

The 36th Quadrennial Ozone Symposium 2024

14-19 July 2024, University of Colorado Boulder & Online

Sunday, July 14

** All times are MST.*

Time	Topic
16:00	Registration
17:00	Ice Breaker
20:00	Adjourn

Monday, July 15

** All times are MST; **Speakers:** please leave 2 min (4 min for keynotes & invited) at the end of your slot for questions.*

Time	Topic	Speakers
1. Stratospheric Ozone Science		
<i>Session 1 Convenors: Birgit Hassler, Hideaki Nakajima, Andrea, Kaley, Ulrike Langematz, Corinne Vigouroux</i>		
7:30	Registration	
8:30	Opening Ceremony	
8:42	Polar Ozone Recovery: Challenges and Uncertainties in Model Projections (keynote)	Douglas Kinnison
9:06	Are trends in total ozone consistent with stratospheric ozone column trends?	Mark Weber
9:18	Ozone trends and exceptional events as seen by the IASI remote sensors	Cathy Clerbaux
9:30	CCMI-2022 Ref-D1 and Ref-D2 stratospheric ozone trends and natural variability	Kleareti Tourpali
9:42	Uncertainties in recent tropical stratospheric and tropospheric ozone changes restrict our understanding of future total column ozone change	Sean Davis
9:54	Sensitivity of Interannual and Long-term Changes in Stratospheric Ozone to Predictors Time Series and Trend Model	Oindrila Nath
10:06	Coffee	
10:36	The 2026 UNEP/WMO Scientific Assessment of Ozone Depletion (invited)	David W. Fahey
11:00	Beyond self-healing: Stabilizing and destabilizing photochemical adjustment of the ozone layer	Aaron Match
11:12	Statistical analysis of the middle and upper atmospheric ozone variations during solar eclipse using AURA/MLS data	Tianliang Yang
11:24	Lunch	

13:00	Unusual Times for the Antarctic Ozone Hole: Interpreting Recovery and Exceptional Events (invited)	Susan Solomon
13:24	Variability of a thirty-year observations of total ozone from a Brewer spectrophotometer over Punta Arenas, Chile (53.2S,70.9W)	Claudio Casaccia
13:36	Antarctic ozone depletion measured by Davis ozonesondes 2003-2023	Matt Tully
13:48	Current trends in the zonal distribution of ozone in Antarctica based on satellite measurements	Gennadii Milinevskiy
14:00	Evolution of Antarctic Ozone, HCl, HNO ₃ , ClO, and Related Species from MLS and WACCM (2004–2023)	Michael J Schwartz
14:12	Antarctic ozone recovery and the vagaries of the polar vortex	Krzysztof Wargan
14:24	Ozone trends in the Arctic from FTIR, ozonesonde, and satellite measurements	Robin Björklund
14:36	Is ozone recovering in Polar Regions during springtime?	Andrea Pazmino
14:48	Investigation of zonal asymmetries in stratospheric ozone trends at northern high latitudes using satellite limb observations and CTM simulations	Carlo Arosio
15:00	Coffee & Posters (1. Stratospheric Ozone Science, 2. Tropospheric Ozone Science, 3. Ozone, Climate, and Meteorology)	
16:00	Quantifying Stratospheric Ozone Recovery using the Integrated Ozone Depletion Metric	Martyn Chipperfield
16:12	Sensitivity of ozone return dates to shared socioeconomic pathway in CMIP6 models	James Keeble
16:24	Impacts of very short lived chlorinated species on halogen budget and stratospheric ozone over the recent past	Ewa Bednarz
16:36	The Impact of Atmospheric Dynamics and Anthropogenic Very Short-Lived Chlorine Species on the Recovery of Northern Hemispheric Extra-Polar Ozone	Laura McBride
16:48	Dependence of Arctic column ozone on future ODSs and GHGs in the variability of 500-ensemble members of MIROC3.2- and MIROC5-CCMs and implications for future Arctic ozone (remote)	Hideharu Akiyoshi
17:00	Posters (1. Stratospheric Ozone Science, 2. Tropospheric Ozone Science, 3. Ozone, Climate, and Meteorology)	
19:00	Adjourn	

Tuesday, July 16

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Time	Topic	Speakers
1. Stratospheric Ozone Science		
Session 1 Convenors: Birgit Hassler, Hideaki Nakajima, Andrea, Kaley, Ulrike Langematz, Corinne Vigouroux		

