

# Robert P. Loughman

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## Professional Preparation

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College of William and Mary, B.S. with honors in Physics, minor in Mathematics May 1993

University of Arizona, M.S. in Atmospheric Science December 1995  
Ph.D. in Atmospheric Science, minor in Mathematics August 1998

## Professional Appointments

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**Chairman and Associate Professor** September 2010 – present  
Hampton University, Department of Atmospheric and Planetary Sciences

**Research Associate Professor** July 2008 – August 2010  
**Research Assistant Professor** August 2003 – June 2008  
Hampton University, APS / Center for Atmospheric Science

**Research Associate** August 1998 – August 2003  
University of Arizona (resident at NASA Goddard Space Flight Center)

## Research Interests

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Improving our ability to understand the Earth-atmosphere system through analysis of remote sensing data is my primary research goal. This work has several aspects, including:

- Developing new tools for modeling radiative transfer more efficiently and accurately
- Extending knowledge of the underlying physics of the Earth-atmosphere system to identify promising measurement strategies
- Developing rigorous methods to forecast the expected performance of various retrieval systems (and to assess their actual performance using measured data).

More specifically, retrieval of aerosol properties and ozone concentration from measurements of the solar radiation scattered by the limb of the atmosphere has been my primary research focus. Several past and present space-borne limb scattering sensors have contributed to this research, including SOLSE/LORE, SAGE III (Meteor-3M), OSIRIS, SCIAMACHY, and particularly the OMPS Limb Profiler. Reconciling the aerosol properties derived from various remote sensing and in-situ measurements is a particular area of emphasis.

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### Selected Peer-Reviewed Publications

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- Taha, G., **R. Loughman**, P. Colarco, T. Zhu, L. Thomason, and G. Jaross: Tracking the 2022 Hunga Tonga-Hunga Ha'apai aerosol cloud in the upper and middle stratosphere using space-based observations, submitted to *Geophys. Res. Letters*, 2022.
- Zawada, D., Franssens, G., **Loughman, R.**, Mikkonen, A., Rozanov, A., Emde, C., Bourassa, A., Dueck, S., Lindqvist, H., Ramon, D., Rozanov, V., Dekemper, E., Kyrola, E., Burrows, J.P., Fussen, D. and Degenstein, D.: Systematic comparison of vectorial spherical radiative transfer models in limb scattering geometry, *Atmos. Meas. Tech.*, 14, 3953–3972, <https://doi.org/10.5194/amt-14-3953-2021>, 2021.
- Stamnes, S., R. Baize, P. Bontempi, B. Cairns, E. Chemyakin, Y.-J. Choi, J. Chowdhary, Y. Hu, M. Jeong, K.-I. Kang, S.S. Kim, X. Liu, **R. Loughman**, D. MacDonnell, M.P. McCormick, B. Moon, A. Omar, C.M. Roithmayr, C.K. Sim, W. Sun, B. van Diedenhoven, G. Videen, and A. Wasilewski: Simultaneous Aerosol and Ocean Properties From the PolCube CubeSat Polarimeter, *Frontiers in Remote Sensing*, doi: 10.3389/frsen.2021.709040, 2021.
- Zubko, E., K. Shmirko, A. Pavlov, W. Sun, G.L. Schuster, Y. Hu, S. Stamnes, A. Omar, R.R. Baize, M.P. McCormick, **R. Loughman**, J.A. Arnold, and G. Videen: Active remote sensing of atmospheric dust using relationships between their depolarization ratios and reflectivity, *Optics Letters*, <https://doi.org/10.1364/OL.426584>, 2021.
- Taha, G., **Loughman, R.**, Zhu, T., Thomason, L., Kar, J., Rieger, L., and Bourassa, A.: OMPS LP Version 2.0 Multi-wavelength Aerosol Extinction Coefficient Retrieval Algorithm, *Atmos. Meas. Tech. Discuss.*, <https://doi.org/10.5194/amt-2020-329>, 2020.
- Chen, Z., Bhartia, P. K., Torres, O., Jaross, G., **Loughman, R.**, DeLand, M., Colarco, P., Damadeo, R. and Taha, G., 2020. Evaluation of the OMPS/LP stratospheric aerosol extinction product using SAGE III/ISS observations, *Atmos. Meas. Tech.*, 13, 3471-3485, <https://doi.org/10.5194/amt-13-3471-2020>.
- Nyaku, E., **Loughman, R.**, Bhartia, P.K., Deshler, T., Chen, Z., and Colarco, P.R., 2020. A comparison of lognormal and gamma size distributions for characterizing the stratospheric aerosol phase function from optical particle counter measurements. *Atmos. Meas. Tech.*, 13, 1071–1087, <https://doi.org/10.5194/amt-13-1071-2020>.
- Shrestha, A., S. Kato, T. Wong, P.W. Stackhouse, and **R.P. Loughman**, 2019. New temporal and spectral unfiltering technique for ERBE/ERBS WFOV Nonscanner Instrument observations, *IEEE Trans. on Geosci. and Remote Sensing*, 57, <https://doi.org/10.1109/TGRS.2019.2891748>.
- Chen, Z., Bhartia, P. K., **Loughman, R.**, Colarco, P., and DeLand, M., 2018. Improvement of stratospheric aerosol extinction retrieval from OMPS/LP using a new aerosol model, *Atmos. Meas. Tech.*, 11, 6495-6509, <https://doi.org/10.5194/amt-11-6495-2018>.

