

Audrey Gaudel

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Research Scientist in Atmospheric Science

Work experience

- 2015 –** **Research Associate**, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado/NOAA Earth System Research Laboratory, **Boulder, Colorado, USA**
Subject: Present day tropospheric ozone distribution and trends relevant to climate change
- 2013 – 2015** **Research Associate**, Laboratoire d'Aérodynamique-Observatoire Midi Pyrénées, **Toulouse, France**
Subject: Evaluation of the MACC models (Monitoring Atmospheric Composition and Climate) for air quality and atmospheric composition at the global scale using aircraft observations of ozone and CO obtained by MOZAIC-IAGOS
- 2009 – 2012** **Course Instructor**, Université Pierre et Marie Curie (UPMC), **Paris, France**
Subject: Physics, Mathematics and MATLAB for BSc and MSc (64 hours per year)

Education

- 2009 – 2012** **Ph.D in Atmospheric Physics and Chemistry**, Université Pierre et Marie Curie (UPMC), Paris, France
Subject: Role of the long range transport on the inter-annual variability of tropospheric ozone measured by the international ozone monitoring network
- 2007 – 2009** **Master of Science degree in Environmental Sciences**, Université Pierre et Marie Curie (UPMC), Paris, France
Specialty: Atmospheric Physics and Chemistry
- 2003 – 2007** **Bachelor of Science degree in Theoretical Physics**,
Université Pierre et Marie Curie (UPMC), Paris, France
Queen Mary University of London (Erasmus student exchange program – 1 year)

Publications:

- A. Gaudel**, O.R. Cooper, K.-L.Chang, I. Bourgeois, V. Thouret, J. R. Ziemke, S. A. Strode, L. D. Oman, P. Nedelec, R. Blot, P. Sellitto, Claire Granier, *Aircraft observations since the 1990s reveal increases of tropospheric ozone at multiple locations across the Northern Hemisphere*, *Science Advances*, **2020**, <https://doi.org/10.1126/sciadv.aba8272>
- O.R. Cooper, M.G. Schultz, S. Schroder, K.-L. Chang, **A. Gaudel** et al., *Multi-decadal surface ozone trends at globally distributed remote locations*, **2020**, *Elem Sci Anth*, 8: 23. DOI: <https://doi.org/10.1525/elementa.420>
- K.-L. Chang, O. R. Cooper, **A. Gaudel**, I. Petropavlovskikh and V. Thouret, *Statistical regularization for trend detection: An integrated approach for detecting long-term trends from sparse tropospheric ozone profiles*, *Atmos. Chem. Phys. Discuss.*, <https://doi.org/10.5194/acp-2019-959>, in review, **2020**.
- I. Bourgeois, J. Peischl, C.R. Thompson, K.C. Aikin, T. Campos, H. Clark, R. Commane, B. Daube, G.W. Diskin, J.W.Elkins, R.S. Gao, **A. Gaudel** et al., *Global-scale distribution of ozone in the remote troposphere from ATom and HIPPO airborne field missions*, **2020**, *Atmospheric Chemistry and Physics Discussions*, pp.1-52.
- D. Tarasick et al., *Tropospheric Ozone Assessment Report: Tropospheric ozone from 1877 to 2016, observed levels, trends and uncertainties*, *Elementa: Science of the Anthropocene*, 2019, 7: 39. DOI: <https://doi.org/10.1525/elementa.376>
- P. Braesicke and J.Neu et al. {**A. Gaudel** as a contributor author}, *Scientific assessment of ozone depletion: 2018, Chapter 3: Update on Global ozone: past, present, and future*, WMO, Global Ozone Research and Monitoring Project – Report No. 58.
- A. Gaudel**, O. R. Cooper, G. Ancellet, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojie, G. Foret, O. Garcia, M. J. Granados-Muñoz, J. W. Hannigan, F. Hase, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, N. Jones, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, E. Mahieu, A. McClure-Begley, J. L. Neu, M. Osman, M. Palm, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rahpoe, A. Rozanov, M. G. Schultz, J. Schwab, R. Siddans, D. Smale, M. Steinbacher, H. Tanimoto, D. W. Tarasick, V. Thouret, A. M. Thompson, T. Trickl, E. Weatherhead, C. Wespes, H. M. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke, *Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation*, *Elementa: Science of the Anthropocene*, 6: 39. DOI: <https://www.elementascience.org/articles/10.1525/elementa.291>
- P. J. Young, V. Naik, A. M. Fiore, **A. Gaudel**, J. Guo, M. Y. Lin, J. L. Neu, D. D. Parrish, H. E. Rieder, J. L. Schnell, S. Tilmes, O. Wild, L. Zhang, J. Ziemke, J. Brandt, A. Delcloo, R. M. Doherty, C. Geels, M. I. Hegglin, L. Hu, U. Im, R. Kumar, A. Luhar, L. Murray, D. Plummer, J. Rodriguez, A. Saiz-Lopez, M. G. Schultz, M. T. Woodhouse and G. Zeng, *Tropospheric Ozone Assessment Report: Assessment of global-scale model performance for global and regional ozone distributions, variability, and trends*, DOI: <https://doi.org/10.1525/elementa.265>, *Elementa Science of the Anthropocene*, 2018
- Yuqiang Zhang, Owen Cooper, **Audrey Gaudel**, Anne Thompson, Philippe Nedelec, Shin-Ya Ogino, and J. Jason West, *Tropospheric ozone change from 1980 to 2010 dominated by equatorward redistribution of emissions*, *Nature Geoscience*, 9, 2016

