [20]Meteorological Research Institute, Japan, [21]GFDL/NOAA, USA, [22]Leibniz Institute for Tropospheric Research, Germany, [23]Chinese Academy of Sciences, China, [24]CNRM, Université de Toulouse, Météo-France, CNRS, France, [25]NCAR, USA, [26]Norwegian Meteorological Institute, Norway, [27]Seoul National University, South Korea, [28]MPI-M, Germany, [29]China Meteorological Administration, China

[TUE1_2] 12:05-12:10

Ozone Trends on Dynamical Coordinate Systems

L. Millán[1], G. Manney[2,3], M. Santee[1], and N. Livesey[1]

[1]CalTech, USA, [2]NWRA, USA, [3]New Mexico Tech, USA

[TUE1_3] 12:10-12:15

New Perspective on Regional Total Ozone Trends 1995-2020 Derived from the GOME-Type Total Ozone Essential Climate Variable (GTO-ECV) Data Record

Melanie Coldewey-Egbers[1], Diego Loyola[1], Klaus-Peter Heue[1], Christophe Lerot[2], and Michel van Roozendael[2]

[1]DLR, Germany, [2]BIRA-IASB, Belgium

V. Program Schedule

[TUE1_4] 12:15-12:20

Global Recovery Trends Derived from Five Merged Total Ozone Datasets

Mark Weber[1], Carlo Arosio[1], Melanie Coldewey-Egbers[2], Vitali E. Fioletov[3], Stacey M. Frith[4], Jeannette D. Wild[5,6], Klaereti Tourpali[7], John P. Burrows[1], and Diego Loyola[2]

[1]University of Bremen, Germany, [2]DLR, Germany, [3]Environment and Climate Change Canada, Canada, [4]Science Systems and Applications, Inc., USA, [5]NOAA/NCEP Climate Prediction Center, USA, [6]University of Maryland, USA, [7]Aristotle University of Thessaloniki, Greece

[TUE1_5] 12:20-12:25

Updated Trends of the Stratospheric Ozone Vertical Distribution in the 60°S-60°N Latitude Range based on the LOTUS Regression Model

N. Azouz[1], S. Godin-Beekmann[1], I. Petropavlovskikh[2], G. Ancellet[1], D. A. Degenstein[3], D. Zawada[3], V. Sofieva[4], L. Froidevaux[5], S. Frith[6], J. Wild[7], S. Davis[2], W. Steinbrecht[8], T. Leblanc[5], R. Querel[9], D. Hubert[10], K. Tourpali[11], and R. Damadeo[6]

[1]LATMOS Sorbonne Université UVSQ CNRS, France, [2]NOAA, USA, [3]University of Saskatchewan, Canada, [4]Finish Meteorological Institute, Finland, [5]CalTech, USA, [6]NASA, USA, [7]ESSIC/UMD&NOAA/NCEP/Climate Prediction Center, USA, [8]Deutsche Wetterdienst, Germany, [9]NIWA, New Zealand, [10]BIRA-IASB, Belgium, [11]Aristotle University of Thessaloniki, Greece

[TUE1_6] 12:25-12:30

Impact of Small-scale Gravity Waves on Stratospheric Ozone

Michael Weimer[1], Catherine Wilka[1], Douglas Kinnison[2], Rolando Garcia[2], Julio Bacmeister[3], and Susan Solomon[1]

[1]MIT, USA, [2]NCAR, USA

[TUE1_7] 12:30-12:35

Repartitioning of Extratropical Stratospheric Chlorine Reservoirs by the 2020 Australian Wildfires

Susan Strahan[1,2], Dan Smale[3], Ghassan Taha[1,2], Megan Damon[1,4], Stephen Steenrod[1,2], Nicholas Jones[5], Ben Liley[3], John Robinson[3], and Richard Querel[3]

[1]NASA, USA, [2]USRA, USA, [3]NIWA, New Zealand, [4]Science Systems and Applications, Inc., USA, [5]Wollongong University, Australia

Q&A 12:35-12:45

[ORAL] Session B. Ozone-Depleting Substances, Sources, Sinks, and Budgets

Date / Time (Tue.) October 5, 2021 / 12:55-13:50 (UTC)

Session Code TUE2

Session Chair Kenneth Jucks

[TUE2_K] 12:55-13:10

Keynote

Long-term Observations of Ozone-Depleting Substances and Their Substitutes from a Regional Background Site in East Asia

Sunyoung Park

Kyungpook National University, Republic of Korea

[TUE2_1] 13:10-13:15

Joint Inference of CFC Lifetimes and Banks Suggests Previously Unidentified Emissions

Megan Lickley[1], Sarah Fletcher[2], Matt Rigby[3], and Susan Solomon[1]

[1]MIT, USA, [2]Stanford University, USA, [3]University of Bristol, UK

[TUE2_2] 13:15-13:20

Global Emissions of CFC-11 Dropped Substantially in 2019--Are They Now No Longer Elevated Above Expectations?

Stephen A. Montzka[1], Geoff S. Dutton[1], Lei Hu[1], Robert W.Portmann[1], Martyn P. Chipperfield[2], Sean Davis[1], Wuhu Feng[2], Alistair Manning[3], Eric Ray[1], Bradley D. Hall[1], Helen Walter Terrinoni[4], Christina Theodoridi[5], and Isaac Vimont[1]

[1]NOAA, USA, [2]University of Leeds, UK, [3]Met Office, UK, [4]AHRI, USA, [5]NRDC, USA

[TUE2_3] 13:20-13:25

Investigating Regional CFC-11 Emissions and Their Changes using Results from HIPPO, ATom, and NOAA Long-Term Atmospheric Sampling

Lei Hu[1,2], Stephen Montzka[2], Fred Moore[1,2], Eric Hintsa[1,2], Carolina Siso[1,2], Geoff Dutton[1,2], Kirk Thoning[2], Robert Portmann[2], Kathryn McKain[1,2], Colm Sweeney[2], David Nance[1,2], Isaac Vimont[1,2], Arlyn Andrews[2], Phil DeCola[3], Brad Hall[2], James Elkins[1], and Steven Wofsy[4]

[1]CIRES, USA, [2]NOAA, USA, [3]University of Maryland, USA, [4]Harvard University, USA

[TUE2_4] 13:25-13:30

Observation-Based Emissions of Anthropogenic CH_3Br from Eastern China and Discrepancies between Top-down and Bottom-up Estimates

Haklim Choi[1], Mi-Kyung Park[1], Paul J. Fraser[2], Hyeri Park[1], Sohyeon Geum[1], Jens Mühle[3], Jooil Kim[3], Peter K. Salameh[3], Christina M. Harth[3], Bronwyn L. Dunse[2], Paul B. Krummel[2], Nada Derek[2], Ian Porter[4], Ray F. Weiss[3], and Sunyoung Park[1]

[1]Kyungpook National University, Republic of Korea, [2]CSIRO, Australia, [3]UCSD, USA, [4]La Trobe University, Australia

V. Program Schedule

[TUE2_5] 13:30-13:35

Comparison of Recent Observed Trends in Hydrofluorocarbons and Inferred Emissions with Projections

Guus J.M. Velders[1,2], John S. Daniel[3], Stephen A. Montzka[3], Isaac Vimont[3], and Matthew Rigby[4]

[1]RIVM, The Netherlands, [2]Utrecht University, The Netherlands, [3]NOAA, USA, [4]University of Bristol, UK

[TUE2_6] 13:35-13:40

Integrated Ozone Depletion: A New Metric for Ozone Recovery

John Pyle[1,2], James Keeble[1,2], Luke Abraham[1,2], Martyn Chipperfield[3,4], and Paul Griffiths[1,2]

[1]University of Cambridge, UK, [2]NCAS, UK, [3]University of Leeds, UK, [4]National Centre for Earth Observation, UK

Q&A 13:40-13:50

[POSTER 3]

Date / Time **(Tue.) October 5, 2021 / 14:00-15:00 (UTC)**

Session Code **TUE3**

Session Chair **Matt Tully, Karin Kreher, Steve Montzka**

[TUE3_1] 14:00-14:02

The MIPAS Climatology of Bromine Nitrate ($BrONO_2$) in Comparison to Atmospheric Modelling

Michael Höpfner, Oliver Kirner, Gerald Wetzel, Björn-Martin Sinnhuber, Florian Haenel, Johannes Orphal, Roland Ruhnke, Gabriele Stiller, and Thomas von Clarmann

Karlsruhe Institute of Technology, Germany

[TUE3_2] 14:02-14:04

Multiyear Study of OClO in the Austral Low Stratosphere as Observed from the Belgrano (78° S) and Marambio (64° S) NDACC Sites

Cristina Prados-Roman[1], Gaia Pinardi[2], José Antonio Adame[1], Olga Puentedura[1], Mónica Navarro Comas[1], Laura Gómez-Martín[1], Héctor Ochoa[3], Michel Van Roozendael[2], and Margarita Yela[1]

[1]National Institute for Aerospace Technology, Spain, [2]BIRA-IASB, Belgium, [3]Argentinian Antarctic Institute, Argentina

[TUE3_3] 14:04-14:06

The Chemical Impact of Extreme Solar Events in the Middle Atmosphere

Thomas Reddmann[1], Monali Borthakur[1], Miriam Sinnhuber[1], Ilya Usoskin[2], and Jan-Maik Wissing[3]

[1]Karlsruhe Institute of Technology, Germany, [2]University of Oulu, Finland, [3]University of Rostock, Germany

[TUE3_4] 14:06-14:08

Exploring Short-Term Variations in Mesospheric Ozone due to Large-Scale Solar Flares using a Ground-Based Millimeter-Wave Radiometer at Rikubestu, Japan and Aura/MLS Ozone Measurements

Tomoo Nagahama, Akira Mizuno, Taku Nakajima, and Tianliang Yang

Nagoya University, Japan

[TUE3_5] 14:08-14:10

Revising 11-Year Solar Cycle Signal in the Stratospheric Ozone using MLS and SORCE Satellite Measurements

Sandip Dhomse[1], Martyn Chipperfield[1], Wuhu Feng[1], and Ryan Hossaini[2]

[1]University of Leeds, UK, [2]University of Lancaster, UK

[TUE3_6] 14:10-14:12

Investigating the Ozone-Climate Feedback of Geomagnetic Forcing using ICON-ART-LINOZ

Maryam Ramezani Ziarani, Thomas Reddmann, Katerina Kusakova, and Miriam Sinnhuber

Karlsruhe Institute of Technology, Germany

V. Program Schedule

[TUE3_7] 14:12-14:14

The Stability and Homogeneity of Long-Term Satellite and Ground-Based Stratospheric Ozone Profile Data Records

Daan Hubert[1], Tijl Verhoelst[1], Arno Keppens[1], Steven Compernolle[1], Carlo Arosio[2], Viktoria Sofieva[3], and Jean-Christopher Lambert[1]

[1]BIRA-IASB, Belgium, [2]University of Bremen, Germany, [3]Finnish Meteorological Institute, Finland

[TUE3_8] 14:14-14:16

Analysis of Vertical Ozone Profiles by the SABER Satellite and SHADOZ: Comparison of the Last 17 Years between Subtropical and Tropical Latitudes

Gabriela Dornelles Bittencourt[1,2], Damaris Kirsch Pinheiro[1], Hassan Bencherif[2], Nelson Bègue [2], Lucas Vaz Peres[3], Francisco Raimundo da Silva[4], and Maria Paulete Pereira Martins[4]

[1]UFSM, Brazil, [2]LACy, France, [3]UFOPA, Brazil, [4]INPE, Brazil

[TUE3_9] 14:16-14:18

Characterization of Total Ozone Column of Two Measuring Stations in the North, and South Hemisphere of America

Gerardo Carbajal Benítez[1] and Héctor R. Estévez Pérez[2]

[1]National Meteorological Service, Argentina, [2]UNAM, Mexico

[TUE3_10] 14:18-14:20

Stratospheric Aerosol and Gas Experiment III on the International Space Station (SAGE III/ISS): Validation of Ozone using In-situ Measurements

S. Kizer[1,2], M. Roell[2], D. Flittner[2], R. Damadeo[2], C. Roller[1,2], D. Hurst[3,4], E. Hall[3,4], A. Jordan[3,4], P. Cullis[3,4], B. Johnson[4], and R. Querel[5]

[1]Science Systems and Applications, Inc., USA, [2]NASA, USA, [3]CIRES, USA, [4]NOAA, USA, [5]NIWA, New Zealand

[TUE3_11] 14:20-14:22

The Impact of Continuing CFC-11 Emissions on the Stratosphere

Eric L. Fleming[1,2], Qing Liang[1], Luke D. Oman[1], Paul A. Newman[1], Feng Li[1,3], and Margaret M. Hurwitz[4]

[1]NASA, USA, [2]Science Systems and Applications, Inc., USA, [3]USRA, USA, [4]NOAA, USA

[TUE3_12] 14:22-14:24

Technical, Economic, and Policy Impacts to CFC-11 Emissions during the Product Lifecycle in Comparison to Derived Emissions

Helen Walter-Terrinoni[1], Nick Harbeck[1], Stephen A. Montzka[2], Jose' Pons[3], Christina Theodoridi[4], and Helen Tope[5]

[1]AHRI, USA, [2]NOAA, USA, [3]Sicamu, Inc., USA, [4]NRDC, USA, [5]Energy International Australia, Australia

[TUE3_13] 14:24-14:26

Impacts of Space Industry Emissions on Stratospheric Ozone

Christopher Maloney[1,3], Martin Ross[2], Robert Portmann[1], and Karen Rosenlof[1]

[1]NOAA, USA, [2]The Aerospace Corporation, USA, [3]University of Colorado, USA

[TUE3_14] 14:26-14:28

Potential Impacts of Supersonic Aircraft Emissions on Ozone and Resulting Forcing on Climate

Jun Zhang[1], Donald J. Wuebbles[1], Douglas E. Kinnison[2], and Steven L Baughcum[3]
[1]University of Illinois at Urbana-Champaign, USA, [2]NCAR, USA, [3]Boeing Company, USA

[TUE3_15] 14:28-14:30

Impact of Unmitigated HFC Emissions on Stratospheric Ozone at the End of the 21st century as Simulated by Chemistry-Climate Models

Eric Dupuy[1], Hideharu Akiyoshi[1], and Yousuke Yamashita[1,2]
[1]National Institute for Environmental Studies, Japan, [2]JAMSTEC, Japan

[TUE3_16] 14:30-14:32

The Response of Stratospheric Ozone and Dynamics to Changes in Atmospheric Oxygen

Iga Józefiak[1], Timofei Sukhodolov[2,3,4], Tatiana Egorova[2,3], Eugene Rozanov[2,3,4], Gabriel Chiodo[3,5], Andrea Stenke[3], and Thomas Peter[3]
[1]University of Geneva, Switzerland, [2]PMOD/WRC, Switzerland, [3]ETH Zurich, Switzerland, [4]Saint Petersburg State University, Russia, [5]Columbia University, USA

[TUE3_17] 14:32-14:34

Annual Kigali Index (AKI): A Novel Measurement-Based Policy Tool for Checking the Compliance of the Initiated HFC Phase-Down

Stefan Reimann[1], Martin K. Vollmer[1], Stephan Henne[1], Lukas Emmenegger[1], Matt Rigby[2]
[1]EMPA, Switzerland, [2]University of Bristol, UK

[TUE3_18] 14:34-14:36

Measurements of HFC-23 and HCFC-22 from Ground-based FTIR Spectrometers at Rikubetsu (44°N), Japan and Syowa Station (69°S), Antarctica