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### Selected Peer-Reviewed Publications (continued)

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- **Loughman, R.**, Bhartia, P. K., Chen, Z., Xu, P., Nyaku, E., and Taha, G., 2018. The Ozone Mapping and Profiler Suite (OMPS) Limb Profiler (LP) Version 1 Aerosol Extinction Retrieval Algorithm: Theoretical Basis, *Atmos. Meas. Tech.*, 11, 2633-2651, <https://doi.org/10.5194/amt-11-2633-2018>.
- Mok, J., Krotkov, N. A., Torres, O., Jethva, H., Li, Z., Kim, J., Koo, J.-H., Go, S., Irie, H., Labow, G., Eck, T. F., Holben, B. N., Herman, J., **Loughman, R. P.**, Spinei, E., Lee, S. S., Khatri, P., and Campanelli, M., 2018. Comparisons of spectral aerosol single scattering albedo in Seoul, South Korea, *Atmos. Meas. Tech.* 11, 2295-2311, <https://doi.org/10.5194/amt-11-2295-2018>.
- Moy, L., Bhartia, P. K., Jaross, G., **Loughman, R.**, Kramarova, N., Chen, Z., Taha, G., Chen, G., and Xu, P., 2017. Altitude registration of limb-scattered radiation, *Atmos. Meas. Tech.*, 10, 167-178, <https://doi.org/10.5194/amt-10-167-2017>.
- **Loughman, R.**, D. Flittner, E. Nyaku and P.K. Bhartia, 2015. Gauss-Seidel Limb Scattering (GSLs) radiative transfer model development in support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler mission, *Atmos. Chem. Phys.*, 15, 3007-3020, doi:10.5194/acp-15-3007-2015.
- Rault, D. and **R.P. Loughman**, 2013, The OMPS Limb Profiler environmental data record algorithm theoretical basis document and expected performance, *IEEE Trans. on Geosci. and Remote Sensing*, doi:10.1109/TGRS.2012.2213093.
- Taha, G., D.F. Rault, **R.P. Loughman**, A.E. Bourassa, and C. von Savigny, 2011. SCIAMACHY stratospheric aerosol extinction profile retrieval using the OMPS/LP algorithm. *Atmos. Meas. Tech.*, 4, pp. 547-556, doi:10.5194/amt-4-547-2011.
- **Loughman, R.P.**, D.E. Flittner, B.M. Herman, P.K. Bhartia, E. Hilsenrath and R.D. McPeters, 2005. Description and sensitivity analysis of a limb scattering ozone retrieval algorithm. *J. Geophys. Res.*, 110, doi: 10.1029/2004JD005429.
- **Loughman, R.P.** L. Oikarinen, E. Griffioen, O.V. Postylyakov, A. Rozanov, D.E. Flittner, and D.F. Rault, 2004. Comparison of radiative transfer models for limb-viewing scattered sunlight measurements. *J. Geophys. Res.*, 109, doi: 10.1029/2003JD003854.
- X. Liu, M. Newchurch, **R. Loughman** and P.K. Bhartia, 2003. Errors resulting from assuming opaque Lambertian clouds in TOMS ozone retrieval. *J. Quant. Spec. Rad. Tran.*, 85, 337-365, doi: 10.1016/S0022-4073(03)00231-0.
- I. Petropavlovskikh, **R. Loughman**, J. DeLuisi, and B. Herman, 2000. A comparison of ultraviolet intensities calculated by spherical atmosphere radiation transfer codes: Application to the aerosol corrections. *J. Geophys. Res.*, 105, 14737-14746.