7:30	Registration	
8:30	The fast conversion to sulfate aerosols in the Hunga plume as seen from satellites (invited)	Bernard Legras
8:54	Hunga volcano: ozone global impact two years after the eruption	Diego Loyola
9:06	Rapid ozone depletion after humidification of the stratosphere by the Hunga Tonga Eruption (remote)	Stephanie Evan
9:18	The chemical effect of increased water vapor from the Hunga Tonga-Hunga Ha'apai eruption on the Antarctic ozone hole (remote)	Ingo Wohltmann
9:30	Stratospheric chlorine processing after the unprecedented Hunga Tonga eruption	Jun Zhang
9:42	Simulating the Volcanic Sulfate Aerosols From the 1991 Eruption of Cerro Hudson and Their Impact on the 1991 Ozone Hole	Parker Case
9:54	On the role of organics from the 2019-2020 Australian wildfires affecting stratospheric heterogeneous chemistry into 2021	Kane Stone
10:06	Coffee	
10:36	Rocket launches and satellite re-entry: Initial findings and the need for observational constraints given projections of a rapidly increasing number of low earth orbit large satellite constellations	Karen Rosenlof
10:48	Assessments (WMO2022 and CCMI-2022) of the effects of solar climate intervention on the ozone layer	Simone Tilmes
11:00	Stratospheric Aerosol Intervention and Ozone in the 2026 WMO report: what uncertainties matter, and how to narrow them?	Daniele Visioni
2. Tropospheric Ozone Science		
<i>Session 2 Convenors: Valerie Thouret, Ja-Ho Koo, Gary Morris, Corinne Vigouroux</i>		
11:12	Anomalously low free-tropospheric ozone in the NH starting 2020 during the Covid pandemic and continuing: Impact on trends (remote)	Jerald Ziemke
11:24	Lunch	
13:00	The Tropospheric Ozone Assessment Report (TOAR), Phase II (keynote)	Helen Worden
13:24	Tropospheric ozone column trends from homogenized ground-based and profile ozone datasets from the TOAR-II/HEGIFTOM Focus Working Group	Roeland Van Malderen
13:36	CEOS response to TOAR II: Assessment of distributions & trends in harmonised satellite tropospheric ozone	Daan Hubert
13:48	Quantification and evaluation of tropospheric TROPES ozone trends using CrIS, AIRS, and OMI satellite products	Elyse Pennington
14:00	Tropospheric ozone distributions and trends from IASI and CrIS	Anne Boynard
14:12	Regional measurements of ozone from IAGOS aircraft over 30 years	Hannah Clark
14:24	The Palau Atmospheric Observatory – Updates on the Ozonesonde Record and Air Mass Transport to the Tropical West Pacific Troposphere	Katrin Müller

14:36	Quantifying the effect of biomass burning on surface ozone concentrations in Southeast Asia	Tomas Liska
14:48	Analysis of an Extreme Ozone Event in Mexico City	Bernhard Rappenglueck
15:00	Coffee & Posters (1. Stratospheric Ozone Science, 2. Tropospheric Ozone Science, 3. Ozone, Climate, and Meteorology)	
16:00	Shifting patterns of global emissions and tropospheric ozone linked to human activity and natural processes using a decadal chemical reanalysis	Kazuyuki Miyazaki
16:12	Simulating Air Quality with MUSICAv0 for the Geostationary Constellation	Louisa Emmons
16:24	WRF-Chem Simulation of Integrated Carbon Monoxide Amount as A Tool to Identify Regions of Ozone Development in the Remote Troposphere: A Theoretical Investigation on the Applicability of the Measurements from Geostationary Satellites	Chuan Feng
16:36	Early Findings in Satellite-based Ozone Production Rate Estimates: Insights from Numerous NASA Atmospheric Composition Campaigns	Amir Souri
16:48	Tropospheric ozone lifetimes and coupling with the lowermost stratosphere	Michael Prather
17:00	Posters (1. Stratospheric Ozone Science, 2. Tropospheric Ozone Science, 3. Ozone, Climate, and Meteorology)	
19:00	Adjourn	

Wednesday, July 17

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Time	Topic	Speakers
2. Tropospheric Ozone		
<i>Session 2 Convenors: Valerie Thouret, Ja-Ho Koo, Gary Morris, Corinne Vigouroux</i>		
7:30	Registration	
8:30	Summertime vertical ozone profile patterns in South Korea from the ozonesonde measurements in 2021-2023	Ja-Ho Koo
8:42	Variability, trends and radiative forcing of global tropical tropospheric ozone as deduced from the long-term satellite and ground-based measurements in 2005–2020	Gopikrishnan G S
8:54	Tropical Tropospheric Ozone Trends (1990 to 2022): A Re-evaluation Based on SHADOZ and IAGOS Profiles and TOMS/OMI Columns	Anne Thompson
3. Ozone, Climate, and Meteorology		
<i>Session 3 Convenors: Raul Cordero, Ayman El Shahat Badawy, Ja-Ho Koo, Masatomo Fujiwara, Paul Newman, Sophie Godin-Beekman, Andreas Kazantzidis</i>		
9:06	The East Asian Summer Monsoon and Stratospheric Ozone	Laura Pan
9:18	The role of ozone depletion and recovery on seasonal climate predictability in the Southern Hemisphere	Amy Butler
9:30	N ₂ O as a proxy for Age of Air Trends	Kimberlee Dubé

