

Ivan Ortega

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Research Interests:

My interest revolves around understanding atmospheric chemistry and transformation of key atmospheric constituents using optical remote sensing techniques, i.e., ground-based, aircraft, and satellites.

Education:

- **2016** - PhD, University of Colorado, Boulder, Department of Chemistry.
- **2009** - M.S, National Autonomous University of Mexico (UNAM), Atmospheric Sciences.
- **2007** - B.S, National Autonomous University of Mexico (UNAM), Chemistry.

Selected Relevant Experience:

- **2022 - present:** *Project Scientist I*, National Center for Atmospheric Research, Boulder, CO.
- **2016 - 2021:** *Associate Scientist II*, National Center for Atmospheric Research, Boulder, CO.
- **2017 - present** *Co-I*, Ground based infrared observations from Mauna Loa, Hawaii and Thule Greenland in support of the Network for the Detection of Atmospheric Composition Change (NDACC).
- **2023 - present** *Co-I*, Role of atmospheric chemistry in monitoring changes in the CH₄ Budget.

Key Scientific, Technical, & Management skills:

- Experience executing mid-Infrared and UV-Vis analysis of solar direct and diffused light to determine atmospheric composition. Expertise in the differential optical absorption spectroscopy (DOAS) and Fourier Transform Infrared (FTIR) methods.
- Currently responsible for the evaluation of key atmospheric compounds using high spectral resolution FTIR instruments at Mauna Loa HI, and at Thule, Greenland as part of the Network for the Detection of Atmospheric Composition Change (NDACC) and in Boulder, CO.
- Expertise in planning and realization of intensive field campaigns & development and implementation of long-term remote measurements.
- Basic knowledge of box models and global 3D chemical transport model.
- Programming knowledge in Python, IDL, LaTeX, and IGOR Pro.

Selected Recent Peer Reviewed Publications:

1. Albores, I. S., Buchholz, R. R., **Ortega, I.**, Emmons, L. K., Hannigan, J. W., Lacey, F., et al. (2023). Continental-scale atmospheric impacts of the 2020 Western U.S. Wildfires. *Atmospheric Environment*, 294, 119436.
2. **Ortega, I.**, Gaubert, B., Hannigan, J., Brasseur, G. P., Worden, H., Blumenstock, T., et al. (2023). Anomalies of O₃, CO, C₂H₂, H₂CO, and C₂H₆ detected with multiple ground-based Fourier-transform infrared spectrometers and assessed with model simulation in 2020: COVID-19 lockdowns versus natural variability. *Elementa: Science of the Anthropocene*, 11: 11. doi:10.1525/elementa.2023.00015.
3. Hannigan, J. W., **Ortega, I.**, Shams, S. B., Blumenstock, T., Campbell, J. E., Conway, S., et al. (2022). Global atmospheric OCS trend analysis from 22 NDACC stations. *Journal of Geophysical Research: Atmospheres*, 127, e2021JD035764. <https://doi-org.cuucar.idm.oclc.org/10.1029/2021JD035764>
4. Kille, N., K. J. Zarzana., J. Romero Alvarez., C. F. Lee., J. Rowe., B. Howard., T. Campos., A. Hills., R. S. Hornbrook., **Ortega, I.**, W. Permar, et al. (2020): The CU Airborne Solar Occultation Flux Instrument: Performance evaluation during BB-FLUX. *ACS Earth and Space Chemistry*, doi:10.1021/acsearthspacechem.1c00281, 2022.
5. **Ortega, I.**, Hannigan, J. W., Buchholz, R. R., & Pfister, G. (2021). Long-term variability and source signature of gases emitted from oil & natural gas and cattle feedlot operations in the Colorado front range. *Atmospheric Environment*, 263, 118663. doi:10.1016/j.atmosenv.2021.118663
6. Franco, B., Blumenstock, T., Cho, C., Clarisse, L., Clerbaux, C., Coheur, P. -F., **Ortega, I** ... Taraborrelli, D. (2021). Ubiquitous atmospheric production of organic acids mediated by cloud droplets. *Nature*, 593, 233-237. doi:10.1038/s41586-021-03462-x