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### Selected Non-Refereed Publications

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- Rault, D., **R. Loughman**, G. Taha and A.J. Fleig, 2008. Algorithm Theoretical Basis Document (ATBD) for the Environmental Data Record (EDR) Algorithm of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler. National Polar-Orbiting Operational Environmental Satellite System (NPOESS) Program.  
[https://ozoneaq.gsfc.nasa.gov/media/docs/EDR\\_ATBD\\_baseline\\_version1.pdf](https://ozoneaq.gsfc.nasa.gov/media/docs/EDR_ATBD_baseline_version1.pdf)
- **Loughman, R.**, D. Rault, A. Bourassa and G. Taha, 2008. Report on the 4<sup>th</sup> International Limb Workshop, SPARC Newsletter #31, July 2008.
- Rault, D., **R. Loughman** and G. Taha, 2008. Data analysis and retrieval algorithms for the ozone mapping and profiler suite/limb profiler instrument. *Proc. of the SPIE*, 7107, pp. 71070T-71070T-12, doi: 10.1117/12.800672.
- Rault, D. and **R. Loughman**, 2007. Stratospheric and upper tropospheric aerosol retrieval from limb scatter signals. *Proc. of the SPIE*, 6745, pp. 674509, doi: 10.1117/12.737325.
- **Loughman, R.**, D. Rault and T. Deshler, 2007. Retrieval of aerosol properties from SAGE III limb scattering measurements: Future applications for OMPS, *Hyperspectral Imaging and Sounding of the Environment (HISE) 2007*, Code 104710,  
<https://doi.org/10.1364/HISE.2007.HThA6>.
- **Loughman, R.** and D. Rault, 2006. Retrieval of aerosol properties from SAGE III limb scattering measurements, Proceedings of the NOAA Educational Partnership Programs' Education and Science Forum.
- Flittner, D.E., E. Hilsenrath, S.J. Janz, **R.P. Loughman**, R.D. McPeters and D.F. Rault, 2004. Retrievals from the Limb Ozone Retrieval Experiment on STS107, *Proc. of the SPIE*, 5542, pp. 215-226, doi: 10.1117/12.559746.
- Lee, K.V. and **R. Loughman**, 2004. The accuracy of SAGE III: Comparing limb scattering measurements. 2004 IEEE International Geoscience and Remote Sensing Symposium (IGARSS) Proceedings: Science for Society: Exploring and Managing a Changing Planet, Volume 7, pp. 4363-4366.
- Rault, D.F., **R. Loughman** and C. Sioris, 2004. Retrieval of atmospheric ozone and nitrogen dioxide vertical distribution from SAGE III limb scattering measurements. *Proc. of the SPIE*, 5235, pp. 298-309.
- Rault, D.F., D. Flittner, **R. Loughman**, and R. McPeters, " Ozone Retrieval from SAGE III Limb Scattering measurement," in *Optical Remote Sensing*, OSA Technical Digest (Optical Society of America, 2003), paper OWB1.  
<http://www.opticsinfobase.org/abstract.cfm?URI=ORS-2003-OWB1>
- **Loughman, R.**, K.V. Lee, M. Hill, D. Flittner, D. Rault, R. McPeters, E. Hilsenrath, S. Janz, T. Brown, and P.K. Bhartia, 2004. Examination of the SOLSE/LORE-2 limb scattering data. NOAA Research and Education Advancements in Oceanic and Atmospheric Sciences, CREST Publication Series, No. 02-2004, Proceedings of the NOAA Educational Partnership Programs' "Education and Science Forum", R. Khanbilvardi and S. Merchant, Eds., City College of CUNY, October 21-23, 2004.