9:42	On the timescales of the response of the Brewer-Dobson circulation to an abrupt quadrupling of CO ₂ in WACCM	Natalia Calvo
9:54	Coupling between lower stratosphere temperature, ozone and surface weather in Northeastern China: four extreme cooling events	Gennadii Milinevskiy
10:06	Coffee	
10:36	Recent past and future trends in stratospheric ozone and circulation (keynote)	Marta Abalos
11:00	Will the recovery of the Antarctic ozone hole be affected by greenhouse gases as well as halogens?	Peter von der Gathen
11:12	Relationships between variability in the stratospheric polar vortex, upper tropospheric jets, tropopause, and UTLS ozone (remote)	Gloria Manney
11:24	Lunch	
13:00	Conference activities	
19:00	Conference dinner	

Thursday, July 18

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Time	Topic	Speakers
3. Ozone, Climate, and Meteorology		
<i>Session 3 Convenors: Raul Cordero, Ayman El Shahat Badawy, Ja-Ho Koo, Masatomo Fujiwara, Paul Newman, Sophie Godin-Beekman, Andreas Kazantzidis</i>		
7:30	Registration	
8:30	Distinguishing the Direct Climate Impacts of Ozone Depleting Substances from Those Mediated by Stratospheric Ozone Depletion (invited)	Lorenzo Polvani
8:54	Are Brewer-Dobson Circulation Changes Consistent with Expectations During the Stratospheric Ozone Recovery Phase?	Eric Ray
9:06	Contribution of stratospheric ozone depletion to the recent tropical La Niña-like warming pattern	Yue Dong
9:18	The halocarbon contribution to global warming is not cancelled by the accompanying ozone depletion (remote)	Gabriel Chiodo
4. Environmental and human health effects of atmospheric ozone and UV		
<i>Session 4 Convenors: Alberto Redondas, Robyn Schofield, Julian Gröbner, Irina Petropavlovskikh</i>		
9:30	Over 30 years of spectral UV measurements in Sodankylä, Finland (remote)	Kaisa Lakkala
9:42	Twenty years of total ozone and spectral UV measurements by a Brewer spectroradiometer in Athens, Greece (remote)	Ilias Fountoulakis
9:54	Extended ozone depletion and reduced snow and ice cover – consequences for Antarctic biodiversity	Laura Revell
10:06	Coffee	

10:36	Interactive changes of ozone, UV radiation, and climate in the 21st century and implications for the environment (keynote)	Alkiviadi Bais
11:00	Ozone Deposition Measurements to a Maize Crop Canopy Using a Fast, High Precision UV Based Absorption Instrument	Reem Hannun
11:12	Progress and Needs in Quantifying the Consequences of a Modified UV-B Environment	Sasha Madronich
11:24	Lunch	
5. Ozone-depleting gases and related substances		
<i>Session 5 Convenors: Hideaki Nakajima, Kaley Walker, Robyn Schofield, Steve Montzka, Nathaniel Livesey, Paul Newman</i>		
13:00	Why emissions of some ozone-depleting substances are still increasing (Keynote)	Luke Western
13:24	Feedstock related emissions of ozone-depleting substances	Stefan Reimann
13:36	The return to 1980 chlorine levels: explaining discrepancies between expected and observed ODS abundances in ozone assessments from 2006 to 2022	Megan Lickley
13:48	A new bottom-up model for estimating ODS emissions and banks: Application to HCFC-141b	John Daniel
14:00	The Asian summer monsoon as a source for short-lived halogenated substances in the UTLS during the PHILEAS campaign in late Summer 2023 (remote)	Andreas Engel
14:12	Challenges to ozone layer recovery arising from emissions of anthropogenic chloromethanes in China	Minde An
14:24	Making atmospheric measurements of difficult-to-separate isomers of CFCs routine: a case study of CFC-113 and CFC-113a that refines our understanding of recent atmospheric changes for both of these chemicals	Stephen Montzka
14:36	Anthropogenic Bromoform at the Extratropical Tropopause	Susann Tegtmeier
14:48	Global and Regional HFC-23 Emissions since the Implementation of the Kigali Amendment (remote)	Ben Adam
15:00	Coffee & Posters (4. Environmental and human health effects of atmospheric ozone and UV, 5. Ozone-depleting gases and related substances, 6. Ozone monitoring and measurement techniques)	
16:00	Taking science to policymakers: A case study in the Montreal Protocol (invited)	A.R. Ravishankara
6. Ozone monitoring and measurement techniques		
<i>Session 6 Convenors: Julian Gröbner, Alberto Redondas, Andrea Pazmiño, Kaley Walker, Masatomo Fujiwara, Corinne Vigouroux, Ayman El Shahat Badawy, Ivan Ortega</i>		
16:24	30 years in-situ measurements of Ozone from IAGOS: Review of main results and prospects (invited)	Valerie Thouret
16:48	The Total Ozone Nadir Cross-calibration Algorithm (TONCA): An Overview	Gordon Labow