Hideaki Nakajima[1,2], Masanori Takeda[2], Isao Murata[2], Tomoo Nagahama[3], Isamu Morino[1], and Geoffrey C. Toon[4]
[1]National Institute for Environmental Studies, Japan, [2]Tohoku University, Japan, [3]CalTech, USA, [4](Now) NARO, Japan

[TUE3_19] 14:36-14:38

Rising Global Emissions of HCFC-141b Inferred from Atmospheric Measurements

Luke M. Western[1], Sunyoung Park[2], Alistair J. Manning[3], Alison L Redington[3], Stephan Henne[4], Xuekun Fang[5], Lei Hu[6,7], Stephen A. Montzka[6], Paul J. Fraser[8], Christina M. Harth[10], Ove Hermansen[9], Jooil Kim[10], Paul B. Krummel[8], Lambert Kuijpers[11], Chris Lund[9], Jens Mühle[10], Simon O'Doherty[1], Stefan Reimann[4], Peter K. Salameh[10], Daniel Say[1], Christina Theodoridi[12], Martin K. Vollmer[4], Helen Walter-Terrinoni[13], Dickon Young[1], Ray F. Weiss[10], Ronald G. Prinn[14], and Matthew Rigby[1]
[1]University of Bristol, UK, [2]Kyungpook National University, Republic of Korea, [3]Met Office, UK, [4]EMPA, Switzerland, [5]Zhejiang University, China, [6]NOAA, USA, [7]CIRES, USA, [8]CSIRO, Australia, [9]Norwegian Institute for Air Research, Norway, [10]UCSD, USA, [11]A/gent Consultancy B.V., The Netherlands, [12]NRDC, USA, [13]AHRI, USA, [14]MIT, USA

V. Program Schedule

[TUE3_20] 14:38-14:40

On the Effects of the Ocean on Atmospheric CFCs and HFCslifetimes and Emissions

Peidong Wang[1], Jeffery R. Scott[1], Susan Solomon[1], John Marshall[1], Andrew R. Babbin[1], Megan Lickley[1], David W. J. Thompson[2], Timothy DeVries[3], Qing Liang[4], and Ronald G. Prinn[1]

[1]MIT, USA, [2]Colorado State University, USA, [3]UCSB, USA, [4]NASA, USA

[TUE3_21] 14:40-14:42

Comparison of Inorganic Chlorine in the Southern Hemispheric Lower Stratosphere During Late Winter 2019

Markus Jesswein[1], Heiko Bozem[2], Hans-Christoph Lachnitt[2], Peter Hoor[2], Thomas Wagenhäuser[1], Timo Keber[1], Tanja Schuck[1], and Andreas Engel[1]

[1]University of Frankfurt, Germany, [2]Johannes Gutenberg University of Mainz, Germany

[TUE3_22] 14:42-14:44

Organic, Inorganic and Total Bromine in the Extratropical Tropopause and Lowermost Stratosphere in Fall 2017: Origins, Transport Pathways and Consequences for Ozone

Meike K. Rotermund[1], Vera Bense[2], Martyn P. Chipperfield[3], Andreas Engel[4], Jens-Uwe Grooß[5], Peter Hoor[2], Tilman Hüneke[1,7], Timo Keber[4], Flora Kluge[1], Ben Schreiner[1], Tanja Schuck[4], Bärbel Vogel[5], Andreas Zahn[6], and Klaus Pfeilsticker[1]

[1]University of Heidelberg, Germany, [2]Johannes Gutenberg University Mainz, Germany, [3]University of Leeds, UK, [4]Goethe University Frankfurt, Germany, [5]Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany, [6]Karlsruhe Institute of Technology, [7](Now) Encavis AG, Germany

[TUE3_23] 14:44-14:46

ENSO-Driven Wildfires Cause Large Variability in the Naturally Emitted, Ozone Depleting Trace Gas Methyl Bromide

Melinda R. Nicewonger[1], Eric S. Saltzman[2], and Stephen A. Montzka[1]

[1]NOAA, USA, [2]UC Irvine, USA

[TUE3_24] 14:46-14:48

Pollution Trace Gases C_2H_6, C_2H_2, HCOOH, and PAN in the UTLS: Observations and Simulations

Gerald Wetzel[1], Felix Friedl-Vallon[1], Norbert Glatthor[1], Jens-Uwe Grooß[2], Thomas Gulde[1], Michael Höpfner[1], Sören Johansson[1], Farahnaz Khosrawi[1], Oliver Kirner[1], Anne Kleinert[1], Erik Kretschmer[1], Guido Maucher[1], Hans Nordmeyer[1], Hermann Oelhaf[1], Johannes Orphal[1], Christof Piesch[1], Björn-Martin Sinnhuber[1], Jörn Ungermann[2], and Bärbel Vogel[2]

[1]Karlsruhe Institute of Technology, Germany, [2]Institute of Energy and Climate Research: Stratosphere (IEK-7), Germany

[TUE3_25] 14:48-14:50

Short-Term Variations of HCl and HF Trends Observed with FTIR at Tsukuba and Rikubetsu, Japan

Isao Murata[1], Yoshihiro Tomikawa[2,3], Isamu Morino[4], Hideaki Nakajima[4], Hideharu Akiyoshi[4], and Tomoo Nagahama[5]

[1]Tohoku University, Japan, [2]National Institute of Polar Research, Japan, [3]SOKENDAI, Japan, [4]National Institute for Environmental Studies, Japan, [5]Nagoya University, Japan

[TUE3_26] 14:50-14:52

A Method for Calculating Offsets to Ozone Depletion and Climate Impacts of Unexpected Production of Ozone-Depleting Substances

Gabrielle Dreyfus[1], Stephen A. Montzka[2], Stephen O. Andersen[1], and Richard ("Tad") Ferris[1]
[1]IGSD, USA, [2]NOAA, USA

[TUE3_27] 14:52-14:54

Revising the Ozone Depletion Potentials Metric for Short-Lived Chemicals

Donald J. Wuebbles[1], Jun Zhang[1], Douglas E. Kinnison[2], and Alfonso Saiz-Lopez[3]
[1]UIUC, USA, [2]NCAR, USA, [3]Institute of Physical Chemistry Rocasolano, Spain

[TUE3_28] 14:54-14:56

Arctic Ozone Depletion Induced by Solar Proton Events – A Statistic Study based on Satellite Observation and WACCM-D Model

Jia Jia[1], Kenneth Nilsen[1], Niilo Kalakoski[2], Antti Kero[1], Pekka T. Verronen[1,2], and Monika E. Szeląg[2]
[1]University of Oulu, Finland, [2]Finnish Meteorological Institute, Finland

[TUE3_29] 14:56-14:58

Quantifying Present and Near-Future Rocket Launch Impacts on the Stratosphere

Tyler Brown, Michele T. Bannister, and Laura E. Revell
University of Canterbury, New Zealand

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Wed.) October 6

(Wed.) October 6

[ORAL] Session C. Tropospheric Ozone Science

Date / Time **(Wed.) October 6, 2021 / 12:00-13:20 (UTC)**

Session Code **WED1**

Session Chair **Gangwoong Lee, Lin Zhang**

[WED1_K] 12:00-12:15

Keynote

Ozone Pollution and Research Program in China: An Overview

Yuanhang Zhang
Peking University, China

[WED1_1] 12:15-12:20

Change in Tropospheric Ozone in the Recent Decades and Its Contribution to Global Total Ozone

Junhua Liu[1,2], Sarah A. Strode[1,2], Qing Liang[2], Luke D. Oman[2], Peter R. Colarco[2], Eric L. Fleming[3,2], Michael E. Manyin[3,2], Jerald R. Ziemke[4,2], and Lok N. Lamsal[1,2]
[1]USRA, USA, [2]NASA, USA, [3]Science Systems and Applications, Inc., USA, [4]Morgan State University, USA

[WED1_2] 12:20-12:25

Free Tropospheric Ozone Reductions due to Reduced Emissions in the COVID-19 Pandemic

W. Steinbrecht[1], D. Kubistin[1], C. Plass-Dülmer[1], J. Davies[2], D.W. Tarasick[2], P. v. d. Gathen[3], H. Deckelmann[3], N. Jepsen[4], R. Kivi[5], N. Lyall[6], M. Palm[7], J. Notholt[7], B. Kois[8] , P. Oelsner[1] , M. Allaart[9], A. Piters[9], M. Gill[10], and R. Van Malderen[12], A.W. Delcloo[11], R. Sussmann[12], E. Mahieu[13], C. Servais[13], G. Romanens[14], R. Stübi[14], G. Ancellet[15], S. Godin-Beekmann[15], S. Yamanouchi[16], K. Strong[16], B. Johnson[17], P. Cullis[17,18], I. Petropavlovskikh[17,18], J.W. Hannigan[19], J.-L. Hernandez[21], A. Diaz[20], T. Nakano[21], F. Chouza[22], T. Leblanc[22], C. Torres[20], O. Garcia[20], A.N. Röhling[23], M. Schneider[23], T. Blumenstock[23], M. Tully[24], C. Paton-Walsh[25], N. Jones[26], R. Querel[26], S. Strahan[22,27], R.M. Stauffer[22], A.M. Thompson[22], A. Inness[28], R. Engelen[28], K.-L. Chang[17,18], O.R. Cooper[17,18], G.P. Brasseur[19,29], I. Bouarar[29], and B. Gaubert[19]
[1]Deutscher Wetterdienst, Germany, [2]Environment and Climate Change Canada, Canada, [3]Alfred Wegener Institute, Germany, [4]Danish Meteorological Institute, Copenhagen, [5]Finnish Meteorological Institute, Sodankylä, [6]British Meteorological Service, Scotland, [7]University of Bremen, Germany, [8]Institute of Meteorology and Water Management, Poland, [9]Royal Netherlands Meteorological Institute, The Netherlands, [10]Met Éireann Forecast, Ireland, [11]Royal Meteorological Institute of Belgium, Belgium, [12]Karlsruhe Institute of Technology, Germany, [13]University of Liège, Belgium, [14]MeteoSwiss, Switzerland, [15]LATMOS, France, [16]University of Toronto, Canada, [17]NOAA, USA, [18]CIRES, USA, [19]NCAR, USA, [20]AEMET, Spain, [21]Meteorological Research Institute, Japan, [22]NASA, USA, [23]Karlsruhe Institute of Technology, Germany, [24]Bureau of Meteorology, Australia, [25]University of Wollongong, Australia, [26]NIWA, New Zealand, [27]USRA, USA, [28]ECMWF, UK, [29]MPI-M, Germany

V. Program Schedule

[WED1_3] 12:25-12:30

Tropospheric Ozone Hourly and Daily Maps Measured from EPIC, OMPS, OMI, and MLS Satellite Instruments: Data Validation, Global Long-Term Trends and NH Ozone Loss in 2020

Jerry R. Ziemke, Natalya A. Kramarova, Liang-Kang Huang, David P. Haffner, Krzysztof Wargan, Gordon J. Labow, Stacey. M. Frith, Pawan K. Bhartia, Jay R. Herman, and Richard D. McPeters
NASA, USA

[WED1_4] 12:30-12:35

Geophysical Signatures in the Sentinel-5p TROPOMI Tropospheric Ozone Data Record and Comparison to Ozonesonde, OMI and GOME-2B

Daan Hubert[1], Klaus-Peter Heue[2,3], Jean-Christopher Lambert[1], Tijl Verhoelst[1], Arno Keppens[1], Steven Compernolle[1], Angelika Dehn[4], Debra E. Kollonige[5,6], Christophe Lerot[1], Diego Loyola[2], Fabian Romahn[2], Anne M. Thompson[6], Pepijn Veefkind[7], Claus Zehner[4], and the SHADOZ ozonesonde station PIs and staff
[1]BIRA-IASB, Belgium, [2]DLR, Germany, [3]Technische Universität München, Germany, [4]ESA/ESRIN, Italy, [5]Science Systems and Applications, Inc., USA, [6]NASA, USA, [7]KNMI, The Netherlands

[WED1_5] 12:35-12:40

Evaluation of Simulated O_3 Production Efficiency During the KORUS-AQ Campaign

Yujin J. Oak[1], Rokjin J. Park[1], Jason R. Schroeder[2,3], James H. Crawford[2], Donald R. Blake[4], AndrewJ. Weinheimer[5], Jung-Hun Woo[6], Sang-Woo Kim[1], Huidong Yeo[1], Alan Fried[7], Armin Wisthaler[8,9], and William H. Brune[10]
[1]Seoul National University, Republic of Korea, [2]NASA, USA, [3](Now) CARB, USA, [4]UC Irvine, USA, [5]NCAR, USA, [6]Konkuk University, Republic of Korea, [7]University of Colorado, USA, [8]University of Oslo, Norway, [9]University of Innsbruck, Austria, [10]Penn. State University, USA

[WED1_6] 12:40-12:45

The Impact of Los Angeles Basin Pollution and Stratospheric Intrusions on the Surrounding San Gabriel Mountains as Seen by Surface Measurements, Lidar, and Numerical Models

Fernando Chouza[1], Thierry Leblanc[1], Mark Brewer[1], Patrick Wang[1], Sabino Piazzolla[1], Gabriele Pfister[2], Rajesh Kumar[2], Carl Drews[2], Simone Tilmes[2], Louisa Emmons[2], and Matthew Johnson[3]
[1]CalTech, USA, [2]NCAR, USA, [3]NASA, USA

[WED1_7] 12:45-12:50

Contribution of Stratospheric Ozone Intrusion to the Interannual Variation of Tropospheric Ozone in East Asian Monsoon Region

Xiaodan Ma[1], Tianliang Zhao[1], and Jianping Huang[2]
[1]NUIST, China, [2]NOAA, USA

[WED1_8] 12:50-12:55

Surface Ozone Concentrations in Austria from 1990 – 2019: Evolution and Lessons for the Future

Monika Mayer, Stefan Schreier, Christoph Staehle, Christian Schmidt, and Harald E. Rieder
University of Natural Resources and Life Sciences (BOKU), Austria

[WED1_9] 12:55-13:00

Global and Regional Anthropogenic and Natural Emissions for the Modeling of Ozone and Other Tropospheric Compounds

Antonin Soulie[1], C. Granier[1,2], H. Denier van der Gon[3], J. Kuenen[3], S. Arellano[4], S. Darras[5], J. Doubalova[6], B. Galle[4], M. Gauss[7], M. Guevara[8], J.P. Jalkanen[9], C. Liousse[1], D. Simpson[7], and K. Sindelarova[6]

[1]CNRS, France, [2]CIRES, USA, [3]TNO, The Netherlands, [4]Chalmers University, Sweden, [5]CNRS, France, [6]Charles University, Czech Republic, [7]Norwegian Meteorological Institute, Norway, [8]Barcelona Supercomputing Center, Spain, [9]Finnish Meteorological Institute, Finland

[WED1_10] 13:00-13:05

A Modeling Study on the Roles of Cloud Distribution in Global Ozone Chemistry

Kengo Sudo[1,2] and Ryoki Matsuda[1]

[1]Nagoya University, Japan, [2]JAMSTEC, Japan

Q&A 13:05-13:20

V. Program Schedule

[ORAL] Session D. Ozone, Climate, and Meteorology

Date / Time (Wed.) October 6, 2021 / 13:40-15:00 (UTC)

Session Code WED2

Session Chair Masatomo Fujiwara, Andrew Klekociuk

[WED2_K] 13:40-13:55

Keynote

The Impacts of Ozone on Climate Across Timescales

Amanda Maycock
Institute for Atmospheric and Climate Science (ICAS), University of Leeds, United Kingdom