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### Selected Conference Presentations

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- Taha, G., **R. Loughman**, P. Colarco, and T. Zhu, 2022. Tracking the Jan 2022 Hunga-Tonga aerosol cloud using space-based observations. Oral presentation, 3<sup>rd</sup> International Workshop on Stratospheric Sulfur and its Role in Climate (SSiRC), Leeds, UK.
- Taha, G., **R. Loughman** and T. Zhu, 2021. OMPS LP V2.0 aerosol extinction profile data records. Virtual presentation, 11<sup>th</sup> International Limb Workshop, hosted by NASA Goddard Space Flight Center, Greenbelt, Maryland, USA.
- Taha, G. and **R. Loughman**, 2021. The Ozone Mapping and Profiler Suite (OMPS) Limb Profiler (LP) Global 3-D View of the Aerosol Extinction in the Upper troposphere/Lower stratosphere (UT/LS). Virtual presentation, Fall AGU Meeting.
- Taha, G., L. Oman, and **R. Loughman**, 2020. OMPS LP Observations of the 2019-2020 Australian Fires. Virtual presentation, Fall AGU Meeting.
- Taha, G. and **R. Loughman**, 2019. Development of the OMPS LP Version 2.0 Multi-wavelength Aerosol Extinction Coefficient Retrieval Algorithm. Fall AGU Meeting.
- **Loughman, R.**, G. Taha, and the OMPS Limb Science Team, 2019. Development of the OMPS LP Version 2 Aerosol Extinction Coefficient Retrieval Algorithm. Oral presentation, 10<sup>th</sup> International Limb Workshop, Greifswald, Germany.
- Taha, G., P. K. Bhartia, Z. Chen, **R. Loughman**, and G. Jaross, 2018. Validation of OMPS LP aerosol extinction profiles. Poster presentation, Fall AGU Meeting, Washington, D.C.
- Shrestha, A., S. Kato, T. Wong, P.W. Stackhouse, and **R.P. Loughman**, 2018. Earth's Radiation Balance Study at Top-of-Atmosphere with reprocessed ERBE/ERBS WFOV Nonscanner Data from 1985 to 1998 and its Validation. Poster presentation, European Geophysical Society General Assembly 2018, Geophys. Res. Abstracts, Vol. 20, EGU2018-10151-1, Vienna, Austria.
- Bhartia, P.K., **R.P. Loughman**, Z. Chen and E. Nyaku, 2018. Improving the Performance of the OMPS Limb Profiling Instrument in Monitoring Aerosols in the Post-Pinatubo Stratosphere. Oral presentation, Chapman Conference on Stratospheric Aerosol in the post-Pinatubo Era: Processes, Interactions, and Importance, Puerto de la Cruz, Canary Islands, Spain.
- Bhartia, P.K., **R.P. Loughman** and J.R. Ziemke, 2017. Synergy Between Occultation, Limb and Nadir Satellite Data to Study Atmospheric Ozone, Aerosols and Radiation. Invited oral presentation, Fall AGU Meeting, New Orleans, Louisiana.
- Shrestha, A., S. Kato, T. Wong, P.W. Stackhouse, and **R.P. Loughman**, 2017. TOA Radiation Balance Study through Reprocessed ERBS WFOV Nonscanner data from 1985 to 1998. Poster presentation, abstract #GC21D-0968, Fall AGU Meeting, New Orleans, Louisiana.
- Taha, G., P. K. Bhartia, Z. Chen, P. Xu, **R. Loughman**, and G. Jaross, 2017. OMPS Limb Profiler: Extending SAGE and CALIPSO stratospheric aerosol records. Oral presentation, abstract #A13D-0293, Fall AGU Meeting, New Orleans, Louisiana.