7. Blumenstock, T., Hase, F., Keens, A., Czurlok, D., Colebatch, O., Garcia, O., Griffith, D. W. T., Grutter, M., Hannigan, J. W., Heikkinen, P., Jeseck, P., Jones, N., Kivi, R., Lutsch, E., Makarova, M., Imhasin, H. K., Mellqvist, J., Morino, I., Nagahama, T., Notholt, J., **Ortega, I.**, Palm, M., Raffalski, U., Rettinger, M., Robinson, J., Schneider, M., Servais, C., Smale, D., Stremme, W., Strong, K., Sussmann, R., Té, Y., and Velazco, V. A.: Characterization and potential for reducing optical resonances in Fourier transform infrared spectrometers of the Network for the Detection of Atmospheric Composition Change (NDACC), *Atmos. Meas. Tech.*, 14, 1239–1252, <https://doi.org/10.5194/amt-14-1239-2021>, 2021.
8. Lutsch, E., Strong, K., Jones, D. B. A., Blumenstock, T., Conway, S., Fisher, J. A., Hannigan, J. W., Hase, F., Kasai, Y., Mahieu, E., Makarova, M., Morino, I., Nagahama, T., Notholt, J., **Ortega, I.**, Palm, M., Poberovskii, A. V., Sussmann, R., and Warneke, T.: Detection and attribution of wildfire pollution in the Arctic and northern midlatitudes using a network of Fourier-transform infrared spectrometers and GEOS-Chem, *Atmos. Chem. Phys.*, 20, 12813–12851, <https://doi.org/10.5194/acp-20-12813-2020>, 2020.
9. Strahan, S. E., Smale, D., Douglass, A. R., Blumenstock, T., Hannigan, J. W., Hase, F., **Ortega, I.** . . . Velazco, V. A. (2020). Observed hemispheric asymmetry in stratospheric transport trends from 1994 to 2018. *Geophysical Research Letters*, 47, e2020GL088567. doi:10.1029/2020GL088567
10. Vigouroux, C., Langerock, B., Bauer Aquino, C. A., Blumenstock, T., Cheng, Z., De Mazière, M., De Smedt, I., Grutter, M., Hannigan, J. W., Jones, N., Kivi, R., Loyola, D., Lutsch, E., Mahieu, E., Makarova, M., Metzger, J.-M., Morino, I., Murata, I., Nagahama, T., Notholt, J., **Ortega, I.**, Palm, M., Pinardi, G., Röhling, A., Smale, D., Stremme, W., Strong, K., Sussmann, R., Té, Y., van Roozendaal, M., Wang, P., and Winkler, H.: TROPOMI–Sentinel-5 Precursor formaldehyde validation using an extensive network of ground-based Fourier-transform infrared stations, *Atmos. Meas. Tech.*, 13, 3751–3767, <https://doi.org/10.5194/amt-13-3751-2020>, 2020.
11. Franco, B., Clarisse, L., Stavrou, T., Müller, J.-F., Taraborrelli, D., Hadji-Lazaro, J., **Ortega, I.**, et al. (2020). Spaceborne measurements of formic and acetic acids: A global view of the regional sources. *Geophysical Research Letters*, 47, e2019GL086239.
12. Lutsch, E., Strong, K., Jones, D. B. A., **Ortega, I.**, Hannigan, J. W., Damers, E. et al. (2019). Unprecedented atmospheric ammonia concentrations detected in the high Arctic from the 2017 Canadian wildfires. *Journal of Geophysical Research: Atmospheres*, 124, 8178– 8202.