[WED2_1] 13:55-14:00

Prescribing Stratospheric Ozone Aggravates Southern Hemisphere Climate Change during Austral Spring in Response to Quadrupled CO_2

Feng Li[1,2] and Paul Newman[2]
[1]USRA, USA, [2]NASA, USA

[WED2_2] 14:00-14:05

Robust Effects of Ozone Feedbacks on Surface Climate Following Spring Arctic Ozone Depletion

Marina Friedel[1], Gabriel Chiodo[1,2], Andrea Stenke[1], Daniela I.V. Domeisen[1], Stephan Fueglistaler[3], Julien Anet[4], and Thomas Peter[1]
[1]ETH Zürich, Switzerland, [2]Columbia University, USA, [3]Princeton University, USA, [4]ZHAW School of Engineering, Switzerland

[WED2_3] 14:05-14:10

Enhanced Climate Response to Ozone Depletion from Ozone-Circulation Coupling

Pu Lin[1,2] and Yi Ming[2]
[1]Princeton University, USA, [2]NOAA, USA

[WED2_4] 14:10-14:15

The Southern Annular Mode in CMIP6 Model Simulations

Olaf Morgenstern
NIWA, New Zealand

[WED2_6] 14:20-14:25

Climate Change Favours Large Seasonal Loss of Arctic Ozone

Peter von der Gathen[1], Rigel Kivi[2], Ingo Wohltmann[1], Ross J. Salawitch[3], and Markus Rex[1,4]
[1]Alfred Wegener Institute, Germany, [2]Finnish Meteorological Institute, Finland, [3]University of Maryland, USA, [4]Universität Potsdam, Germany

[WED2_7] 14:25-14:30

Shedding New Light on the Radiative Impacts of Ozone-Depleting Substances

Gabriel Chiodo[1,2] and Lorenzo M. Polvani[2,3]
[1]ETH Zurich, Switzerland, [2]Columbia University, USA, [3]Lamont-Doherty Observatory, USA

[WED2_8] 14:30-14:35

Persistent Perturbations in the Composition of the Southern Hemisphere Stratosphere from the Australian New Year's Fires as Observed by the Aura Microwave Limb Sounder

Michelle L. Santee[1], Alyn Lambert[1], Lucien Froidevaux[1], Gloria L. Manney[2,3], Nathaniel J. Livesey[1], Frank Werner[1], Luis F. Millán[1], William G. Read[1], Jessica L. Neu[1], and Michael J. Schwartz[1]

[1]NASA, USA, [2]NorthWest Research Associates, USA, [3]New Mexico Tech, USA

[WED2_9] 14:35-14:40

Stratospheric Ozone Depletion by the Australian Black Summer Wildfires from Satellite and Ground-Based Observations

Sergey Khaykin[1], Sophie Godin-Beekmann[1], Andrea Pazmiño[1], A. Bazureau[1], F. Goutail[1], A. Hauchecorne[1], and R. Querel[2]

[1]LATMOS, France, [2]NIWA, New Zealand

[WED2_10] 14:40-14:45

Stratospheric Temperature and Ozone Anomalies Associated with the 2020 Australian Bushfires

L. A. Rieger[1], W. J. Randel[2], A. E. Bourassa[1], and S. Solomon[3]

[1]University of Saskatchewan, Canada, [2]NCAR, USA, [3]MIT, USA

Q&A 14:45-15:00

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Thu.) October 7

(Thu.) October 7

[ORAL] Session E. Ozone Monitoring and Measurement Techniques

Date / Time (Thu.) October 7, 2021 / 12:00-12:45 (UTC)

Session Code THU1

Session Chair Andrea Pazmiño

[THU1_K] 12:00-12:15

Keynote

Ozone Monitoring and Measurement Techniques

Natalya Kramarova

NASA, Goddard Space Flight Center, Greenbelt, Maryland, USA

[THU1_1] 12:15-12:20

Version 8 Ozone Profile and Version 8 Total Column Ozone Records from the Ozone Mapping and Profiler Suites

Lawrence E. Flynn[1], Zhihua Zhang[2], Eric Beach[2], Chunhui Pan[3], Irina Petropavlovskikh[1], C. Trevor Beck[1], and Ding Liang[4]

[1]NOAA, USA, [2]IM Systems Group, Inc., USA, [3]University of Maryland, USA, [4]Government Systems Technologies Inc., USA

[THU1_2] 12:20-12:25

Gaps and Advances in the Validation of Satellite EO Data and their Uncertainties: Case Studies on Atmospheric Ozone Data Sets

Tijl Verhoelst[1], Daan Hubert[1], Arno Keppens[1], Steven Compernolle[1], Jean-Christopher Lambert[1], Alberto Redondas[2], and Alexander Cede[3,4]

[1]BIRA-IASB, Begium, [2]AEMET, Spain, [3]NASA, USA, [4]LuftBlick, Austria

[THU1_3] 12:25-12:30

Satellite Data Harmonization for the TOAR-II Tropospheric Ozone Assessment

Arno Keppens, Daan Hubert, Tijl Verhoelst, Steven Compernolle, and Jean-Christopher Lambert

BIRA-IASB, Begium

[THU1_4] 12:30-12:35

Using Machine Learning Techniques to Create the Homogenized 25 Year Data Record GOME-Type Ozone Profile Essential Climate Variable (GOP-ECV)

Diego Loyola[1], Melanie Coldewey-Egbers[1], Barry Latter[2], Richard Siddans[2], Brian Kerridge[2], Michel van Roozendael[3], and Christian Retscher[4]

[1]DLR, Germany, [2]NCEO, UK, [3]BIRA-IASB, Belgium, [4]European Space Agency, Italy

V. Program Schedule

[THU1_5] 12:35-12:40

Update of the Homogenization of the Long-Term Global Ozonesonde Records

Roeland Van Malderen[1], Deniz Poyraz[1], Herman G.J. Smit[2], Gonzague Romanens[3], René Stübi[3], Gérard Ancellet[4], Sophie Godin-Beekmann[4], Natalia Prats[5], Carlos Torres[5], Wolfgang Steinbrecht[6], Marc Allaart[7], Ankie Piters[7], Ana Díaz[5], Jose L. Hernandez[5], Rigel Kivi[8], Richard Querel[9], Matt Tully[10], Peter von der Gathen[11], Barbora Klikova[12], Martin Motl[12], Pavla Skrivankova[12], Bogumil Kois[13], Norrie Lyall[14], Michael Gill[15], Nis Jepsen[16], Peter Oelsner[6], Vincenzo Rizi[17], Marco Iarlori[17], David W. Tarasick[18], Bryan J. Johnson[19], Anne M. Thompson[20], and Ryan M. Stauffer[20]

[1]Royal Meteorological Institute of Belgium, Belgium, [2]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany, [3]MeteoSwiss, Switzerland, [4]LATMOS, France, [5]AEMET, Spain, [6]Deutscher Wetterdienst Meteorologisches Observatorium, Germany, [7]KNMI, The Netherlands, [8]Finnish Meteorological Institute, Finland, [9]NIWA, New Zealand, [10]Bureau of Meteorology, Australia, [11]Alfred Wegener Institut, Germany, [12]Czech Hydrometeorological Institute, Czech Republic, [13]Institute of Meteorology and Water Management, Poland, [14]British Meteorological Service, UK, [15]Met Éireann Forecast, Ireland, [16]Danish Meteorological Institute, Denmark, [17]Università Degli Studi dell'Aquila, Italy, [18]Environment and Climate Change Canada, Canada, [19]NOAA, USA, [20]NASA, USA

[THU1_6] **12:40-12:45**

On the Use of Satellite Observations to Fill Gaps in the Halley Station Total Ozone Record

Lily N. Zhang[1], Susan Solomon[1], Kane A. Stone[1], Jonathan D. Shanklin[2], Joshua D. Eveson[2], Steve Colwell[2], John P. Burrows[3], Mark Weber[3], Pieternel F. Levelt[4,5], Natalya A. Kramarova[6], and David P. Haffner[6,7]

[1]MIT, USA, [2]British Antarctic Survey, UK, [3]University of Bremen, Germany, [4]KNMI, The Netherlands, [5]TU Delft, The Netherlands, [6]NASA, USA, [7]Science Systems and Applications, Inc., USA

[ORAL] Session E. Ozone Monitoring and Measurement Techniques

Date / Time (Thu.) October 7, 2021 / 12:55-13:45 (UTC)

Session Code THU2

Session Chair Yugo Kanaya

[THU2_1] 12:55-13:00

The World Brewer Reference Triads and Uncertainties in Primary Calibration

Xiaoyi Zhao[1], Vitali Fioletov[1], Michael Brohart[1], Volodya Savastiouk[2], Ihab Abboud[1], Akira Ogyu[1], Jonathan Davies[1], Reno Sit[1], Sum Chi Lee[1], Alexander Cede[3,4], Martin Tiefengraber[4,5], Moritz Müller[4,5], Debora Griffin[1], and Chris McLinden[1]

[1]Environment and Climate Change Canada, Canada, [2]International Ozone Services Inc., Canada, [3]NASA, USA, [4]LuftBlick, Austria, [5]University of Innsbruck, Austria

[THU2_2] 13:00-13:05

The Official Version 1.8 Direct Sun Total Column Ozone Product of Pandora within the Pandonia Global Network (PGN)

Martin Tiefengraber[1,2], Alexander Cede[1,3], Manuel Gebetsberger[1], Moritz Müller[1], and Alberto Redondas[4]

[1]LuftBlick, Austria, [2]University of Innsbruck, Austria, [3]NASA, USA, [4]AEMET, Spain

[THU2_3] 13:05-13:10

Ground-Based Validation of GEMS Ozone Column and Profile Data

Arno Keppens[1], Gaia Pinardi[1], Tijl Verhoelst[1], Daan Hubert[1], Corinne Vigouroux[1], Bavo Langerock[1], Minqiang Zhou[1], Jean-Christopher Lambert[1], Pucai Wang[2], Youwen Sun[2], Cheng Liu[3], Isao Murata[4], Hideaki Nakajima[5], Isamu Morino[5], Tomoo Nagahama[6], and the GEMS AO Validation Team

[1]BIRA-IASB, Begium, [2]Chinese Academy of Sciences, China, [3]University of Science and Technology of China, China, [4]Tohoku University, Japan, [5]National Institute for Environmental Studies, Japan, [6]Nagoya University, Japan

[THU2_4] 13:10-13:15

Optimized Umkehr Profile Algorithm for Ozone Trend Analyses

Irina Petropavlovskikh[1,2], Koji Miyagawa[2], Audra McClure-Begley[1,2], Bryan Johnson[2], Jeannette Wild[3,4], Susan Strahan[5,6], Krzysztof Wargan[6,7], Richard Querel[8], Lawrence Flynn[9], Eric Beach[10], and Sophie Godin-Beekmann[11]

[1]CIRES/NOAA, USA, [2]NOAA/GML, USA, [3]CISESS/NOAA, USA, [4]NOAA/NWS/NCEP/CPC, USA, [5]USRA, USA, [6]NASA/GSFC, USA, [7]SSI Inc., USA, [8]NIWA, New Zealand, [9]NOAA/STAR, USA, [10]IMSG, USA, [11]LASP/IPSL, France

V. Program Schedule

[THU2_5] 13:15-13:20

Implementation of a New Value of the Ozone Absorption Cross-Section per Molecule at 253.65 nm (Air) for Global Atmospheric Ozone Measurement

Paul J. Brewer[1], Andrew S. Brown[1], Sangil Lee[2], Joele Viallon[3], Robert I. Wielgosz[3], Joseph J. Hodges[4], Jennifer Carney[4], James Norris[4], Louise Sorensen[5], Joann Rice[6], Christoph Zellweger[7], Hiroshi Tanimoto[8], and Bernhard Niederhauser[9]

[1]National Physical Laboratory, UK, [2]Korea Research Institute of Standards and Science, Republic of Korea, [3]Bureau International des Poids et Measures, France, [4]National Institute of Standards and Technology, USA, [5]California Air Resources Board, USA, [6]Environmental Protection Agency, USA, [7]Swiss Federal Laboratories for Materials Science and Technology, Switzerland, [8]National Institute for Environmental Studies, Japan, [9]Federal Institute of Metrology, Switzerland

[THU2_6] 13:20-13:25

The 25th Anniversary of the Juelich Ozone Sonde Intercomparison Experiment (JOSIE): 25 Years of Ozonesonde QA/QC and Data Quality Improvements

Herman G.J. Smit[1], Anne M. Thompson[2], Bryan J. Johnson[3], Jonathan Davies[4], David W. Tarasick[4], Jacqueline C. Witte[5], René Stuebi[6], Roeland Van Malderen[7], Ryan M. Stauffer[2], Holger Voemel[5], Peter von der Gathen[8], Debra E. Kollonige[2], Samuel J. Oltmans[3], Francis J. Schmidlin[2], Bruno Hoegger[6], Gary Morris[9], Rigel Kivi[10], Tatsumi Nakano[11], Richard Querel[12], Marc Allaart[13], and many more members of the JOSIE-ASOPOS-O3SDQA Teams

[1]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany, [2]NASA, USA, [3]NOAA, USA, [4]Environment and Climate Change Canada, Canada, [5]NCAR, USA, [6]MeteoSwiss, Switzerland, [7]Royal Meteorological Institute of Belgium, Belgium, [8]Alfred Wegener Institute, Germany, [9]St. Edward's University, USA, [10]Finnish Meteorological Institute, Finland, [11]JMA, Japan, [12]NIWA, New Zealand, [13]KNMI, The Netherlands

Q&A 13:25-13:45

[POSTER 4]

Date / Time (Thu.) October 7, 2021 / 13:55-15:05 (UTC)

Session Code THU3

Session Chair Seok-Woo Son, Ulrike Langematz

[THU3_1] 13:55-13:57

Stratospheric to Tropospheric Fractions in the Tropopause Transition Layer using Water and Ozone Concentrations

Paul A. Newman[1], Leslie R. Lait[1], Junhua Liu[1], Qing Liang[1], Chaitri Roy[2], and A. R. Ravishankara[2]

[1]NASA, USA, [2]Colorado State University, USA

[THU3_2] 13:57-13:59

Tropospheric Ozone Variability in Associations with Tropical Climate Variability

Vishnu M Warrier and Vazhathottathil Madhu

Cochin University of Science and Technology, India

[THU3_3] 13:59-14:01

Ozone Trends in the Lower Stratosphere from Ozone Sondes

W. Steinbrecht[1], R. Van Malderen[2], D. Poyraz[2], D. Hubert[3], J. Davies[4], D.W. Tarasick[4], P. v. d. Gathen[5], H. Deckelmann[5], N. Jepsen[6], R. Kivi[7], N. Lyall[8], B. Kois[9], P. Oelsner[1], M. Allaart[10], A. Piters[11], M. Gill[11], G. Romanens[12], R. Stübi[12], G. Ancellet[13], S. Godin-Beekmann[13], B. Johnson[14], P. Cullis[14,15], I. Petropavlovskikh[14,15], J.-L. Hernandez[16], A. Diaz[16], T. Nakano[17], C. Torres[16], M.Tully[18], R. Querel[19], D.E. Kollonige[20,21], R.M. Stauffer[20], A.M. Thompson[20], and H.G.J. Smit[22]