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### Selected Conference Presentations (continued)

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- **R. Loughman**, P.K. Bhartia, Z. Chen, P. Xu, E. Nyaku, G. Taha, S. Bhatta and P. Colarco, 2017. The importance of the phase function for both limb scattering aerosol extinction retrievals and estimations of the energy balance effects. Oral presentation, SSiRC Workshop on the Measurement of Stratospheric Aerosol, Boulder, Colorado.
- Taha, G., P. K. Bhartia, Z. Chen, P. Xu, **R. Loughman**, and G. Jaross, 2017. OMPS LP aerosol extinction data evaluation and comparison with OSIRIS and CALIPSO. Oral presentation, SSiRC Workshop on the Measurement of Stratospheric Aerosol, Boulder, Colorado.
- **Loughman, R.**, P.K. Bhartia, E. Nyaku, G. Taha, S. Bhatta, and Z. Chen, 2017. Aerosol Characterization Through the Combination of Occultation and Limb Scattering Observations. Oral presentation, 9<sup>th</sup> Atmospheric Limb Workshop, Saskatoon, Canada.
- Taha, G., P. K. Bhartia, Z. Chen, P. Xu, **R. Loughman**, and G. Jaross, 2017. Assessment of OMPS Limb Profiler Aerosol Extinction Measurements. Oral presentation, 9<sup>th</sup> Atmospheric Limb Workshop, Saskatoon, Canada.
- **Loughman, R.**, P.K. Bhartia, L. Moy, N. Kramarova, and K. Wargan, 2016. Using MERRA-2 analysis fields to simulate limb scattered radiance profiles for inhomogeneous atmospheric lines of sight: Preparation for data assimilation of OMPS LP radiances through 2D single-scattering GSLS radiative transfer model development, Poster presentation, Fall AGU Meeting, San Francisco, California.
- Taha, G., P.K. Bhartia, Z. Chen, P. Xu, **R. Loughman**, and G. Jaross, 2016. OMPS Limb Profiler: Extending SAGE and CALIPSO Stratospheric Aerosol Records, Poster presentation, Fall AGU Meeting, San Francisco, California.
- DeLand, M., P.K. Bhartia, G. Jaross, **R. Loughman**, P. Xu, Z. Chen, N. Kramarova, G. Taha, L. Moy, N. Gorkavyi, and T. Zhu, 2016. Suomi NPP OMPS Limb Profiler data products, Poster presentation, Quadrennial Ozone Symposium, Edinburgh, Scotland.
- Taha, G., P.K. Bhartia, P. Xu, **R. Loughman**, and G. Jaross, 2016. OMPS LP aerosol extinction coefficient measurements, Oral presentation, 2<sup>nd</sup> Workshop on Stratospheric Sulfur and its Role in Climate, Potsdam, Germany.
- **Loughman, R.**, P.K. Bhartia, G. Taha, P. Xu, E. Nyaku, G. Jaross, P. Colarco and V. Aquila, 2016. The OMPS Limb Profiler stratospheric aerosol retrieval, Poster presentation, 21<sup>st</sup> Annual Research Symposium, Hampton University.
- Taha, G., P.K. Bhartia, P. Xu, **R.P. Loughman**, G.R. Jaross, M.T. DeLand, P.R. Colarco, and V. Aquila, 2015. OMPS LP Characterization of Stratospheric Aerosols, Poster presentation, Fall AGU Meeting, San Francisco, California.
- Bhartia, P.K., M.P. McCormick, and **R.P. Loughman**, 2015. Volcanic Aerosols from Satellites: Current and Emerging Capabilities. Oral presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, P.K. Bhartia, G. Taha, P. Xu, E. Nyaku, G. Jaross, P. Colarco and V. Aquila, 2015. The OMPS Limb Profiler stratospheric aerosol retrieval, Oral presentation, 8<sup>th</sup> Atmospheric Limb Workshop, Gothenburg, Sweden.