- H. Petetin, V. Thouret, G. Athier, R. Blot, D. Boulanger, J.-M. Cousin, **A. Gaudel**, P. Nédélec, O. Cooper, *Diurnal cycle of ozone throughout the troposphere over Frankfurt as measured by MOZAIC-IAGOS commercial aircraft*, Elementa Science of the Anthropocene, 2016
- A. Gaudel**, G. Ancellet, S. Godin-Beekmann, *Analysis of 20 years of tropospheric ozone vertical profiles by lidar and ECC at Observatoire de Haute Provence (OHP) at 44°N, 6.7°E*, Atmospheric Environment, 113, 78-89, 2015
- A. Gaudel**, H. Clark, V. Thouret, L. Jones, A. Inness, H. Eskes, V. Huijnen, P. Nédélec, *Evaluation of the ability of the MACC-II Reanalysis to reproduce the distribution of O₃ and CO in the UTLS as measured by MOZAIC-IAGOS*, Tellus B, 67, 2015 (special issue MOZAIC-IAGOS 20th Anniversary Symposium)
- J. Flemming, V. Huijnen, J. Arteta, P. Bechtold, A. Beljaars, A.-M. Blechschmidt, M. Diamantakis, R.J. Engelen, **A. Gaudel**, A. Inness, L. Jones, E. Katragkou, V.-H. Peuch, A. Richter, M.G Schultz, O. Stein, A. Tsikerdekis, *Tropospheric Chemistry in the Integrated Forecasting System of ECMWF*, Geosci. Model Dev., 8, 975–1003, 2015
- A. Inness, A.-M. Blechschmidt, I. Bouarar, S. Chabrillat, M. Crepulja, R. J. Engelen, H. Eskes, J. Flemming, **A. Gaudel**, F. Hendrick, V. Huijnen, L. Jones, J. Kapsomenakis, E. Katragkou, A. Keppens, B. Langerock, M. de Mazière, D. Melas, M. Parrington, V. H. Peuch, M. Razinger, A. Richter, M. G. Schultz, M. Suttie, V. Thouret, M. Vrekoussis, A. Wagner, and C. Zerefos, *Data assimilation of satellite-retrieved ozone, carbon monoxide and nitrogen dioxide with ECMWF's Composition-IFS*, Atmos. Chem. Phys., 15, 5275–5303, 2015
- H. Eskes, V. Huijnen, A. Arola, A. Benedictow, A.-M. Blechschmidt, E. Botek, O. Boucher, I. Bouarar, S. Chabrillat, E. Cuevas, R. Engelen, H. Flentje, **A. Gaudel**, J. Griesfeller, L. Jones, J. Kapsomenakis, E. Katragkou, S. Kinne, B. Langerock, M. Razinger, A. Richter, M. Schultz, N. Sudarchikova, V. Thouret, M. Vrekoussis, A. Wagner, and C. Zerefos, *Validation of reactive gases and aerosols in the MACC global analysis and forecast system*, Geosci. Model Dev. Discuss., 8, 1117–1169, 2015
- O. Stein, M. G. Schultz, I. Bouarar, H. Clark, V. Huijnen, **A. Gaudel**, M. George, C. Clerbaux, *On the wintertime low bias of Northern Hemisphere carbon monoxide found in global model simulations*, Atmos. Chem. Phys., 14, 9295-9316, 2014