[1]Deutscher Wetterdienst, Germany, [2]Royal Meteorological Institute of Belgium, Belgium, [3]BIRA-IASB, Belgium, [4]Environment and Climate Change Canada, Canada, [5]Alfred Wegener Institute, Germany, [6]Danish Meteorological Institute, Denmark, [7]Finnish Meteorological Institute, Finland, [8]British Meteorological Service, Scotland, [9]Institute of Meteorology and Water Management, Poland, [10]KNMI, The Netherlands, [11]Met Éireann Forecast, Ireland, [12]MeteoSwiss, Switzerland, [13]LATMOS, France, [14]NOAA, USA, [15]CIRES, USA, [16]AEMET, Spain, [17]Meteorological Research Institute, Japan, [18]Bureau of Meteorology, Australia, [19]NIWA, New Zealand, [20]NASA, USA, [21]Science Systems and Applications, Inc., USA, [22]Institute of Energy and Climate Research (IEK), Germany

[THU3_4] 14:01-14:03

Persistent Stratospheric Warming due to 2019–2020 Australian Wildfire Smoke

Karen H. Rosenlof[1], Pengfei Yu[2], Sean M. Davis[1], Robert W. Portmann[1], Owen B. Toon[3], Charles G. Bardeen[4], Christopher Maloney[4,1], Hagen Telg[3,1], and John E. Barnes[1]

[1]NOAA, USA, [2]Jinan University, China, [3]University of Colorado, USA, [4]NCAR, USA

V. Program Schedule

[THU3_5] 14:03-14:05

Formation of Lower-Tropospheric High-Ozone Layer in Spring over Southeast Asia

S.-Y. Ogino[1], K. Miyazaki[2], M. Fujiwara[3], M. I. Nodzu[4], M. Shiotani[5], F. Hasebe[3], J. Matsumoto[1,4], J. Witte[6], A. M. Thompson[2], Nguyen Hoang Anh[7], and Nguyen Vinh Thu[7]

[1]JAMSTEC, Japan, [2]NASA, USA, [3]Hokkaido University, Japan, [4]Tokyo Metropolitan University, Japan, [5]Kyoto University, Japan, [6]NCAR, USA, [7]NCHMF, Vietnam

[THU3_6] 14:05-14:07

The ENSO Induced Tropospheric Ozone Dipole based on Chemistry-Climate Model Simulation

Vazhathottathil Madhu[1,2] and Kengo Sudo[2]

[1]Cochin University of Science and Technology, India, [2]Nagoya University, Japan

[THU3_7] 14:07-14:09

Variability of the Spectral Ultraviolet Irradiance and Total Ozone in Italy: The Role of Atmospheric Dynamics

Ilias Fountoulakis[1,5], Henri Diémoz[1,2], Anna Maria Siani[3], Alcide di Sarra[4], and Daniela Meloni[4]

[1]Aosta Valley Regional Environmental Protection Agency, Italy, [2]National Research Council, Italy, [3]Sapienza Università di Roma, Italy, [4]Agenzia nazionale per le Nuove Tecnologie, Italy, [5]National Observatory of Athens, Greece

[THU3_8] 14:09-14:11

Northern Hemisphere Climate Response to Projected Stratospheric Ozone Recovery

Denise Seiling and Ulrike Langematz

Freie Universität Berlin, Germany

[THU3_9] 14:11-14:13

Investigation of Ozone Changes in 10-Year Period in Tehran

Nasim Hossein Hamzeh and Sara Karami

Atmospheric Science and Meteorological Research Center, Iran

[THU3_10] 14:13-14:15

Roles of Ozone-Wave Interaction on the Stratospheric Pathway of the Arctic-Mid-Latitude Climate Linkage

Tetsu Nakamura[1], Daniel Kreyling[2], Jinro Ukita[3], Ingo Wohltmann[2], Ralf Jaiser[2], and Dörthe Handorf[2]

[1]Hokkaido University, Japan, [2]Alfred Wegener Institute for Polar and Marine Research, Germany, [3]Niigata University, Japan

[THU3_11] 14:15-14:17

The Stratospheric Brewer-Dobson Circulation in ERA5 and ERA-Interim Reanalyses

Felix Ploeger, Mohamadou Diallo, Paul Konopka, and Martin Riese

Institute of Energy and Climate Research (IEK), Germany

[THU3_12] 14:17-14:19

The Impact of the Southern Hemisphere Polar Vortex on Surface Climate and the Role of Ozone Feedbacks

Nora Bergner[1], Gabriel Chiodo[1,2], Marina Friedel[1], Daniela Domeisen[1], and Thomas Peter[1]
[1]ETH Zürich, Switzerland, [2]Columbia University, USA

[THU3_13] 14:19-14:21

Projections Changes in the Total Column Ozone over the 21st Century in CMIP6 Models

Ana Letícia Campos Yamamoto, Marcelo de Paula Corrêa, and Roger Rodrigues Torres
Federal University of Itajubá, Brazil

[THU3_14] 14:21-14:23

Coupling of the Fast Stratospheric Ozone Chemistry Module (SWIFT) to the Atmospheric General Circulation Model for the Earth Simulator (AFES)

Daniel Kreyling[1], Tetsu Nakamura[2], Jinro Ukita[3], Ingo Wohltmann[1], Ralf Jaiser[1], and Dörthe Handorf[1]
[1]Alfred Wegener Institute for Polar and Marine Research, Germany, [2]Hokkaido University, Japan, [3]Niigata University, Japan

[THU3_15] 14:23-14:25

Long-Term Changes in Tropospheric Ozone in Antarctica and Possible Drivers

P. Kumar[1], J. Kuttippurath[1], P. von der Gathen[2], I. Petropavlovskikh[3,4], B. Johnson[4], A. McClure Begley[3,4], P. Cristofanelli[5], P. Bonasoni[5], M. E. Barlasina[6], and R. Sánchez[6]
[1]Indian Institute of Technology Kharagpur, India, [2]Alfred Wegener Institute, Germany, [3]University of Colorado, USA, [4]NOAA, USA, [5]National Research Council, Italy, [6]Servicio Meteorológico Nacional, Argentina

[THU3_17] 14:27-14:29

Early Vortex Break-Up Events in the ACCESS-CM2-Chem Model

Fraser Dennison
CSIRO, Australia

[THU3_18] 14:29-14:31

Analysis of Completeness, Coherency and Plausibility of Ground-Based Ozone Datasets within the Copernicus Climate Change Service

Fabrizio Marra[1], Karin Kreher[2], and Fabio Madonna[1]
[1]National Research Council (CNR), Italy, [2]BK SCIENTIFIC (BKS), Germany

[THU3_19] 14:31-14:33

Evaluation of a Stratospheric Ozone Reduction Event of Tropical Origin Influenced by the Secondary Effect of the Antarctic Ozone Hole over the Southern Brazil through CFSV2: July/August 2013

Gustavo Rasera[1], Vagner Anabor[1], Luiz Angelo Steffenel[2], Damaris Kirsch Pinheiro[1], and Lissette Guzmán Rodríguez[1]
[1]UFSM, Brazil, [2]Université de Reims Champagne Ardenne, Laboratoire LICIIS / LRC CEA DIGIT, France

V. Program Schedule

[THU3_21] 14:35-14:37

Developing Artificial Intelligence-Based Prediction Systems to Monitor the Quantitative Effect of Australian Bushfires on the Antarctic Ozone Hole

Thomas Y. Chen
Academy for Mathematics, Science, and Engineering, USA

[THU3_22] 14:37-14:39

Air-Temperature and Humidity Dependence of the Ozone Generation Rate in the Surface Air Layer

P.N. Antokhin, O.Yu. Antokhina, V.V. Antonovich, V.G. Arshinova, M.Yu. Arshinov, B.D. Belan, S.B.Belan, D.K. Davydov, G.A.Ivlev, A.V.Fofonov, A.V. Kozlov, T. M. Rasskazchikova, D.E. Savkin, D.V. Simonenkov, T.K. Sklyadneva, and G.N. Tolmachev
V.E. Zuev Institute of Atmospheric Optics SB RAS, Russia

[THU3_23] 14:39-14:41

Bias Correction of Multi-Sensor Satellite-Acquired Total Column Ozone

Hiroaki Naoe[1], Takashi Maki[1], Makoto Deushi[1], and Keisuke Ueno[2]
[1]Meteorological Research Institute, Japan, [2]Aerological Observatory, Japan

[THU3_24] 14:41-14:43

Towards Understanding the Mechanism for the Downward Propagation of Ozone Depletion on Surface Climate

Chaim I Garfinkel[1], Ian White[1], Edwin Gerber[2], Martin Jucker[3], and Seok-Woo Son[4]
[1]Hebrew University, Israel, [2]New York University, USA, [3]UNSW Sydney, Australia, [4]Seoul National University, Republic of Korea

[THU3_25] 14:43-14:45

Montreal Protocol Benefits Simulated with SOCOLv4.0

Tatiana Egorova[1], Jan Sedlacek[1], Timofei Sukhodolov[1,3], Arseniy Karagodin[1,2], and Eugene Rozanov[1,2,3]
[1]PMOD/WRC, Switzerland, [2]ETH Zürich, Switzerland, [3]St. Petersburg State University, Russia

[THU3_26] 14:45-14:47

Ozone Hole Impacts on Southern Annular Mode Persistency and Predictability in Idealized ICON-ART Climate Change Simulations

Marleen Braun and Peter Braesicke
Karlsruhe Institute of Technology, Germany

[THU3_27] 14:47-14:49

Monitoring of Surface Ozone in the Moscow Region

Danil Vladimirovich Borisov[1], Irina Nikolaevna Kuznetsova[1], Irina Yurievna Shalygina[1], Murat Islemgaleevich Nahaev[1], Elena Aleksandrovna Lezina[2], and Vladimir Aleksandrovich Lapchenko[3]
[1]Hydrometeorological Research Center of Russian Federation, Russia, [2]Budgetary Environmental Protection Institution, Russia, [3]Karadag Scientific Station, Russia

[THU3_28] 14:49-14:51

Effective Radiative Forcing of Stratospheric Ozone Recovery

Katerina Kusakova, Björn-Martin Sinnhuber, Maryam Ramezani Ziarani, and Peter Braesicke
Karlsruhe Institute of Technology, Germany

[THU3_29] 14:51-14:53

Assessment of Tropical UTLS Ozone in Chemistry-Climate Models

Joowan Kim and Hosun Ryu
Kongju National University, Republic of Korea

[THU3_30] 14:53-14:55

Effect of Ozone Enhancement in UT/LS for the Long-Term Total Ozone Trend Analysis in Seoul, Korea

Sang Seo Park[1], Yun Gon Lee[2], Jhoon Kim[3], Hi Ku Cho[3], and Hyunkwang Lim[3]
[1]UNIST, Republic of Korea, [2]Chungnam National University, Republic of Korea, [3]Yonsei University, Republic of Korea

[THU3_31] 14:55-14:57

The Present and Future Ozone Trend in South Korea

Taegyung Lee[1], Ja-Ho Koo[1], and Sungbo Shim[2]
[1]Yonsei University, Republic of Korea, [2]National Institute of Meteorological Sciences, Republic of Korea

[THU3_32] 14:57-14:59

Effect of Stratospheric Ozone on Simulation of Winter Surface Temperature in the Northern Hemisphere in Climate Models

Yong-Cheol Jeong[1], Sang-Wook Yeh[1], Seungun Lee[2], Rokjin J. Park[2], and Seok-Woo Son[2]
[1]Hanyang University, Republic of Korea, [2]Seoul National University, Republic of Korea

[THU3_33] 14:59-15:01

Impact of Stratospheric Ozone on the Subseasonal Prediction in the Southern Hemisphere Spring

Jiyoung Oh[1,2], Seok-Woo Son[1], Jung Choi[1], Eun-Pa Lim[3], Chaim Garfinkel[4], Harry Hendon[3], Yoonjae Kim[2], and Hyun-Sun Kang[2]
[1]Seoul National University, Republic of Korea, [2]Korea Meteorological Administration, Republic of Korea, [3]Bureau of Meteorology, Australia, [4]Hebrew University, Israel

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Fri.) October 8

(Fri.) October 8

[ORAL] Session E. Ozone Monitoring and Measurement Techniques

Date / Time **(Fri.) October 8, 2021 / 12:00-12:45 (UTC)**

Session Code **FRI1**

Session Chair **Nathaniel Livesey**

[FRI1_1] 12:00-12:05

The Importance of Correcting the Time Response of the Electrochemical Concentration Cell (ECC) Ozonesonde

Holger Vömel[1], Herman G. J. Smit[2], David Tarasick[3], Bryan Johnson[4], Samuel J. Oltmans[4], Henry Selkirk[5], Anne M. Thompson[5], Ryan M. Stauffer[5], Jacquelyn C. Witte[1], Jonathan Davies[3], Roeland van Malderen[6], Gary A. Morris[7], Tatsumi Nakano[8], and René Stübi[9]

[1]NCAS, USA, [2]Institute of Energy and Climate Research (IEK), Germany, [3]Environment and Climate Change Canada, Canada, [4]NOAA, USA, [5]NASA, USA, [6]Royal Meteorological Institute, Belgium, [7]St. Edward's University, USA, [8]JMA, Japan, [9]MeteoSwiss, Switzerland

[FRI1_2] 12:05-12:10

An Updated Examination of the Post-2013 Ozonesonde Total Column Ozone "Dropoff"

Ryan M. Stauffer[1], Anne M. Thompson[1], Debra E. Kollonige[2,1], David W. Tarasick[3], Holger Vömel[4], Gary A. Morris[5], Roeland Van Malderen[6], Bryan J. Johnson[7], Patrick D. Cullis[8,7], René Stübi[9], and Herman G. J. Smit[10]

[1]NASA, USA, [2]Science Systems and Applications, Inc., USA, [3]Environment and Climate Change Canada, Canada, [4]NCAS, USA, [5]St. Edwards University, USA, [6]Royal Meteorological Institute of Belgium, Belgium, [7]NOAA, USA, [8]University of Colorado, USA, [9]MeteoSwiss, Switzerland, [10]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany

[FRI1_3] 12:10-12:15

The Changing-Atmosphere Infra-Red Tomography Explorer CAIRT – A Candidate for ESA's Earth Explorer 11

Björn-Martin Sinnhuber[1], Peter Preusse[2], Martyn Chipperfield[3], Quentin Errera[4], Felix Friedl-Vallon[1], Bernd Funke[5], Sophie Godin-Beekmann[6], Maya Garcia Comas[5], Michael Höpfner[1], Manuel López Puertas[5], Vincent-Henri Peuch[7], Felix Plöger[2], Inna Polichtchouk[7], Piera Raspollini[8], Stefanie Riel[9], Martin Riese[2], Miriam Sinnhuber[1], Gabi Stiller[1], Jörn Ungermann[2], Thomas von Clarmann[1], and Kaley Walker[10]

[1]Karlsruhe Institute of Technology, Germany, [2]Institute of Energy and Climate Research (IEK), Germany, [3]University of Leeds, UK, [4]BIRA-IASB, Belgium, [5]Instituto de Astrofísica de Andalucía, Spain, [6]National Centre for Scientific Research, France, [7]ECMWF, UK, [8]National Research Council (CNR), Italy, [9]Airbus Defense and Space, Germany, [10]University of Toronto, Canada

V. Program Schedule

[FRI1_4] 12:15-12:20

The Continuity Microwave Limb Sounder (C-MLS) – Capitalizing on New Technology to Continue the MLS Record of Daily Global Middle Atmosphere Composition Observations

Nathaniel J. Livesey[1], Goutam Chattopadhyay[1], Adrian Tang[1], Robert A. Stachnik[1], Robert F. Jarnot[1], Luis F. Millán[1], William G. Read[1], Richard E. Cofield[1], Michelle L. Santee[1], Mau-Chung (Frank) Chang[2], and Rulin Huang[2]