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### Selected Conference Presentations (continued)

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- **Loughman, R.**, E. Nyaku, P.K. Bhartia, and N. Gorkavyi, 2015. OMPS Limb Profiler (LP) aerosol extinction algorithm development, 2015 NOAA Satellite Conference, Greenbelt, Maryland.
- Chen, Z., P.K. Bhartia, and **R. Loughman**, 2015. Aerosol Correction for Improving OMPS/LP Ozone Retrieval. Poster presentation, 95<sup>th</sup> American Meteorological Society Annual Meeting, Phoenix, Arizona.
- Moy, L., P.K. Bhartia, Z. Chen, M.T. DeLand, G.R. Jaross, T.J. Kelly, N.A. Kramarova, **R.P. Loughman**, G. Taha and P. Xu, 2014. Evaluation of MLS mesospheric geopotential height profiles and improved altitude registration of the OMPS Limb Profiler measurements. Poster presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Flittner, E. Nyaku, and P.K. Bhartia, 2014. Limb Scattering Radiative Transfer Model Development in Support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler Mission, NOAA EPP 7<sup>th</sup> Biennial Education and Science Forum, University of Maryland Eastern Shore.
- **Loughman, R.**, D. Flittner, E. Nyaku, and P.K. Bhartia, 2014. Limb Scattering Radiative Transfer Model Development in Support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler Mission, Poster presentation, 19<sup>th</sup> Annual Research Symposium, Hampton University.
- Nyaku, E., **Loughman, R.**, D. Flittner, and P.K. Bhartia, 2014. Characterizing aerosol properties in the upper troposphere and stratosphere from limb scattered radiance, Poster presentation, 19<sup>th</sup> Annual Research Symposium, Hampton University.
- **Loughman, R.**, D. Flittner, E. Nyaku, and P.K. Bhartia, 2013. Limb Scattering Radiative Transfer Model Development in Support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler Mission, Poster presentation, 7<sup>th</sup> Atmospheric Limb Conference, Bremen, Germany.
- **Loughman, R.**, D. Flittner, E. Nyaku, P.K. Bhartia and L. Flynn, 2013. Limb Scattering Radiative Transfer Model Development in Support of the Ozone Mapping and Profiler Suite (OMPS) Limb Profiler Mission, Oral presentation, 8<sup>th</sup> Annual NOAA-CREST Symposium, City College of the City University of New York.
- **Loughman, R.**, D. Rault, D. Ludy, E. Nyaku, and S. Hyater-Adams, 2012. The OMPS Limb Profiler Instrument on the NPP satellite, Oral presentation, The 6th NOAA Educational Partnership Program Education and Science Forum, Tallahassee, Florida.
- Xu, P., D.F. Rault, S. Pawson, **R. Loughman**, and G. Taha, 2011. Global Performance Evaluation of OMPS Limb Profiler Using the Proxy Data Assimilated from GEOS-5, Poster presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Rault, D. Ludy, E. Nyaku, and S. Hyater-Adams, 2011. Testing the OMPS Limb Profiler (LP) retrieval algorithms, Oral presentation, The 7th Annual NOAA-CREST Symposium, Hampton, Virginia.

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### Selected Conference Presentations (continued)