17:00	Posters (4. Environmental and human health effects of atmospheric ozone and UV, 5. Ozone-depleting gases and related substances, 6. Ozone monitoring and measurement techniques)
19:00	Adjourn

Friday, July 19

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Time	Topic	Speakers
6. Ozone monitoring and measurement techniques		
<i>Session 6 Convenors: Julian Gröbner, Alberto Redondas, Andrea Pazmiño, Kaley Walker, Masatomo Fujiwara, Corinne Vigouroux, Ayman El Shahat Badawy, Ivan Ortega</i>		
7:30	Registration	
8:30	EUBREWNET new developments, uncertainty and updated algorithm (keynote)	Alberto Redondas
8:54	The transition to new ozone absorption cross-sections for Dobson and Brewer total ozone measurements	Voltaire Velazco
9:06	Bayesian composite of Umkehr ozone profiles time series	Eliane Maillard Barras
9:18	Total Column Ozone Retrieval from BTS Array Spectroradiometer by applying a Custom Double Ratio Technique	Luca Egli
9:30	TOTAL COLUMN OZONE DATANALYSIS OVER BRAZIL AND COMANDANTE FERRAZ ANTARCTIC STATION (remote)	Gabriela Dornelles Bittencourt
9:42	Tuneable and portable radiation source for in situ metrological characterization of Dobson spectrometers	Geiland Porrovecchio
9:54	Ground-based monitoring of stratospheric ozone since the 1960s in Germany	Wolfgang Steinbrecht
10:06	Coffee	
10:36	Autonomous year-round ozone profiling in the Canadian High Arctic from 2008 to 2022	Joseph Hung
10:48	More Than 25 Years of Ozonesonde QA/QC and Data Quality Improvements: In-sights From JOSIE and ASOPOS	Herman Smit
11:00	Explore stratospheric and lower mesospheric ozone variability across the middle to polar latitudes using ground-based microwave radiometers	Guochun Shi
11:12	New Small Mobile Ozone Lidar instrument with extended capability for stratospheric ozone monitoring (SMOL-X)	Thierry Leblanc
11:24	Lunch	
13:00	Two Decades of Stratospheric Composition Measurements from the Aura Microwave Limb Sounder: Insights into Heterogeneous Chemical Processing at Low, Middle, and High Latitudes (invited)	Michelle Santee
13:24	Global ozone observations with OMPS instrumental suites	Natalya Kramarova

13:36	Assessing SAGE III/ISS Ozone Data Stability	Mary Cate McKee
13:48	The Stratospheric Aerosol and Gas Experiment (SAGE) IV	Robert Damadeo
14:00	The Atmospheric Chemistry Experiment MAESTRO spectrophotometer on CSA's SCISAT satellite in its 21st year	Tom McElroy
14:12	The Canadian Atmospheric Chemistry Experiment: Validation and science results after 20 years in orbit	Kaley Walker
14:24	Bridging the Gap: A Machine Learning Approach to Construct Daily, Gap-Free, Long-Term Stratospheric Trace Gases Data Sets	Sandip Dhomse
14:36	Merged long-term datasets of ozone profiles developed in the ESA Climate Change Initiative	Viktoria Sofieva
14:48	Ozone profiles from EUMETSATs current and future hyperspectral sounding missions.	Stefan Stapelberg
15:00	Coffee & Posters (4. Environmental and human health effects of atmospheric ozone and UV, 5. Ozone-depleting gases and related substances, 6. Ozone monitoring and measurement techniques)	
16:00	Ozone profile and tropospheric ozone retrievals from TEMPO: initial result and evaluation using other satellites, TOLNet, and ozonesonde observations (remote)	Junsung Park
16:12	The OSIRIS-3 CubeSat - Affordable Ozone Measurement Continuity	Doug Degenstein
16:24	ESA's ALTIUS mission: status and expected performance for stratospheric ozone monitoring	Emmanuel Dekemper
16:36	The Multi-Sensor-Reanalysis daily total ozone column dataset: updates and extension (1960-current)	Jos deLaat
16:48	Asian summer monsoon outflow and meteorological transport of ozone and carbon monoxide over East Asian-western pacific during the 2022 ACCLIP airborne field campaign: An integrated aircraft and satellite perspective (remote)	Juseon Bak
17:00	Recent advances and remaining challenges in satellite total ozone column validation	Tijl Verhoelst
17:12	The scientific requirements for continued ozone observations: expectations and challenges	Elizabeth Weatherhead
17:24	Closing	
17:30	Adjourn	