[1]NASA, USA, [2]UCLA, USA

[FRI1_5] 12:20-12:25

TOPAS Ozone Profile Retrieval from TROPOMI Nadir Measurements in the Ultraviolet Spectral Range and Improvements by Combining with CrIS Infrared Measurements

Nora Mettig[1], Mark Weber[1], Alexei Rozanov[1], Carlo Arosio[1], John P. Burrows[1], and Pepijn Veefkind[2]

[1]University of Bremen, Germany, [2]KNMI, The Netherlands

[FRI1_6] 12:25-12:30

Diurnal Variation of GEMS Total Column Ozone Data: Ground-Based Validation and Consistency with Other Satellite Missions

Kanghyun Baek[1], Jae-Hwan Kim[1], and David P. Haffner[2]

[1]Pusan National University, Republic of Korea, [2]Science Systems and Application Inc., USA

Q&A **12:30-12:45**

[ORAL] Session F. Environmental and Human Health Effects of Atmospheric Ozone and U

Date / Time (Fri.) October 8, 2021 / 12:55-13:50 (UTC)

Session Code FRI2

Session Chair Julian Gröbner, Johanna Tamminen

[FRI2_K] 12:55-13:10

Keynote

Mapping Global Ground-Level Ozone Concentrations for 1990 to 2017 to Support Health Impact Assessment

Jason West

Department of Environmental Sciences and Engineering, University of North Carolina, Chapel Hill, North Carolina, USA

[FRI2_1] 13:10-13:15

Surface UV Radiation Contribution to the Increase of Melanoma Incidence Rate in Europe in the Last 20 Years

Agnieszka Czerwińska and Janusz Krzyścin

Institute of Geophysics, Polish Academy of Sciences, Poland

[FRI2_2] 13:15-13:20

Solar Ultraviolet Radiation Temporal Variability Analisys from 2-Years of Continuous Observation in an Amazonian City of Brazil

Gabriela Reis[1], Samuel Souza[1], Helvécio Neto[2], Rardiles Branches[1], Rodrigo da Silva[1], Lucas Vaz Peres[1], Damaris Kirsch Pinheiro[3], Kevin Lamy[4], Hassan Bencherif[4], Thierry Portafaix[4], and Marcelo de Paula Corrêa[5]

[1]UFOPA, Brazil, [2]INPE, Brazil, [3]UFSM, Brazil, [4]LACy, France, [5]Federal University of Itajubá, Brazil

[FRI2_3] 13:20-13:25

Erythemal UV-B Dose Measurements Comparison Recorded by RBCC-E and BSRN at Izaña Atmospheric Observatory

Sergio F. León-Luis[1,2], R.D. García[1,2], Alberto Redondas[2], Virgilio Carreño[2], Javier López-Solano[1,2], Alberto Berjón[1,2], and Daniel Santana[2,3]

[1]Tragsatec, España, [2]AEMET, Spain, [3]LuftBlick Earth Observation Technologies, Austria

[FRI2_4] 13:25-13:30

Total Ozone and DNA UV Changes in the Future due to Greenhouse Gases

Kostas Eleftheratos[1], John Kapsomenakis[2], Christos S. Zerefos[2], I. Fountoulakis[3], Patrick Jöckel[4], and Martin Dameris[4]

[1]National and Kapodistrian University of Athens, Greece, [2]Academy of Athens, Greece, [3]National Observatory of Athens, Greece, [4]DLR, Germany

V. Program Schedule

[FRI2_5] 13:30-13:35

Characterizing Subarctic Biomes for Land Surface Modeling of Ozone Pollution and Climate Risk

Stefanie Falk[1], Ane Victoria Vollsnes[1], Aud B. Eriksen[1], Lisa Emberson[2], Connie O'Neill[2], Frode Stordal[1], and Terje K. Berntsen[1]

[1]University of Oslo, Norway, [2]University of York, UK

[FRI2_6] 13:35-13:40

A Satellite-Based UV and VIS Climatology for Biological and Agricultural Applications for Greece and Cyprus: Preliminary Results and Validation

Fountoulakis Ilias[1], Kosmopoulos Panagiotis[1], Papachristopoulou Kyriakoula[1,2], Raptis Ioannis-Panagiotis[1,2], Eleftheratos Kostas[2,3], Garane Katerina[4], Bais Alkiviadis[4], Melina-Maria Zempila[5], Kontoes Charalampos[1], and Kazadzis Stelios[6]

[1]National Observatory of Athens, Greece, [2]National and Kapodistrian University of Athens, Greece, [3]Academy of Athens, Greece, [4]Aristotle University of Thessaloniki, Greece, [5]RAL - RAL Space, UK, [6]PMOD/WRC, Switzerland

Q&A 13:40-13:50

[POSTER 5]

Date / Time (Fri.) October 8, 2021 / 14:00-14:50 (UTC)

Session Code FRI3

Session Chair Corinne Vigouroux, Valerie Thouret

[FRI3_1] 14:00-14:02

Two Complementary Tropospheric Ozone Column Data Records based on Total Columns from GOME, SCIAMACHY, GOME-2, OMI and TROPOMI and Stratospheric Columns from BASCOE/MLS

Klaus-Peter Heue[1,2], Diego Loyola[1], Fabian Romahn[1], Melanie Coldewey-Egbers[1], Christophe Lerot[3], Simon Chabrillat[3], and Quentin Errera[3]

[1]DLR, Germay, [2]TUM, Germany, [3]BIRA, Belgium

[FRI3_2] 14:02-14:04

Tropospheric Ozone Column Dataset Derived by Combination of Nadir and Limb Satellite Measurements

Viktoria F. Sofieva[1], Risto Hänninen[1], Mikhail Sofiev[1], Monika Szelag[1], Hei Shing Lee[1], Johanna Tamminen[1], and Christian Retscher[2]

[1]Finnish Meteorological Institute, Finland, [2]ESA/ESRIN, Italy

[FRI3_3] 14:04-14:06

Inter-Comparison and Evaluation of Tropospheric Ozone Reanalysis Products from CAMS, and TCR

Vincent Huijnen[1], Kazuyuki Miyazaki[2], Johannes Flemming[3], Antje Inness[3], and Takashi Sekiya[4]

[1]KNMI, The Netherlands, [2]NASA, USA, [3]ECMWF, UK, [4]JAMSTEC, Japan

[FRI3_4] 14:06-14:08

Evaluation of Tropospheric Ozone Reanalyses with Independent Ozonesonde Observations in East Asia

Sunmin Park[1], Seok-Woo Son[1], Myung-Il Jung[1], Jinkyung Park[1], and Sang Seo Park[2]

[1]Seoul National University, Republic of Korea, [2]UNIST, Republic of Korea

[FRI3_5] 14:08-14:10

Evaluation of the Total Column Ozone and Tropospheric Ozone in the CCMI1 Models over East Asia

Seo-Yeon Kim[1], Sunmin Park[2], and Seok-Woo Son[1]

[1]Seoul National University, Republic of Korea, [2]Korea University, Republic of Korea

V. Program Schedule

[FRI3_6] 14:10-14:12

Improving the Current Understanding of Tropospheric Ozone Processes with Coordinated Ozone Profiling by the Tropospheric Ozone Lidar Network (TOLNet)

John T. Sullivan[1], Michael J. Newchurch[2], Timothy A. Berkoff[1] Guillaume Gronoff[1,3], Shi Kuang[2], Andrew O. Langford[4], Christoph J. Senff[4,5], Raul J. Alvarez II[4], Thierry Leblanc[6], Fernando Chouza[6], Jia Su[7], M. Patrick McCormick[7], Matthew S. Johnson[1], Kevin Strawbridge[8], Fred Moshary[5], Michael Shook[1], and Gao Chen[1]

[1]NASA, USA, [2]University of Alabama, USA, [3]Science Systems and Applications Inc., USA, [4]NOAA, USA, [5]CIRES, USA, [6]CalTech, USA, [7]Hampton University, USA, [8]Environment and Climate Change Canada, Canada

[FRI3_7] 14:12-14:14

Stratosphere-Troposphere Exchange of Ozone and Carbon Monoxide over the North Pacific Ocean in Northern Winter using Two Chemical Reanalysis Data Sets

Haosen Xi and Masamoto Fujiwara

Hokkaido University, Japan

[FRI3_8] 14:14-14:16

Effect of Synoptic Scale Dynamics on the Vertical Distribution of Ozone over the Arabian Sea and Indian Ocean During the Boreal Winter of 2018

P. R. Satheesh Chandran[1,2], S. V. Sunilkumar[1], M. Muhsin[1,3], Maria Emmanuel[1,2], and Hemanth Kumar[4]

[1]VSSC, India, [2]University of Kerala, India, [3]National Institute of Technology, India, [4]NARL, India

[FRI3_9] 14:16-14:18

Comparison between Two Events with Ozone-Poor Masses Originating from the South Pole and the Tropics over the City of Durban, South Africa

Fabio Henrique Corrêa[1], Gabriela Dornelles Bittencourt[1], Damaris Kirsch Pinheiro[1], and Hassan Bencherif[2]

[1]UFSM, Brazil, [2]LACy, France

[FRI3_10] 14:18-14:20

Origin of Tropospheric Air Masses in the Tropical West Pacific Inferred from Balloon-Borne Ozone and Water Vapour Observations from Palau

Katrin Müller, Ingo Wohltmann, Peter von der Gathen, Ralph Lehmann, and Markus Rex

Alfred-Wegener-Institute, Germany

[FRI3_11] 14:20-14:22

Multi-Year of Dynamics of Vertical Ozone Distribution in the Troposphere over the South of Western Siberia

P.N. Antokhin, V.G. Arshinova, M.Yu. Arshinov, B.D. Belan, S.B.Belan, D.K. Davydov, A.V.Fofonov, T. M. Rasskazchikova, D.E. Savkin, D.V. Simonenkov, T.K. Sklyadneva, and G.N. Tolmachev

V.E. Zuev Institute of Atmospheric Optics r SB RAS, Russia

[FRI3_14] 14:26-14:28

Ozone Observations over Open Oceans on R/V Mirai from 67°S to 75°N since 2012: Testing Global Chemical Reanalysis TCR-2 in terms of Arctic Processes and Low Ozone Levels at Low Latitudes

Yugo Kanaya[1], Kazuyuki Miyazaki[2,1], Fumikazu Taketani[1], Takuma Miyakawa[1], Hisahiro Takashima[1,3], Xiaole Pan[1,4], Saki Kato[3], Kengo Sudo[1,5], Takashi Sekiya[1], Jun Inoue[6], Kazutoshi Sato[7], and Kazuhiro Oshima[1,8]

[1]JAMSTEC, Japan, [2]CalTech, USA, [3]Fukuoka University, Japan, [4]Chinse Academy of Sciences, China, [5]Nagoya University, Japan, [6]National Institute of Polar Research, Japan, [7]Kitami Institute of Technology, Japan, [8]Rokkasho Institute of Environmental Sciences, Japan

[FRI3_15] 14:28-14:30

South America and Africa Biomass Burning Influence on the Seasonality of the Tropospheric Ozone over Natal, Brazil

Damaris Kirsch Pinheiro[1], Hassan Bencherif[2], Lucas Vaz Peres[3], Gabriela Dornelles Bittencourt[1], Nelson Bègue[2], Maria Paulete Pereira Martins[4], and Francisco Raimundo da Silva[4]

[1]UFSM, Brazil, [2]LACy, France, [3]UFOPA, Brazil, [4]INPE, Brazil

[FRI3_16] 14:30-14:32

Surface Ozone Concentration over Russian Territory in 2020-2021

E.V. Stepanov[1], V.V. Andreev[2], M.Yu. Arshinov[3], B.D. Belan[3], S.B. Belan[3], Chelibanov[4], V.P. Chelibanov[4], D.K. Davydov[3], N.F. Elansky[5], G.A. Ivlev[3], A.V. Kozlov[3], S.N. Kotel'nikov[1], I.N. Kuznetsova[6], V.A. Lapchenko[7], E.A. Lezina[8], O.V. Postylyakov[5], D.E. Savkin[3], I.A. Senik[3], G.N. Tolmachev[3], A.V. Fofonov[3], and I.V. K.A. Shukurov[5]

[1]A. M. Prokhorov General Physics Institute, RAS, Russia, [2]RUDN University, Russia, [3]IAO SB RAS, Russia, [4]Instrument-Making Company OPTEK, Russia, [5]A.M. Obukhov Institute of Atmospheric Physics RAS, Russia, [6]Hydrometeorological Research Center of Russian Federation, Russia, [7]Institute of Biology of the Southern Seas of RAS, Russia, [8]Mosecomonitoring, Russia

[FRI3_17] 14:32-14:34

Application of Adjacened-Avarage to Analysis of Longterm Surface Ozone Courses

Eugene V. Stepanov

A. M. Prokhorov General Physics Institute, RAS, Russia

[FRI3_18] 14:34-14:36

Variation of Surface Ozone, NOx, CO, BTEX, SO_2 and NH_3 in Kannur- A South Indian Coastal City

Nishanth T[1], Resmi CT[2], and Satheesh Kumar MK[3]

[1]Sree Krishna College Guruvayur, India, [2]Erode Arts and Science College, India, [3]MAHE, India

V. Program Schedule

[FRI3_19] 14:36-14:38

Preliminary Study of the Characterization of Surface Ozone in the Marambio Station for the Period 2012-2018

Gerardo Carbajal Benítez, María Elena Barlasina, and Lino Fabian Condori
National Meteorological Service (SMN), Argentina

[FRI3_20] 14:38-14:40

Long-Term Changes in Seasonal Cycle of Surface Ozone over Japan with Continuous Air Quality Monitoring Records for 1980-2015

Natsumi Kawano, Tatsuya Nagashima, and Seiji Sugata
National Institute for Environmental Studies, Japan

[FRI3_21] 14:40-14:42

Surface Ozone Trends over a 21-year Period at El Arenosillo Observatory: Emission Precursors, Weather Conditions and Implications on Air Quality

José A Adame[1], Isidoro Gutierrez-Alvarez [2], Paolo Cristofanelli[3], Alberto Notario[4,5], Jose A. Bogeat[1], Antonio Lopez[1], Alvaro Gómez[1], Juan P. Bolívar[2], and Margarita Yela[1]
[1]National Institute for Aerospace Technology (INTA), Spain, [2]University of Huelva, Spain, [3]National Research Council of Italy, Italy, [4]Universidad de Castilla-La Mancha, Spain, [5]ICCA-UCLM, Spain

[FRI3_22] 14:42-14:44

Patterns and Trends of Ozone and Carbon Monoxide at Ushuaia (Argentina) Observatory

José A Adame[1], Olga Puentedura[1], Laura Gómez[1], Lino Condorí[2], Gerardo Carbajal[2,4], María E. Barlasina[2], and Margarita Yela[1]
[1]National Institute for Aerospace Technology (INTA), Spain, [2]National Meteorological Service (SMN), Argentina, [4]Pontificia Universidad Católica Argentina, Argentina

[FRI3_23] 14:44-14:46

Introducing New Lightning Schemes to a Chemistry Climate Model CHASER (MIROC)

Yanfeng He[1], Kengo Sudo[1,2], and H.M.S. Hoque[1]
[1]Nagoya University, Japan [2]JAMSTEC, Japan

[FRI3_24] 14:46-14:48

Ozonesonde Profiles at Reunion Island (21.1°S, 55.5°E) in the Indian Ocean, and Impact of Convection on the Upper-Tropospheric Composition