13. **Ortega, I.**, Buchholz, R. R., Hall, E. G., Hurst, D. F., Jordan, A. F., and Hannigan, J. W.: Tropospheric water vapor profiles obtained with FTIR: comparison with balloon-borne frost point hygrometers and influence on trace gas retrievals, *Atmos. Meas. Tech.*, 12, 873–890, <https://doi.org/10.5194/amt-12-873-2019>, 2019.
14. Vigouroux, C., Bauer Aquino, C. A., Bauwens, M., Becker, C., Blumenstock, T., De Mazière, M., García, O., Grutter, M., Guarín, C., Hannigan, J., Hase, F., Jones, N., Kivi, R., Koshelev, D., Langerock, B., Lutsch, E., Makarova, M., Metzger, J.-M., Müller, J.-F., Notholt, J., **Ortega, I.**, et al: NDACC harmonized formaldehyde time series from 21 FTIR stations covering a wide range of column abundances, *Atmos. Meas. Tech.*, 11, 5049–5073.
15. Pumphrey, H. C., Glatthor, N., Bernath, P. F., Boone, C. D., Hannigan, J. W., **Ortega, I.**, Livesey, N. J., and Read, W. G.: MLS measurements of stratospheric hydrogen cyanide during the 2015–2016 El Niño event, *Atmos. Chem. Phys.*, 18, 691–703, <https://doi.org/10.5194/acp-18-691-2018>, 2018.
16. Damers, E., Shephard, M. W., Palm, M., Cady-Pereira, K., Capps, S., Lutsch, E., Strong, K., Hannigan, J. W., **Ortega, I.**, Toon, G. C., Stremme, W., Grutter, M., Jones, N., Smale, D., Siemons, J., Hrpcek, K., Tremblay, D., Schaap, M., Notholt, J., and Erisman, J. W.: Validation of the CrIS fast physical NH₃ retrieval with ground-based FTIR, *Atmos. Meas. Tech.*, 10, 2645–2667, <https://doi.org/10.5194/amt-10-2645-2017>, 2017.
17. Peters, E., Pinardi, G., Seyler, A., Richter, A., Wittrock, F., Bösch, T., Van Roozendaal, M., Hendrick, F., Drosoglou, T., Bais, A. F., Kanaya, Y., Zhao, X., Strong, K., Lampel, J., Volkamer, R., Koenig, T., **Ortega, I.**, et al : Investigating differences in DOAS retrieval codes using MAD-CAT campaign data, *Atmos. Meas. Tech.*, 10, 955–978, <https://doi.org/10.5194/amt-10-955-2017>, 2017.
18. **Ortega, I.**, Coburn, S., Berg, L. K., Lantz, K., Michalsky, J., Ferrare, R. A., Hair, J. W., Hostetler, C. A., and Volkamer, R.: The CU 2-D-MAX-DOAS instrument - Part 2: Raman scattering probability measurements and retrieval of aerosol optical properties, *Atmos. Meas. Tech.*, 9, 3893–3910, doi:10.5194/amt-9-3893-2016, 2016.
19. **Ortega, I.**, Berg, L., Ferrare, R., Hair, J., Hostetler, C., Volkamer, R. : Elevated aerosol layers modify the O₂-O₂ absorption measured by ground based MAX-DOAS, *Journal of Quantitative Spectroscopy and Radiative Transfer*, 176, 34–49, 2016, doi:10.1016/j.jqsrt.2016.02.021.