Presentations and meeting participation:

- 2020** **Seminar at Chemical Science Laboratory** (Boulder, France)
Oral (invited) *Tropospheric ozone is still increasing across the Northern Hemisphere*
Audrey Gaudel
- 2020** **100th AMS Annual meeting** (Boston, Massachusetts, USA)
Oral (invited) *Tropospheric ozone is still increasing across the Northern Hemisphere*
A. Gaudel, O.R. Cooper, K.-L.Chang, I. Bourgeois, J. R. Ziemke, S. A. Strode, L. D. Oman, P. Nedelec, R. Blot, V. Thouret, P. Sellitto
- 2019** **Seminar at Laboratoire LISA** (Paris, France)
Oral *Twenty years of observed tropospheric ozone increases across the Northern Hemisphere*
A. Gaudel, O. R. Cooper, K.-L. Chang, V. Thouret, J. Ziemke, S. Strode, P. Nedelec, R. Blot
- 2019** **Workshop AerChemMIP – Preparation for IPCC AR6** (Princeton, New Jersey, USA)
Oral *Twenty years of observed tropospheric ozone increases across the Northern Hemisphere*
A. Gaudel, O. R. Cooper, Kai-Lan Chang, Valerie Thouret, Jerry Ziemke, Sarah Strode, Philippe Nedelec, Romain Blot
- 2019** **CIRES Rendez-Vous** (Boulder, Colorado, USA)
Poster *Tropospheric column ozone variability from space: results from the first multi-instrument intercomparison*
A. Gaudel, O. R. Cooper, V. Thouret, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, G. Huang, B. Kerridge, B. Latter, X. Liu, N. Rappoe, A. Rozanov, C. Wespes, J. Ziemke
- 2019** **47th Global Monitoring Annual Conference** (Boulder, Colorado, USA)
Oral *Tropospheric column ozone variability from space: results from the first multi-instrument intercomparison*
A. Gaudel, O. R. Cooper, V. Thouret, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, G. Huang, B. Kerridge, B. Latter, X. Liu, N. Rappoe, A. Rozanov, C. Wespes, J. Ziemke
- 2018** **AGU Fall meeting** (Washington D.C., Maryland, USA)
Poster *Present-day distribution and trends of global tropospheric ozone from satellite observations: Results from the Tropospheric Ozone Assessment Report (TOAR)*
A. Gaudel, O. R. Cooper, B. Barret, A. Boynard, C. Clerbaux, P. Coheur, G. Huang, D. Hurtmans, B. Kerridge, B. Latter, E. Flochmoën, X. Liu, J. Neu, R. Siddans, C. Wespes, H. Worden, J. Ziemke
- 2018** **IGAC** (Takamatsu, Japan)
Poster *Tropospheric column ozone variability from space: results from the first multi-instrument intercomparison*
A. Gaudel, O. R. Cooper, V. Thouret, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, G. Huang, B. Kerridge, B. Latter, X. Liu, N. Rappoe, A. Rozanov, C. Wespes, J. Ziemke