Jerome Brioude[1], Stephanie Evan[1], Damien Héron[2], Jean-Marc Metzger[3], Kevin Lamy[1], and Françoise Posny[1]
[1]LACy, France, [2]LMD, CNRS-UMR8539, France, [3]OSU-R, UMS3365, CNRS, France

QOS 2021

October 3 (Sunday) - 9 (Saturday), 2021
Online Meeting

V. Program Schedule

(Sat.) October 9

V. Program Schedule

(Sat.) October 9

[POSTER 6]

Date / Time **(Sat.) October 9, 2021 / 12:00-13:10 (UTC)**

Session Code **SAT1**

Session Chair **Sang Seo Park**

[SAT1_1] 12:00-12:02

Internal Consistency of the IAGOS Ozone Measurements for the Last 25 Years

Romain Blot[1], Philippe Nedelec[1], Damien Boulanger[1], Pawel Wolff[1], Bastien Sauvage[1], Jean-Marc Cousin[1], Andreas Zahn[2], Hannah Clark[3], and Valérie Thouret[1]

[1]Université de Toulouse, France, [2]Karlsruhe Institute of Technology, Germany, [3]IAGOS-AISBL, Belgium

[SAT1_2] 12:02-12:04

Dobson Global Calibration System: More than Half a Century of Successful QA/QC

Ulf Köhler[1], Wolfgang Steinbrecht[1], Voltaire A. Velazco[1], Glen McConville[2], and Robert D. Evans[2]

[1]Deutscher Wetterdienst Meteorologisches Observatorium, Germany, [2]NOAA, USA

[SAT1_3] 12:04-12:06

Total Ozone Column Variability Analysis over Natal in 21st Century

Alanna Maués de Souza[1], Lucas Vaz Peres[1], Rodrigo da Silva[1], Damaris Kirsch Pinheiro[2], Hassan Bencherif[3], Francisco Raimundo da Silva[4], and Maria Paulete Pereira Martins[4]

[1]UFOPA, Brazil, [2]UFSM, Brazil, [3]LACy, France, [4]INPE, Brazil

[SAT1_4] 12:06-12:08

Comparison of Dobson and Brewer Retrieved Total Ozone Column using Different Ozone Absorption Cross Sections in the Retrieval Algorithm

Karl Voglmeier, Ulf Köhler, Voltaire A. Velazco, and Wolfgang Steinbrecht

Deutscher Wetterdienst, Germany

[SAT1_5] 12:08-12:10

Intercomparison of Total Ozone Column (TOC) Measurements in Hohenpeißenberg from Three Spectrometer Systems: Dobson, Brewer and BTS Solar

Voltaire A. Velazco[1], Ulf Köhler[1], Ralf Zuber[2], Wolfgang Steinbrecht[1], and Karl Voglmeier[1]

[1]Deutscher Wetterdienst, Germany, [2]Gigahertz Optik GmbH, Germany

[SAT1_6] 12:10-12:12

Umkehr Ozone Profile Analysis and Satellite Validation for Selected Brewer and Dobson Spectrophotometers

Konstantinos Fragkos[1,3], Koji Miyagawa[2], Panagiotis Fountoukidis[1], MariLiza Koukouli[1], Katerina Garane[1], Dimitris Balis[1], Irina Petropavlovskikh[2], and Alkiviadis Bais[1]

[1]Aritotle University of Thessaloniki, Greece, [2]NOAA, USA, [3]INOE 2000, Romania

[SAT1_7] 12:12-12:14

Consistency of Brewer and Dobson Total Column Ozone Measurements of the World's Longest Time Series at Arosa/Davos, Switzerland

Julian Gröbner[1], Herbert Schill[1], Luca Egli[1], and René Stübi[2]
[1]PMOD/WRC, Switzerland, [2]MeteoSwiss, Switzerland

[SAT1_8] 12:14-12:16

Advanced NO_2 Retrieval Technique for the Brewer Spectrophotometer Long-Term Changes over Rome and «Lockdown Effect» over Aosta, Italy

Henri Diémoz[1], Anna Maria Siani[2], Stefano Casadio[3], Anna Maria Iannarelli[3], Giuseppe Rocco Casale[2], Francesca Frasca[2], Vladimir Savastiouk[4], Alexander Cede[5,6], Martin Tiefengraber[5,7], and Moritz Müller[5]
[1]ARPA Valle d'Aosta, Italy, [2]Sapienza University of Rome, Italy, [3]Serco Italia, Italy, [4]International Ozone Services Inc., Canada, [5]LuftBlick, Austria, [6]NASA, USA, [7]University of Innsbruck, Austria

[SAT1_9] 12:16-12:18

Harmonized Retrieval of Middle Atmospheric Ozone from Two Microwave Radiometers in Switzerland

Eric Sauvageat[1], Eliane Maillard Barras[2], Klemens Hocke[1], Alexander Haefele[2], and Axel Murk[1]
[1]University of Bern, Switzerland, [2]MeteoSwiss, Switzerland

[SAT1_10] 12:18-12:20

Traceability of Total Ozone Column Measurements with the Portable Reference Spectroradiometer for Ultraviolet Radiation (QASUME)

Luca Egli, Gregor Hülsen, and Julian Gröbner
PMOD/WRC, Switzerland

[SAT1_11] 12:20-12:22

The Reevaluated Intraday Total Column Ozone Series from the Dobson Spectrophotometer No.84 Operating at Belsk (51.84N, 20.79E), Poland, since March 23, 1963

Bonawentura Rajewska-Więch, Janusz Krzyścin, and Janusz Jarosławski
Institute of Geophysics, Poland

[SAT1_12] 12:22-12:24

Comparison of Total Ozone Column and UVI Retrieved from Brewer, PANDORA and OMI at Athens, Greece during 2018-2021

Raptis Ioannis-Panagiotis[1,2], Kouklaki Dimitra[2] ,Eleftheratos Kostas[2,3], Fountoulakis Ilias[1], and Kazadzis Stelios[4,1]
[1]National Observatory of Athens, Greece, [2]National and Kapodistrian University of Athens, Greece, [3]Academy of Athens, Greece, [4]PMOD/WRC, Switzerland

[SAT1_13] 12:24-12:26

New Millimeter-Wave Spectrometer for Simultaneous Multi-Line Observations Operating at Syowa Station

Akira Mizuno[1], Taku Nakajima[1], Tomoo Nagahama[1], Daichi Tsutsumi[1], Genma Mizoguchi[1], Naoto Sekiya[2], Takuma Hayashi[2], Yoshihiro Tomikawa[3], Mitsumu K. Ejiri[3], Masaki Tsutsumi[3], and Kaoru Sato[4]
[1]Nagoya University, Japan, [2]University of Yamanashi, Japan, [3]National Institute of Polar Research, Japan, [4]The University of Tokyo, Japan

V. Program Schedule

[SAT1_15] 12:28-12:30

Continuity of the Swiss Total Ozone Column Series after Dobson Automation and the Instruments Relocation

René Stübi[1], Herbert Schill[2], Jörg Klausen[1], Eliane Maillard Barras[1], Alexander Haefele[1], Julian Gröbner[2], and Luca Egli[2]

[1]Meteoswiss, Switzerland, [2]PMOD/WRC, Switzerland

[SAT1_16] 12:30-12:32

Comparison of Total Ozone Measurements in Melbourne, Australia, Performed with a Low-Cost Microspectrometer and a Brewer MK-III

Kåre Edvardsen[1], Anders Nordli[1], Matt Tully[2], and Steve Rhodes[2]

[1]The Arctic University of Norway, Norway, [2]Bureau of Meteorology, Australia

[SAT1_17] 12:32-12:34

Comparing Lauder Total Column Ozone Retrievals from FRM4DOAS with Dobson and NIWA UV Spectrometer Retrievals

Richard Querel[1], Alex Geddes[1], Ben Liley[1], Francois Hendrick[2], Martina Friedrich[2], and Caroline Fayt[2]

[1]NIWA, New Zealand, [2]BIRA-IASB, Belgium

[SAT1_18] 12:34-12:36

Reprocessing of the RBCC-E Izaña Observatory Triad Ozone Series

Alberto Berjón[1,2], Alberto Redondas[2], Javier López-Solano[1,2], Virgilio Carreño[2], Francisco C. Parra-Rojas[2], and Sergio F. León-Luis[1,2]

[1]Tragsatec, Spain, [2]AEMET, Spain

[SAT1_19] 12:36-12:38

Total Ozone Uncertainty Model on Brewer Algorithm

Parra-Rojas F.C.[1], Redondas A.[1], Berjón A.[1,2], López-Solano J.[1,2], Carreño V.[1], and León-Luis S.F.[1,2]

[1]AEMET, Spain, [2]Tragsatec, Spain

[SAT1_20] 12:38-12:40

EUBREWNET: An Overview of Recent Advances

J. López-Solano[1,2], A. Redondas[2], J. Rimmer[3], A. Berjón[1,2], F.C. Parra-Rojas[2], V. Carreño[2], and S.F. León-Luis[1,2]

[1]Tragsatec, Spain, [2]AEMET, Spain, [3]University of Manchester, UK

[SAT1_21] 12:40-12:42

Eubrewnet Brewer Updated Algorithm, Total Ozone in Six European Stations: Sodankylä, Davos, Uccle, Thessaloniki, Madrid and Izaña

Redondas A.[1], Parra-Rojas F.C.[1], Berjón A.[2,1], López-Solano J.[2,1], Bais A.[3], Gröbner J.[4], De Bock V.[5], Karppinen T.[6], and Vilaplana JM[7]

[1]AEMET, Spain, [2]Tragsatec, Spain, [3]Aristotle University of Thessaloniki, Greece, [4]PMOD/WRC, Switzerland, [5]Royal Meteorological Institute of Belgium, Belgium, [6]Finnish Meteorological Institute, Finland, [7]National Institute for Aerospace Technology, Spain

[SAT1_22] 12:42-12:44

Comparison of the Ozone Vertical Profiles based on the Umkehr Observations by Collocated the Dobson and Brewer Spectrophotometers at Belsk, Poland, for the Period 2011-2016

Janusz Jarosławski, Janusz Krzyścin, and Bonawentura Rajewska-Więch
Polish Academy of Sciences, Poland

[SAT1_23] 12:44-12:46

Ozone Measurement Complex in Tomsk (Russia)

Arshinov M.Y., Bazhenov O.E., Belan B.D., Belan S.B., Davydov D.K., Ivlev G.A., Kharchenko O.V., Kozlov A.V., Nevzorov A.A., Nevzorov A.V., Romanovkii O.A., and Tolmachev G.N.
V.E. Zuev Institute of Atmospheric Optics SB RAS, Russia

[SAT1_24] 12:46-12:48

Brewer Spectrophotometer Internal Spectral Stray Light Correction based on Physical Principles

Vladimir Savastiouk[1] and Henri Diémoz[2]
[1]International Ozone Services Inc., Canada, [2]ARPA Valle d'Aosta, Italy

[SAT1_25] 12:48-12:50

Implementation of the Comorian Observatory for Atmospheric Sciences: Ozone and UV Radiation Measurements

Mohamed Toihir Abdoulwahab[1], Hassan Bencherif[2], Thierry Portafaix[2], Gerrie Coetzee[3], Sivakumar Venkataraman[4], and Kevin Lamy[2]
[1]Agence Nationale de l'Aviation Civile et de la Météorologie, France, [2]LACy, France, [3]South African Weather Service, South Africa, [4]University of KwaZulu-Natal, South Africa

[SAT1_26] 12:50-12:52

Ozone Monitoring by NDACC FTIR Spectrometry: Improved Retrieval Strategy and Impact of Instrumental Line Shape Characterisation

Omaira E. García[1], Esther Sanromá[1,3], Matthias Schneider[2], Frank Hase[2], Sergio F. León-Luis[1,4], Thomas Blumenstock[2], Eliezer Sepúlveda[1], Alberto Redondas[1], Virgilio Carreño[1], Carlos Torres[1], and Natalia Prats[1]
[1]AEMET, Spain, [2]Karlsruhe Institute of Technology, Germany, [3](Now) Employment Observatory of the Canary Islands, Spain, [4](Now) Tragsatec, Spain

[SAT1_27] 12:52-12:54

Ozone Observation of Dobson Spectrophotometer in Yonsei University

Jaemin Hong, Songkang Kim, Jhoon Kim, and Ja-Ho Koo
Yonsei University, Republic of Korea

[SAT1_28] 12:54-12:56

Machine-Learning-Based Satellite-Corrected Global Stratospheric Ozone Profile Dataset from a Chemical Transport Model

Sandip Dhomse[1], Carlo Arosio[2], Mark Weber[2], and Martyn Chipperfield[1]
[1]University of Leeds, UK, [2]University of Bremen, Germany

V. Program Schedule

[SAT1_29] 12:56-12:58

Homogeneity of Total Ozone Data from Three Reanalyses

Peter Krizan, Michal Kozubek, and Jan Lastovicka

Institute of the Atmospheric Physics of the Czech Academy of Science, Czech Republic

[SAT1_30] 12:58-13:00

Reanalysis of the Long-Term Atmospheric Composition Datasets from the JPL Lidars at Table Mountain Facility, California, and Mauna Loa Observatory, Hawaii

Thierry Leblanc, Mark Brewer, Fernando Chouza, Darryl Koon, and Patrick Wang

NASA, USA

[SAT1_31] 13:00-13:02

Assessment of Interannual Variability of the Ozone Column in the Upper Troposphere and Lower Stratosphere between Different Reanalysis of the S-Rip

Mateus Dias Nunes[1], Simone M. Sievert. C. Coelho[1], Paulo Yoshio Kubota[1], and Michaela I. Hegglin[2]

[1]INPE, Brazil, [2]University of Reading, UK

[SAT1_32] 13:02-13:04

Measurements of Ozone Columns by IKFS-2 Spectrometer aboard Meteor-M N2 Satellite

Yana Virolainen, Alexander Polyakov, Georgy Nerobelov, and Yury Timofeyev

St. Petersburg State University, Russia

[POSTER 7]

Date / Time (Sat.) October 9, 2021 / 13:20-14:30 (UTC)

Session Code SAT2

Session Chair Sang Seo Park

[SAT2_1] 13:20-13:22

The Stratospheric Aerosol and Gas Experiment (SAGE) IV Pathfinder

Robert Damadeo, Charles Hill, and Michael Obland
NASA, USA

[SAT2_2] 13:22-13:24

Using Measurements from the Disturbance Monitoring Package in SAGE III/ISS Data Processing

Marsha LaRosee[1], David Huber[3], Charles Hill[2], Kevin Leavor[1], Amy Rowell[2], Andrew Peterson[2], Robert Damadeo[2], Robert Manion[1], and David Flittner[2]
[1]Science Systems and Applications, Inc., USA, [2]NASA, USA, [3]NOAA, USA

[SAT2_3] 13:24-13:26

Diurnal Scaling Factors for SAGE III/ISS: Using a 3D Model to Account for Time of Day Differences between Observing Platforms

Sarah Strode[1,2], Ghassan Taha[1,2], Luke Oman[1], and Mark Schoeberl[3]
[1]NASA, USA, [2]USRA, USA, [3]Science and Technology Corporation, USA

[SAT2_4] 13:26-13:28

Total Ozone Columns from Multiple Satellite Sensors Homogeneously Validated against Global Ground-Based Measurements

Katerina Garane[1], Maria Elissavet Koukouli[1], Christophe Lerot[2], Tijl Verhoelst[2], Klaus-Peter Heue[3], PieterValks[3], JonasVlietinck[2], Fabian Romahn[3], Walter Zimmer[3], Dimitris Balis[1], Jean-Christopher Lambert[2], Michel van Roozendael[2], Diego Loyola[3], and Christos Zerefos[4]
[1]Aristotle University of Thessaloniki, Greece, [2]BIRA-IASB, Belgium, [3]DLR, Germany, [4]Academy of Athens, Greece