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- **Loughman, R.**, D. Rault, J. Zawodny, G. Taha, D. Flittner and M. Patrick McCormick, 2010. Limb Scattering and Occultation Measurement Opportunities from the International Space Station Stratospheric Aerosol and Gas Experiment (SAGE) III mission. Oral presentation, The Meeting of the Americas, Foz do Iguassu, Brazil.
- **Loughman, R.**, D. Rault, G. Taha, J. Li, T. Zhu and A. Bourassa, 2009. The OMPS Limb Profiler Ozone and Aerosol Profile Retrieval algorithms. Oral presentation, 5th Atmospheric Limb Conference, Helsinki, Finland.
- **Loughman, R.**, D. Rault, G. Taha, J. Li, T. Zhu and A. Bourassa, 2009. The OMPS Limb Profiler Ozone and Aerosol Profile Retrieval algorithms. Oral presentation, 5th NOAA Educational Partnership Program Education and Science Forum, Washington, D.C.
- Taha, G., A. Bourassa, D.F. Rault, **R. Loughman**, D. Flittner, G. Jaross, and R. McPeters, 2008. Evaluation of OMPS Limb Profiler retrieval algorithm using limb scattering measurements, Poster presentation, Quadrennial Ozone Symposium, Tromso, Norway.
- Rault, D.F., **R. Loughman**, A. Bourassa, G. Taha, and D. Flittner, 2008. NPP Ozone Mapper and Profiler Suite. The Limb Profiler. Poster presentation, Quadrennial Ozone Symposium, Tromso, Norway.
- **Loughman, R.**, D. Rault, A. Bourassa, G. Taha and D. Flittner, 2008. The OMPS Limb Profiler Ozone and Aerosol Profile Retrieval algorithms. Oral presentation, 37th COSPAR Scientific Assembly, Montreal, Canada.
- Rault, D., **Loughman, R.**, A. Bourassa, G. Taha, G. Jaross, and D. Flittner, 2008. The OMPS Limb Profiler instrument: Data analysis and retrieval algorithm. Oral presentation, 37th COSPAR Scientific Assembly, Montreal, Canada.
- Taha, G., G. Jaross, D. Rault, A. Bourassa, **Loughman, R.**, D. Flittner, and R. McPeters, 2008. Altitude registration analysis and ozone profile retrieval using SCIAMACHY limb scattering measurements. Oral presentation, 37th COSPAR Scientific Assembly, Montreal, Canada.
- Bourassa, A., **Loughman, R.**, D. Flittner, D. Rault and G. Taha, 2008. Evaluation of the OMPS Limb Profiler stratospheric aerosol inversion algorithm. Oral presentation, 37th COSPAR Scientific Assembly, Montreal, Canada.
- **Loughman, R.** and D. Rault, 2008. Retrieval of aerosol properties from SAGE III limb scattering measurements, NOAA CREST Research Symposium, Mayaguez, Puerto Rico.
- **Loughman, R.** and D. Rault, 2007. Stratospheric and upper tropospheric aerosol retrieval from limb scatter signals. Oral presentation, 4<sup>th</sup> International Limb Workshop, Virginia Beach, Virginia.
- **Loughman, R.**, D. Rault, T. Deshler, D. Degenstein 2007. Retrieval of aerosol properties from SAGE III limb scattering measurements, Oral presentation, Fall AGU Meeting, San Francisco, California.



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### Selected Conference Presentations (continued)

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- Rault, D. and **R. Loughman**, 2007. Stratospheric and upper tropospheric aerosol retrieval from Limb Scatter signals. Oral presentation, AGU Joint Assembly, Acapulco, Mexico.
- **Loughman, R.**, D. Rault and T. Deshler, 2007. Retrieval of aerosol properties from limb scattering measurements: Future applications for OMPS. Oral presentation, OSA HISE Meeting, Santa Fe, New Mexico.
- Paterson, W.R., M.P. McCormick, J.M. Russell, J. Anderson, S. Kireev, **R.P. Loughman**, and W.L. Smith, 2006. A Department of Atmospheric and Planetary Sciences at Hampton University, Poster presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Rault and T. Deshler, 2006. Retrieval of aerosol properties from limb scattering measurements: Implications for OMPS. Oral presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Rault and T. Deshler, 2006. Retrieval of aerosol properties from limb scattering measurements. Oral presentation, Spring AGU Meeting, Baltimore, Maryland.
- **Loughman, R.**, R. McPeters, D. Flittner, E. Hilsenrath, S. Janz, T. Brown, D. Rault, M. Hill, S. Petelina, and C. von Savigny, 2006. The SOLSE/LORE-2 Experiment: Ozone profiles retrieved from limb scattering measurements. Oral presentation, 3rd International Limb Workshop, Montreal, Canada.
- **Loughman, R.P.** and D.F. Rault, 2006. Retrieval of aerosol properties from SAGE III limb scattering measurements. Proceedings of the 4<sup>th</sup> Annual NOAA-CREST Symposium, Mayaguez, Puerto Rico, February 23-25, 2006.
- **Loughman, R.**, D. Rault, D. Flittner, R. McPeters, E. Hilsenrath, S. Janz, T. Brown, P.K. Bhartia, M. Hill and K. Lee, 2005. Ozone Retrievals from Limb Scattered Radiance Measurements. Poster Presentation, 3<sup>rd</sup> Solar Occultation Satellite Science Team (SOSST) Meeting, Columbia, Maryland.
- **Loughman, R.**, D. Flittner, R. McPeters, E. Hilsenrath, S. Janz, T. Brown, D. Rault, P.K. Bhartia, M. Hill and K. Lee, 2004. Examination of the SOLSE/LORE-2 Data. Oral presentation, 2nd International Limb Workshop, Stockholm, Sweden.
- **Loughman, R.**, D. Rault, D. Flittner, R. McPeters, K. Lee, and M. Hill, 2004. Initial Validation of SAGE III Limb Scattering Ozone Retrievals. Poster presentation, 2<sup>nd</sup> Solar Occultation Satellite Science Team (SOSST) Meeting, Boulder, Colorado.
- Rault, D.F., D.E. Flittner and **Loughman, R.**, 2004. Retrieval of atmospheric ozone and nitrogen dioxide vertical distribution from SAGE III limb scattering measurement. Oral presentation, Spring AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Rault, D. Flittner, R. McPeters, E. Hilsenrath, P.K. Bhartia, and M.P. McCormick, 2003. Comparison of limb scattering measurements made by the SOLSE, LORE, and SAGE III instruments. Poster presentation, Fall AGU Meeting, San Francisco, California.