- 2018**
Oral presentation **First Friday Forum at the Chemical Sciences Division of ESRL NOAA** (Boulder, Colorado, USA)
Tropospheric column ozone trends observed from space : Results from the Tropospheric Ozone Assessment Report (TOAR), TOAR-Climate
Audrey Gaudel
- 2018**
Poster **CIRES Rendez-Vous** (Boulder, Colorado, USA)
Tropospheric column ozone variability from space: results from the first multi-instrument intercomparison
A. Gaudel, O. R. Cooper, V. Thouret, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, G. Huang, B. Kerridge, B. Latter, X. Liu, N. Rappoe, A. Rozanov, C. Wespes, J. Ziemke
- 2018**
Oral Presentation **46th Global Monitoring Annual Conference** (Boulder, Colorado, USA)
Tropospheric column ozone variability from space: results from the first multi-instrument intercomparison
A. Gaudel, O. R. Cooper, V. Thouret, B. Barret, A. Boynard, J. P. Burrows, C. Clerbaux, G. Huang, B. Kerridge, B. Latter, X. Liu, N. Rappoe, A. Rozanov, C. Wespes, J. Ziemke
- 2018**
Oral Presentation (Invited) **NDACC Lidar Working Group Meeting** (Huntsville, Alabama, USA)
TOAR-Climate overview: Results from the Tropospheric Ozone Assessment Report (TOAR)
A. Gaudel, O. R. Cooper, G. Ancellet, B. Barret, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojje, G. Foret, M. J. Granados Muñoz, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, A. McClure-Begley, J. Neu, M. Osman, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rappoe, A. Rozanov, M. Schultz, J. Schwab, M. Steinbacher, R. Siddans, H. Tanimoto, D. Tarasick, V. Thouret, A. Thompson, T. Trickl, C. Wespes, H. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke
- 2017**
Poster **AGU Fall meeting** (New Orleans, Louisiana, USA)
Present-day distribution and trends of global tropospheric ozone from satellite observations: Results from the Tropospheric Ozone Assessment Report (TOAR)
A. Gaudel, O. R. Cooper, B. Barret, A. Boynard, C. Clerbaux, P. Coheur, G. Huang, D. Hurtmans, B. Kerridge, B. Latter, E. Flochmoën, X. Liu, J. Neu, R. Siddans, C. Wespes, H. Worden, J. Ziemke
- 2017**
Oral presentation **Seminar at the Laboratoire d'Aerologie** (Toulouse, France)
TOAR-Climate overview: Results from the Tropospheric Ozone Assessment Report (TOAR)
A. Gaudel, O. R. Cooper, G. Ancellet, B. Barret, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojje, G. Foret, M. J. Granados Muñoz, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, A. McClure-Begley, J. Neu, M. Osman, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rappoe, A. Rozanov, M. Schultz, J. Schwab, M. Steinbacher, R. Siddans, H. Tanimoto, D. Tarasick, V. Thouret, A. Thompson, T. Trickl, C. Wespes, H. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke

- 2017**
Oral presentation **SPARC OCTAV-UTLS workshop** (Boulder, Colorado, USA)
Global ozone trends: First results from the Tropospheric Ozone Assessment Report (TOAR), TOAR-Climate
A. Gaudel, O. R. Cooper, G. Ancellet, B. Barret, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojje, G. Foret, M. J. Granados Muñoz, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, A. McClure-Begley, J. Neu, M. Osman, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rahpoe, A. Rozanov, M. Schultz, J. Schwab, M. Steinbacher, R. Siddans, H. Tanimoto, D. Tarasick, V. Thouret, A. Thompson, T. Trickl, C. Wespes, H. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke
- 2017**
Oral presentation **45th Global Monitoring Annual Conference** (Boulder, Colorado, USA)
Global ozone trends: First results from the Tropospheric Ozone Assessment Report (TOAR), TOAR-Climate
A. Gaudel, O. R. Cooper, G. Ancellet, B. Barret, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojje, G. Foret, M. J. Granados Muñoz, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, A. McClure-Begley, J. Neu, M. Osman, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rahpoe, A. Rozanov, M. Schultz, J. Schwab, M. Steinbacher, R. Siddans, H. Tanimoto, D. Tarasick, V. Thouret, A. Thompson, T. Trickl, C. Wespes, H. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke
- 2017**
Poster **CIRES Rendez-Vous** (Boulder, Colorado, USA)
Global ozone trends: First results from the Tropospheric Ozone Assessment Report (TOAR)
A. Gaudel, O. R. Cooper, G. Ancellet, M. Granados Muñoz, T. Leblanc, A. Thompson, V. Thouret and J. Witte
- 2016**
Oral presentation **Seminar at the Laboratoire ATmosphere, Milieux, Observations, Spatiales (LATMOS)** (Paris, France)
The first results of TOAR-Climate focusing on Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation
A. Gaudel, O. R. Cooper, G. Ancellet, B. Barret, C. Clerbaux, P.-F. Coheur, J. Cuesta, E. Cuevas, S. Doniki, G. Dufour, F. Ebojje, G. Foret, M. J. Granados Muñoz, B. Hassler, G. Huang, D. Hurtmans, D. Jaffe, P. Kalabokas, B. Kerridge, S. Kulawik, B. Latter, T. Leblanc, E. Le Flochmoën, W. Lin, J. Liu, X. Liu, A. McClure-Begley, J. Neu, M. Osman, H. Petetin, I. Petropavlovskikh, R. Querel, N. Rahpoe, A. Rozanov, M. Schultz, J. Schwab, M. Steinbacher, R. Siddans, H. Tanimoto, D. Tarasick, V. Thouret, A. Thompson, T. Trickl, C. Wespes, H. Worden, C. Vigouroux, X. Xu, G. Zeng, J. Ziemke
- 2016**
Oral presentation **IAGOS Scientific Symposium on Atmospheric Composition** (Manchester, UK)
Long-term trends of tropospheric ozone over North America and Southeast Asia
A. Gaudel, O. R. Cooper, B. Hassler, V. Thouret, H. Petetin, D. Tarasick, A. Thompson, J. Witte and IAGOS team