[SAT2_5] 13:28-13:30

Measurements of Ozone and Related Species from Space using the Atmospheric Chemistry Experiment (ACE)

Kaley A. Walker, Patrick E. Sheese, and Jiansheng Zou
University of Toronto, Canada

[SAT2_6] 13:30-13:32

Error Budget Assessment for OMPS Limb Ozone Retrieval

Carlo Arosio[1], Alexei Rozanov[1], Mark Weber[1], Victor Gorshelev[1], Natalya Kramarova[2], Chris Roth[3], and John P. Burrows[1]
[1]University of Bremen, Germany, [2]NASA, USA, [3]University of Saskatchewan, Canada

V. Program Schedule

[SAT2_7] 13:32-13:34

Assessment of AIRS, IASI, and CrIS Ozone Vertical Retrievals over the Central Himalaya

Prajjwal Rawat[1,4], Manish Naja[1], Evan Fishbein[2], R. Kumar[3], P. Bhardwaj[3], S. N. Tiwari[4], S. Venkataramani[5], and S. Lal[5]

[1]Aryabhatta Research Institute of Observational Sciences, India, [2]NASA, USA, [3]NCAR, USA, [4]Deen Dayal Upadhyaya Gorakhpur University, India, [5]Physical Research Laboratory, India

[SAT2_8] 13:34-13:36

Continuing Validation of Stratospheric Ozone Profiles from the EUMETSAT Atmospheric Composition SAF

Peggy Achtert and Wolfgang Steinbrecht

Deutscher Wetterdienst Meteorologisches Observatorium, Germany

[SAT2_9] 13:36-13:38

Tropical Tropospheric Ozone from Sentinel-5P TROPOMI Data: Improvements and Synergies of the CHORA and CHOVA Cloud Related Ozone Retrievals

Kai-Uwe Eichmann, Swathi M. Satheesan, Mark Weber, and John P. Burrows

University of Bremen, Germany

[SAT2_11] 13:40-13:42

Assessment of Satellite Total Ozone Retrieval Errors in Polar Regions

David P. Haffner[1,2], Pawan K. Bhartia[2], Natalya A. Kramarova[2], Richard D. McPeters[2], Ramaswamy Tiruchirapalli[1,2], Gordon J. Labow[1,2], Jerald R. Ziemke[3,2], and Stacey M. Frith[1,2]

[1]Science Systems and Applications, Inc., USA, [2]NASA, USA, [3]Morgan State University, USA

[SAT2_12] 13:42-13:44

Early Results of Retrieving BrO from the Geostationary Environment Monitoring Spectrometer

Heesung Chong[1], Jhoon Kim[1], Gonzalo González Abad[2], Christopher Chan Miller[2], Rafael P. Fernandez[3,4], Alfonso Sáiz-López[3], Caroline Nowlan[2], Xiong Liu[2], Kelly Chance[2], Dha Hyun Ahn[1], Hyeji Cha[1], Ja-Ho Koo[1], and Sang Seo Park[5]

[1]Yonsei University, Republic of Korea, [2]Harvard–Smithsonian Center for Astrophysics, USA, [3]Institute of Physical Chemistry Rocasolano, Spain, [4]National Scientific and Technical Research Council (CONICET), Argentina, [5]UNIST, Republic of Korea

[SAT2_13] 13:44-13:46

Validations of GEMS Formaldehyde Retrieval Algorithm during IOT

Gitaek Lee[1], Rokjin J. Park[1], Hyeong-Ahn Kwon[2], Seunga Shin[1], Michel Van Roozendael[3], and Francois Hendrick[3]

[1]Seoul National University, Republic of Korea, [2]Harvard-Smithsonian Center for Astrophysics, USA, [3]BIRA-IASB, Belgium

[SAT2_15] 13:48-13:50

Validations of Ozone Profiles from Satellite Remote Sensings using Ozonesonde Measurements over the Jang Bogo Station, Antarctica

Hana Lee[1], Taejin Choi[2], Dha Hyun Ahn[1], Seong-Joong Kim[2], Jaeil Yoo[2], Natalya Alekseyevna Kramarova[3], Juseon Bak[4], Jhoon Kim[1], and Ja-Ho Koo[1]

[1]Yonsei University, Republic of Korea, [2]KOPRI, Republic of Korea, [3]NASA, USA, [4]Pusan National University, Republic of Korea

[SAT2_16] 13:50-13:52

Southern Hemisphere Additional Ozonesondes (SHADOZ) Project Update: 2021 Archive, Outreach and Data Quality Assurance Activities

Debra E. Kollonige[1], Anne M. Thompson[2], and Ryan M. Stauffer[2]

[1]Science Systems and Applications, Inc., USA, [2]NASA, USA

[SAT2_17] 13:52-13:54

Long Term Ozonesonde Observations at Sodankylä

Rigel Kivi[1], Pauli Heikkinen[1], Kenneth Nilsen[2], Roeland Van Malderen[3], Deniz Poyraz[3], Ryan M. Stauffer[4], and Herman G. J. Smit[5]

[1]Finnish Meteorological Institute, Finland, [2]University of Oulu, Finland, [3]Royal Meteorological Institute of Belgium, Belgium, [4]NASA, USA, [5]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany

[SAT2_18] 13:54-13:56

SHADOZ Watukosek Station Update: Comparisons between (1998-2013; 2016-2020) Ozonesonde and Satellite Vertical Profiles

Ninong Komala[1], Habib Khirzin Al-Ghazali[1], Laily Fajarwati[1], Dian Yudha Risdiyanto[1], Dwinanda Puspitasari Harahap[1], Sigit Purnomo[1], and Anne Thompson[2]

[1]National Institute of Aeronautics and Space, Indonesia, [2]NASA, USA

[SAT2_19] 13:56-13:58

Evaluating Long-Term Changes in Atmospheric Ozone

David W. Tarasick[1], Herman G.J. Smit[2], Anne M. Thompson[3], Gary A. Morris[4], Jacquelyn C. Witte[5], Jonathan Davies[1], Tatsumi Nakano[6], Roeland Van Malderen[7], Ryan M. Stauffer[3], Bryan J. Johnson[8], René Stübi[9], Samuel J. Oltmans[8], and Holger Vömel[5]

[1]Environment and Climate Change Canada, Canada, [2]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany, [3]NASA, USA, [4]St. Edward's University, USA, [5]NCAR, USA, [6]JMA, Japan, [7]Royal Meteorological Institute of Belgium, Belgium, [8]NOAA, USA, [9]MeteoSwiss, Switzerland

V. Program Schedule

[SAT2_20] 13:58-14:00

ASOPOS (Assessment of Standard Operating Procedures (SOPs) for OzoneSondes) 2.0: Ozonesonde Measurement Principles and Best Operational Practices

Debra E. Kollonige[1,2], Anne M. Thompson[2], Herman G.J. Smit[3], Ryan M. Stauffer[2], David W. Tarasick[4], Bryan J. Johnson[5], Roeland Van Malderen[6], Holger Vömel[7], Peter von der Gathen[8], Gary Morris[9], and Richard Querel[10]

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[SAT2_21] 14:00-14:02

Antarctic Ozone Depletion Measured by Davis Ozonesondes 2003-2020

Matt Tully[1] and Andrew Klekociuk[2]

[1]Bureau of Meteorology, Australia, [2]Australian Antarctic Division, Australia

[SAT2_22] 14:02-14:04

Repeated Ozone Vertical Profiles over Cyprus using Adapted Ozonesondes

Maximilien Desservettaz[1], Christos Keleshis[1], Christos Constantinides[1], Panayiota Antoniou[1], Yunsong Liu[1], Mihalis Vrekoussis[1], Greg Kok[2], Jonathan Harnetiaux[2], and Jean Sciare[1]

[1]The Cyprus Institute, Cyprus, [2]Environmental Science, USA

[SAT2_23] 14:04-14:06

New Insights from the Jülich Ozone-Sonde Intercomparison Experiments: Calibration Functions Traceable to One Ozone Reference Instrument

Herman G.J. Smit[1], Deniz Poyraz[2], Roeland Van Malderen[2], David W. Tarasick[3], Holger Voemel[4], Bryan J. Johnson[5], Jonathan Davies[3], Rene Stuebi[6], Ryan M. Stauffer[7], Anne M. Thompson[7], Marc Allaart[8], Gary Morris[9], and Tatsumi Nakano[10]

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[SAT2_24] 14:06-14:08

50 Years of Balloon-Borne Ozone Profile Measurements at Uccle, Belgium

Hugo De Backer[1], Roeland Van Malderen[1], Dirk De Muer[1], Deniz Poyraz[1], Willem W. Verstraeten[1], Veerle De Bock[1], Andy Delcloo[1], Alexander Mangold[1], Quentin Laffineur[1], Marc Allaart[2], Frans Fierens[3], and Valérie Thouret[4]

[1]Royal Meteorological Institute of Belgium, Belgium, [2]KNMI, The Netherlands, [3]Belgian Interregional Environment Agency (IRCEL - CELINE), Belgium, [4]Université de Toulouse, France

[SAT2_25] 14:08-14:10

Homogenisation of the Observation de Haute Provence ECC Ozonesonde Data Record: Comparison with Lidar and Satellite Observation

G. Ancellet[1], S. Godin-Beekmann[1], R. Bodichon[5], A. Pazmiño[1], H.G.J. Smit[2], R.M. Stauffer[3], and R. Van Malderen[4]

[1]LATMOS, France, [2]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany, [3]NASA, USA, [4]Royal Meteorological Institute of Belgium, Belgium, [5]IPSL, Sorbonne Université-UVSQ-CNRS/INSU, France

[SAT2_26] 14:10-14:12

Update on Lauder Ozonesonde Homogenisation

Richard Querel[1], Hisako Shiona[1], Alex Geddes[1], Deniz Poyraz[2], and Roeland Van Malderen[2]

[1]NIWA, New Zealand, [2]Royal Meteorological Institute of Belgium, Belgium

[SAT2_27] 14:12-14:14

The Cell Temperature of ECC Ozonesondes in Relation to the Measured Pump Pemperature: Impact of Freezing and Boiling Effects Observed during JOSIE

Deniz Poyraz[1], Herman G.J. Smit[2], Roeland Van Malderen[1], Tatsumi Nakano[3], and René Stuebi[4]

[1]Royal Meteorological Institute of Belgium, Belgium, [2]Institute of Energy and Climate Research: Troposphere (IEK-8), Germany, [3]JMA, Japan, [4]MeteoSwiss, Switzerland

[SAT2_28] 14:14-14:16

South Pole Station Ozonesonde 35-Year Record 1986-2020: Altitude Layer Metrics and Potential Recovery Layers Observed

Bryan Johnson[1], I. Petropavlovskikh[1,2], P. Cullis[1,2], and J. Booth[1]

[1]NOAA, USA, [2]CIRES, USA

[SAT2_30] 14:18-14:20

Development and Testing of a Novel SO_2 Sonde

Paul J. Walter[1], James H. Flynn[2], Sergio Alvarez[2], Jonathan Harnetiaux[3], Elizabth Klovenski[2], Alex Kotsakis[4], Gary A. Morris[1], Mark D. Spychala[5], and Subin Yoon[2]

[1]St. Edward's University, USA, [2]University of Houston, USA, [3]En-Sci, USA, [4]NASA, USA, [5]Army Research Laboratory, USA

[SAT2_31] 14:20-14:22

The Highest UV Index of the Marambio Station UV Time Series (2000-2020) Was Measured in November and December 2020

Kaisa Lakkala[1], Ricardo Sanchez[2], Margit Aun[3], Jukka Kujanpää[1], Germar Bernhard[4], Rigel Kivi[1], Leif Backman[1] , Outi Meinander[1], Veijo Aaltonen[1], Eija Asmi[1], Antti Arola[1], Gustavo Copes[2], Germán Fogwill[2], Bjorn Johnsen[6], Alberto Redondas[5], Victoria Sofieva

[1]Finnish Meteorological Institute, Finland, [2]National Meteorological Service, Argentina, [3]University of Tartu, Estonia, [4]Biospherical Instruments, Inc, USA, [5]AEMET, Spain, [6]Norwegian Radiation and Nuclear Safety Authority, Norway

[SAT2_32] 14:22-14:24

Comparison of SAGE III/ISS NO_2 Measurements with Ground-Based Observations from Lauder, NZ

David E. Flittner[1], Kimberlee Dubé[2], and Richard Querel[3]

[1]NASA, USA, [2]University of Saskatchewan, Canada, [3]NIWA, New Zealand

[POSTER 8]

Date / Time (Sat.) October 9, 2021 / 14:40-15:05 (UTC)

Session Code SAT3

Session Chair Stefan Reis, Kaley Walker

[SAT3_1] 14:40-14:42

Estimations of UV Index and Biological Dose Rates in Asia for GEMS Measurements

Hana Lee[1], Jhoon Kim[1], Ukkyo Jeong[2,3], Won-Jin Lee[4], and Dongwon Lee[4]

[1]Yonsei University, Republic of Korea, [2]NASA, USA, [3]University of Maryland, USA, [4]National Institute of Environmental Research, Republic of Korea

[SAT3_2] 14:42-14:44

Estimation of UV Index over South Korea using Empirical Models, Random Forest, and Deep Neural Network

Jaemin Kim and Yun Gon Lee

Chungnam National University, Republic of Korea

[SAT3_3] 14:44-14:46

Changes in 2005-2020 Aura OMI Total Column Ozone and Ultra-Violet Index (UVI) over Indonesia and Their Connections to Regional Cloud Cover

Ninong Komala

National Institute of Aeronautics and Space, Indonesia

[SAT3_5] 14:48-14:50

Assessment of Impact of Tropospheric Ozone on Forest Site of Delhi, India by the Use of Mathematical Models

Pallavi Saxena[1], Monojit Chakraborty[2], Saurabh Sonwani[1], and Tushar Gautam[1]

[1]University of Delhi, India, [2]LEA Associates South Asia Pvt. Ltd., India

[SAT3_6] 14:50-14:52

The Relationship between Ozone and Cardiorespiratory Mortality for Different Age Groups for Attica Region

Lida Dimitriadou[1,2], Kostas Eleftheratos[2], Christos Zerefos[1,3,4,5], and Panagiotis Nastos[2]

[1]Academy of Athens, Greece, [2]National and Kapodistrian University of Athens, Greece, [3]Academy of Athens, Greece, [4]Navarino Environmental Observatory, Greece, [5]Mariolopoulos-Kanaginis Foundation for the Environmental Sciences, Greece

[SAT3_7] 14:52-14:54

The SOUVENIR Project (Solar UV Extensive Network for Information and Reporting)

G. Fasano[1,2], H. Diémoz[1], A. M. Siani[2], L. Scacchi[3], M. Depaoli[4], M. Zublena[1], and I. Fountoulakis[1]

[1]ARPA Valle d'Aosta, Italy, [2]Sapienza University of Rome, Italy, [3]University of the Aosta Valley, Italy, [4]Consultant Dermatologist

V. Program Schedule

[SAT3_8] 14:54-14:56

Comparison of Global UV Spectral Irradiance Measurements from a BTS Array Spectroradiometer versus a Double Brewer MK-III Spectrometer

C. González[1], J. M. Vilaplana[1], J. A. Bogeat[1], and A. Serrano[2]
[1]National Institute for Aerospace Technology, Spain, [2]Universidad de Extremadura, Spain