20. **Ortega, I.**, Koenig, T., Sinreich, R., Thomson, D., and Volkamer, R.: The CU 2-D-MAX-DOAS instrument – Part 1: Retrieval of 3-D distributions of NO₂ and azimuth-dependent OVOC ratios, *Atmos. Meas. Tech.*, 8, 2371-2395, doi:10.5194/amt-8-2371-2015, 2015.
21. Kille, N., Baidar, S., Handley, P., **Ortega, I.**, Sinreich, R., Cooper, O. R., Hase, F., Hannigan, J. W., Pfister, G., and Volkamer, R.: The CU mobile Solar Occultation Flux instrument: structure functions and emission rates of NH₃, NO₂ and C₂H₆, *Atmos. Meas. Tech.*, 10, 373-392, doi:10.5194/amt-10-373-2017, 2017.
22. Wang, Y., S. Beirle, F. Hendrick, A. Hilboll, J. Jin, A. A. Kyuberis, J. Lampel, A. Li, Y. Luo, L. Lodi, J. Ma, M. Navarro, **I. Ortega**, E. Peters, O. L. Polyansky, J. Remmers, A. Richter, O. Puentedura Rodriguez, M. Van Roozendaal, A. Seyler, J. Tennyson, R. Volkamer, P. Xie, N. F. Zobov, T. Wagner. MAX-DOAS measurements of HONO slant column densities during the MAD-CAT Campaign: inter-comparison and sensitivity studies on spectral analysis settings, submitted to *Atmos. Meas. Tech.*, (24 Nov 2016).
23. Sherwen, T., Schmidt, J. A., Evans, M. J., Carpenter, L. J., Grossmann, K., Eastham, S. D., Jacob, D. J., Dix, B., Koenig, T. K., Sinreich, R., **Ortega, I.**, Volkamer, R., Saiz-Lopez, A., Prados-Roman, C., Mahajan, A. S., and Ordóñez, C.: Global impacts of tropospheric halogens (Cl, Br, I) on oxidants and composition in GEOS-Chem, *Atmos. Chem. Phys.*, 16, 12239-12271, doi:10.5194/acp-16-12239-2016, 2016.
24. Fast, J., L. Berg, K. Zhang, R. Easter, R. Ferrare, J. Hair, C. Hostetler, Y. Liu, **I. Ortega**, A. Sedlacek, III, M. K. Shrivastava, S. Springston, J. Tomlinson, R. Volkamer, J. Wilson, R. Zaveri, A. Zelenyuk. Model Representations of Aerosol Layers Transported from North American over the Atlantic Ocean during the Two-Column Aerosol Project (TCAP). *J. Geophys. Res. - Atmospheres.*, 121, 9814-9848, 2016. doi: 10.1002/2016JD025248.
25. Sherwen, T., Evans, M. J., Carpenter, L. J., Andrews, S. J., Lidster, R. T., Dix, B., Koenig, T. K., Sinreich, R., **Ortega, I.**, Volkamer, R., Saiz-Lopez, A., Prados-Roman, C., Mahajan, A. S., and Ordóñez, C.: Iodine's impact on tropospheric oxidants: a global model study in GEOS-Chem, *Atmos. Chem. Phys.*, 16, 1161-1186, doi:10.5194/acp-16-1161-2016, 2016.
26. Kim, S. W., B. McDonald, S. Baidar, S. S. Brown, W. P. Dube, R. Ferrare, G. Frost, R. Harley, J. S. Holloway, H. J. Lee, S. McKeen, J. Neuman, J. Nowak, H. Oetjen, **I. Ortega**, I. Pollack, J. Robert, T. Ryerson, A. Scarino, C. Senff, R. Thalman, M. Trainer, R. Volkamer, N. Wagner, R. Washenfelder, E. Waxman, C. Young: Modeling the weekly cycle of NO_x and CO emissions and their impacts on O₃ in the Los Angeles-South Coast Air Basin during the CalNex 2010 field campaign. *J. Geophys. Res. - Atmospheres*, 21 (3), 1340-1360, 2016. doi: 10.1002/2015JD024292.
27. Volkamer, R., Baidar, S., Campos, T. L., Coburn, S., DiGangi, J. P., Dix, B., Eloranta, E. W., Koenig, T. K., Morley, B., **I. Ortega**, Pierce, B. R., Reeves, M., Sinreich, R., Wang, S., Zondlo, M. A., and Romashkin, P. A.: Aircraft measurements of BrO, IO, glyoxal, NO₂, H₂O, O₂-O₂ and aerosol extinction profiles in the tropics: comparison with aircraft-/ship-based in situ and lidar measurements, *Atmos. Meas. Tech.*, 8, 2121-2148, <https://doi.org/10.5194/amt-8-2121-2015>, 2015.
28. Coburn, S., **Ortega, I.**, R. Thalman, B. Blomquist, C.W. Fairall and R. Volkamer, R: Measurements of diurnal variations and Eddy Covariance (EC) fluxes of glyoxal in the tropical marine boundary layer: description of the Fast LED-CE-DOAS instrument. 2014, *Atmos. Meas. Tech. Discuss*, 7, 6245-6285, doi:10.5194/amtd-7-6245-2014.

Full list of publications available at [Google Scholar](#)

Selected Honors and Awards:

- NASA Earth Science graduate fellowship, Boulder, CO, September 2012 - September 2015.
- Nomination for NCAR/UCAR Outstanding Accomplishment in Technical Advancement in Support of Science (2021).

Additional Activities:

- **2022/2023:** STEM mentor lectures at Eagle County middle school
- **2023:** Reviewer, NASA panel review
- **2021:** NCAR Early Career Leadership Program Certificate
- **2021 - present:** ACOM DEI participant committee
- **2020:** Member, Scientist Hiring Committee, (2020)
- **2019 - present:** Organizer of the ACOM/NCAR seminar series: <https://www2.acom.ucar.edu/seminars>