- 2016**
Poster
IGAC (Breckenridge, Colorado, USA)
Long-term trends of global tropospheric column ozone
A. Gaudel, O. R. Cooper, J. Ziemke, C. Vigouroux, I. Petropavlovskikh, J. Liu, G. Huang, X. Liu, A. McClure, C. Wespes
- 2016**
Oral presentation
44th Global Monitoring Annual Conference (Boulder, Colorado, USA)
Long-term trends of tropospheric ozone over South and East Asia
A. Gaudel, O. R. Cooper, B. Hassler, H. Petetin, D. Tarasick, V. Thouret
- 2016**
Poster
CIRES Rendez-Vous (Boulder, Colorado, USA)
What is the present-day distribution of global tropospheric ozone?
A. Gaudel
- 2016**
Oral presentation
Tropospheric ozone Assessment Report (TOAR) Workshop III (Beijing, China)
Lead author presentation to the TOAR community on the progress of Chapter 6 of the assessment report
- 2015**
Oral presentation
SPARC Workshop (Boulder, Colorado, USA)
Long-term trends of tropospheric ozone at globally distributed locations
A. Gaudel, O. Cooper, J. Ziemke, C. Vigouroux, J. Hannigan, O. Garcia
- 2015**
Oral presentation
Tropospheric ozone Assessment Report (TOAR) Workshop II (Madrid, Spain)
Leader of the Free Tropospheric and Satellite Working Group meeting
- 2014**
Oral presentation
MOZAIC-IAGOS Symposium (Toulouse, France)
Use of simultaneous O₃ and CO data from MOZAIC-IAGOS to evaluate the MACC-II Reanalysis in the UTLS
A. Gaudel, H. Clark, V. Thouret, L. Jones, A. Inness, H. Eskes, V. Huijnen, P. Nédélec, MACC team, IAGOS team
- 2014**
Oral presentation
General Assembly of MACC (Brussels, Belgium)
Evaluation of the ability of the MACC-II Reanalysis to reproduce the distribution of O₃ and CO in the UTLS as measured by MOZAIC-IAGOS
A. Gaudel, H. Clark, V. Thouret, L. Jones, A. Inness, H. Eskes, V. Huijnen, P. Nédélec, MACC team, IAGOS team
- 2013**
Poster
American Geophysical Union (San Francisco, California)
Evaluation of the ability of the MACC-II Reanalysis to reproduce the distribution of O₃ and CO in the UTLS as measured by MOZAIC-IAGOS
A. Gaudel, H. Clark, V. Thouret, H. Eskes, V. Huijnen, A. Inness, P. Nédélec, MACC team, IAGOS team
- 2012**
Oral presentation
Quadriennial Ozone Symposium (Toronto, Ontario)
Twenty years of tropospheric ozone variability measured in the western Mediterranean basin
A. Gaudel, G. Ancellet, Sophie Godin-Beekmann
- 2010**
Poster
International Global Atmospheric Chemistry (Halifax, Nova Scotia)
Twenty years of tropospheric ozone variability measured at the Observatoire de Haute Provence from 1990-2009
A. Gaudel, G. Ancellet, Sophie Godin-Beekmann