[SAT3_9] 14:56-14:58

Modelling Spectral UV Radiation at Marambio Base, Antarctic Peninsula Region, using Artificial Neural Networks

Klára Čížková[1,2], Kamil Láska[2], Ladislav Metelka[1], and Martin Staněk[1]
[1]Czech Hydrometeorological Institute, Czech Republic, [2]Masaryk University, Czech Republic

[SAT3_10] 14:58-15:00

Variation of Stratosferic Ozone Concentration and Genotoxic Effects of Solar UV Radiation in Southern Brazil

Bruna Cogo Borin[1,2], Maurício Beux dos Santos[1,2], James Eduardo Lago Londero[1,2], and André Passaglia Schuch[1,2]
[1]UFSM, Brazil, [2]Southern Regional Space Research Center, CRS/INPE-MCTIC, Brazil

[SAT3_11] 15:00-15:02

Climatology of UV Index in South Region of Brazil

Bibiana Culau Lopes[1], Damaris Kirsch Pinheiro[1], Hassan Bencherif[2], Thierry Portafaix[2], and Nathalie Tissot Boiaski[1]
[1]UFSM, Brazil, [2]LACy, France

[SAT3_12] 15:02-15:04

UV Index Behavior during Events of Influence of Antarctic Ozone Hole in Southern Region of Brazil

Bibiana Culau Lopes[1], Gabriela Dornelles Bittencourt[1], Damaris Kirsch Pinheiro[1], Hassan Bencherif[2], and Lucas Vaz Peres[3]
[1]UFSM, Brazil, [2]LACy, France, [3]UFOPA, Brazil

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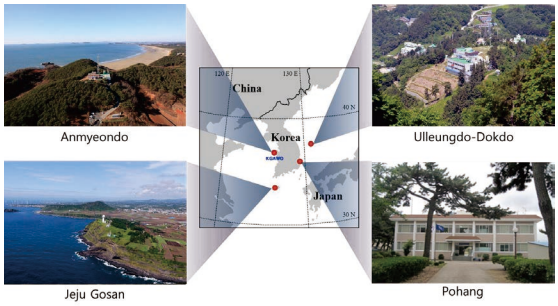
National Institute of Meteorological Sciences

Korea Meteorological Administration

Global Atmosphere Watch Team / Innovative Meteorological Research Department

- Korean GAW activities and related research
- Comprehensive monitoring of Asian dust and haze
- Observation and Analysis study on atmospheric compositions (A total of 36 atmospheric constituents, including greenhouse gases, reactive gases, aerosols, and stratospheric ozone/UV)

[KMA GAW stations]



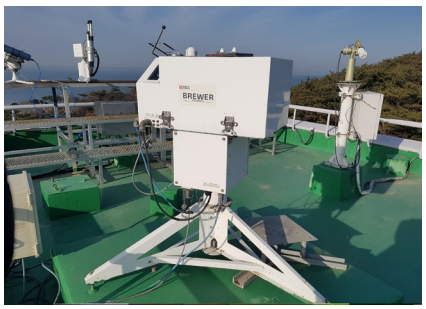
< Atmospheric species monitored in Korea >

	Greenhouse Gases	Reactive Gases	Aerosols	Stratospheric O_3 / Ultra Violet	Atmospheric Radiation	Atmospheric Deposition
Anmyeondo	CO_2, CH_4 N_2O SF_6 CFCs	O_3 CO NOx SO_2	PM_{10} Size distribution(0.01~20 ㎛) Optical properties [1] Water soluble Ions [2] Elements [3]	Total Column O_3 UV-A UV-B	Solar Terrestrial	Acidity Conductivity Precipitation ion components
Jeju Gosan	CO_2, CH_4 N_2O SF_6		PM_{10} Size distribution(0.5~20 ㎛) Number concentration(0.01~3 ㎛) Optical Depth		Solar	
Ulleungdo		CO	PM_{10} Size distribution(0.5~20 ㎛) Optical Depth	UV-A UV-B		
Dokdo	CO_2, CH_4					
Pohang				O_3 profile UV-A UV-B		

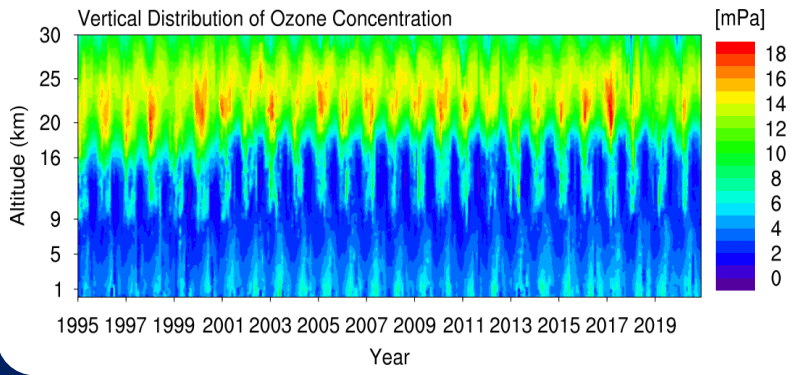
1) AOD, Scattering coefficient, Absorption coefficient, Vertical poperties
2) F^-, Cl^-, NO_3^-, SO_4^{2-}, Na^+, NH_4^+, K^+, Mg^{2+}, Ca^{2+}
3) Al, Ca, Fe, K, Mg, Na, S, Ti, Mn, Zn, Cu, V, Cr, Co, Ba, Pb, Ni

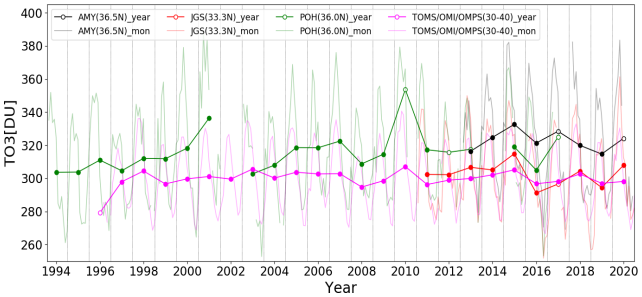
Stratospheric Ozone observation

- The analysis of stratospheric ozone is performed through observation of the vertical ozone (obtained from ozonesonde at Pohang) and the total column ozone (obtained from Brewer spectrophotometer at Anmyeondo and Jeju-Gosan)
- Vertical ozone has been observed in Pohang since 1995, and the total amount of ozone has been observed in Anmyeondo and Jeju-Gosan since 2013 and 2011, respectively.



- Observation of total column ozone was also conducted in Pohang since 1995, but was stopped in 2017
- An ozonesonde is launched once a week to monitor the vertical distribution of ozone up to an altitude of 30 km



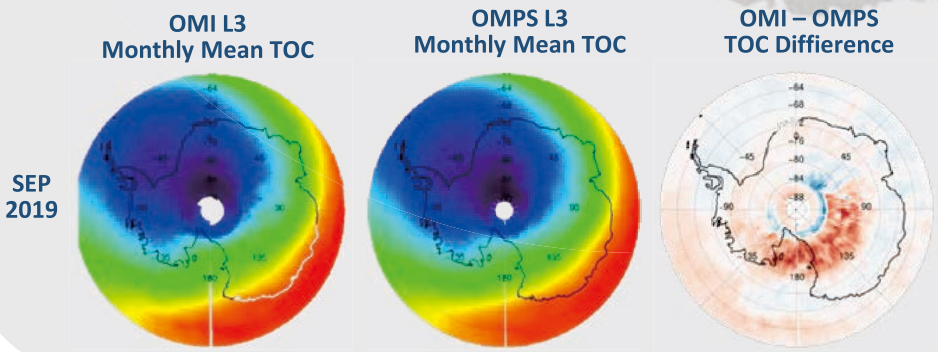


Assessment for the climate and environment change in Antarctica and its global influence

In Antarctica, rapid warming has been appreciable only over its western part, in contrast with the rapid arctic warming at the Pan-Arctic scale. Despite the importance of Antarctic warming that is associated with ice sheet disintegration and sea level rise, the reason why there is a significant asymmetry in climate responses remains uncertain. Synthetic analyses through multiple data sources, such as modern in-situ observation data, observation model–combined reanalysis data, reconstructed data using paleo-proxy records, multimodel simulation data, and self-generated sensitivity simulation data with climate models, the Korea Polar Research Institute discovered the cause of the west-east climate asymmetry that originates from the harmony of the atmosphere–ocean coupled feedback off West Antarctica and the Antarctic terrain, as an internal mode.

Continuous observations of the physical properties of aerosol particles (e.g., number concentration, size distribution, and Cloud condensation nuclei concentration) have been carried out since March 2009 at King Sejong Station in the Antarctic Peninsula.

We have recorded total amount of ozone concentrations since 1998 to the present at King Sejong Station and since 2014 at Jang Bogo Station. From theses observation and satellite records, we detected the slow recovery of ozone during springtime that might be related to steadily reducing ozone depleting substances.

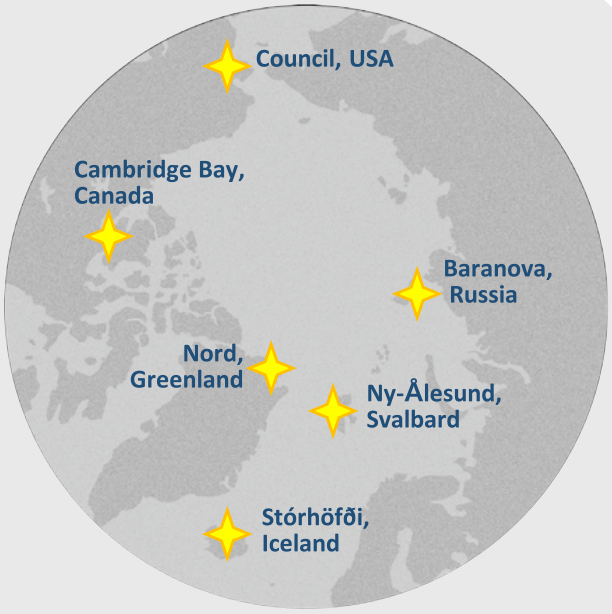


Total ozone column (TOC) data from KOPRI's King Sejong and Jang Bogo Antarctic Research stations were used to evaluate satellite derived TOC (*Remote Sens.* 2021, *13*(8), 1594; https://doi.org/10.3390/rs13081594)

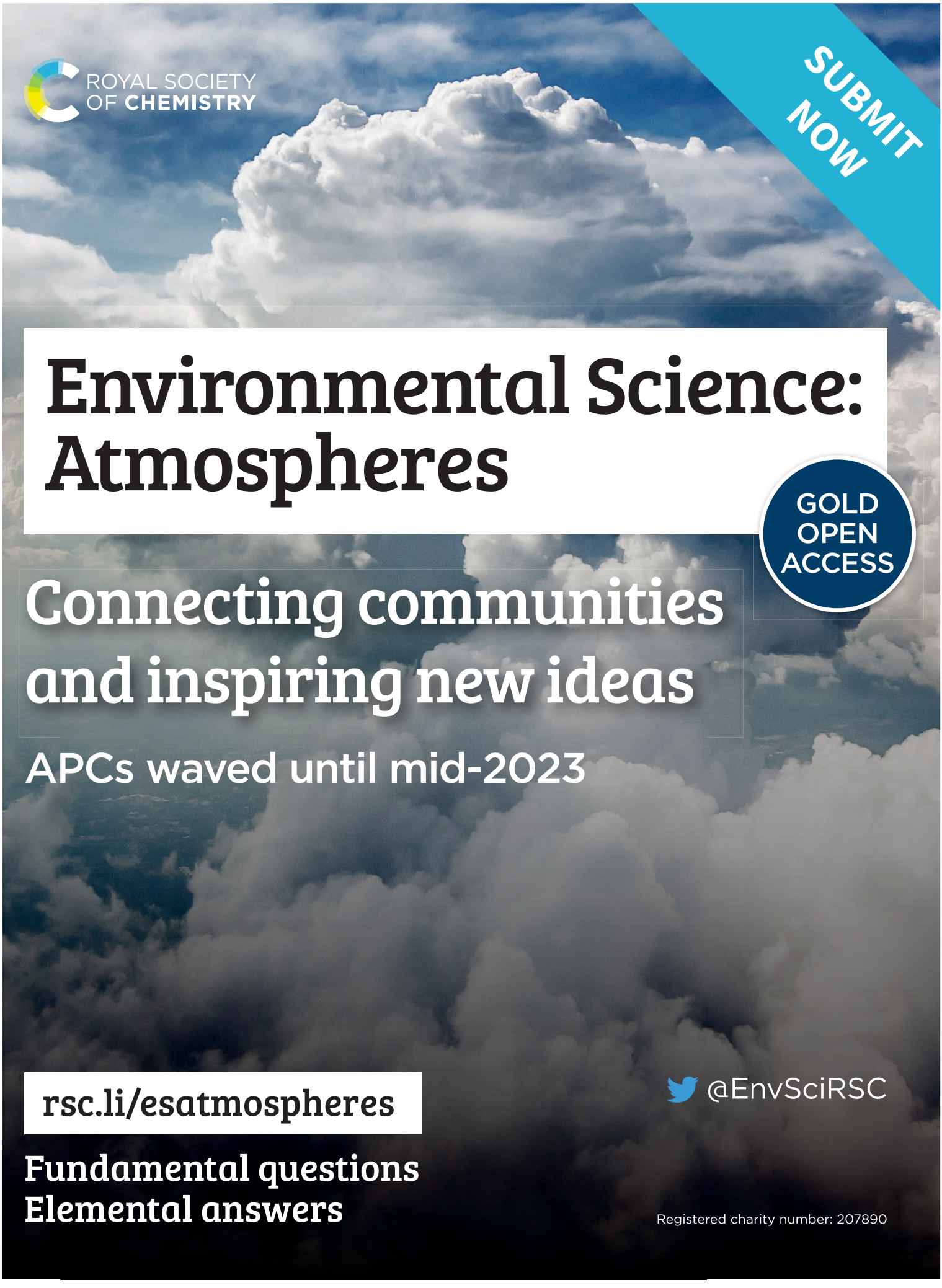
Circum-Arctic Environmental Changes: Monitoring, Assessment, Projection and Adaptation Strategy Development(CA-MAP)

The rapid climate change in the Arctic has various impacts on the global climate as well as the midlatitudes. As part of the project to detect rapidly changing environments in the Arctic, the project team is conducting continuous permafrost environment research based on six observation nodes.

Under the CA-MAP project supported by Korean Government(MSIT), KOPRI scientists are collaborating with numerous domestic and international researchers in the field of permafrost climate monitoring and assessments, long term ecological change, atmospheric composition monitoring, etc.



Arctic permafrost observation nodes operated by KOPRI : KOPRI has collaborated with Arctic Council countries to develop research program for each site.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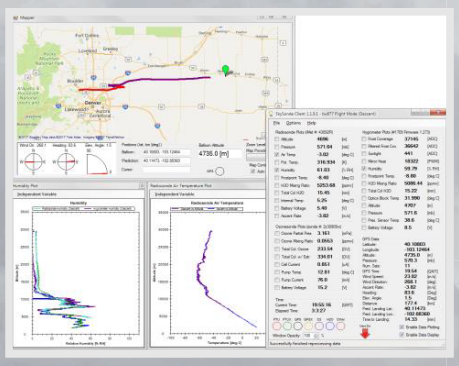

Skysonde Software

- All iMet-4 Radiosondes are fully compatible with NOAA's open-source software, Skysonde
- Coming Soon: iMet-X4; UAV sensor package with multiple atmospheric variable measurement options including O3/NO2

Contact InterMet Systems:
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