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### Selected Conference Presentations (continued)

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- Rault, D., and **Loughman, R.**, 2003. Retrieval of atmospheric ozone and nitrogen dioxide vertical distribution from SAGE III limb scattering measurement. Poster presentation, Fall AGU Meeting, San Francisco, California.
- Liu, X., M. Newchurch, J. Kim, P.K. Bhartia, and **R. Loughman**, 2003. TOMS Ozone Anomalies and Ozone Retrieval Errors Over Cloudy Areas. Oral presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Flittner, D. Rault, E. Hilsenrath, R. McPeters, and P. Bhartia, 2003. Limb scattering measurements made by the Shuttle Ozone Limb Sounding Experiment (SOLSE) and Limb Ozone Retrieval Experiment (LORE) instruments. Presented at Poster session, EGS-AGU-EUG Joint Assembly, Nice, France and at Oral session, 1st International UV/Vis Limb-Scattering Workshop, Bremen, Germany.
- Rault, D., D. Flittner, **R. Loughman**, and R. McPeters, 2003. Ozone Retrieval from SAGE III limb scattering. Poster session, European Geophysical Society XXVII General Assembly, Nice, France.
- Flittner, D.E., **R.P. Loughman**, D. Rault, R.D. McPeters and E. Hilsenrath, 2003. Water vapor profiling using limb scatter measurements. Poster session, European Geophysical Society XXVII General Assembly, Nice, France.
- Rault, D.F., **R.P. Loughman**, D. Flittner, and R. McPeters, 2002. SAGE III Limb Scattering Measurements and Initial Inversion Results, Oral presentation, Fall AGU Meeting, San Francisco, California.
- **Loughman, R.**, D. Flittner, B. Herman, P. Bhartia, E. Hilsenrath, R. McPeters, and D. Rault, 2002. Sensitivity analysis of a limb scattering ozone retrieval algorithm. Poster session, European Geophysical Society XXVII General Assembly, Nice, France.
- Colon, E., J. Hornstein, J. Lumpe, E. Shettle, R. Bevilacqua, J. Larsen, D. Flittner, and **R. Loughman**, 2002. A Comparison of Two Limb Scatter Inversion Methods. Poster presentation, Spring AGU Meeting, Washington, D.C.
- **Loughman, R.P.**, D.E. Flittner, B.M. Herman, P.K. Bhartia, E. Hilsenrath, R.D. McPeters, and D. Rault, 2002. Description and Sensitivity Analysis of the SOLSE/LORE-2 and SAGE III Limb Scattering Ozone Retrieval Algorithm. Poster presentation, Spring AGU Meeting, Washington, D.C.
- Oikarinen, L., E. Griffioen, **R. Loughman**, O. Postlyakov, and A. Rozanov, 2001. Comparison of radiative transfer models for limb-viewing scattered sunlight measurements. Poster session, Fall American Geophysical Union (AGU) Meeting, San Francisco, California.
- Flittner, D., **R. Loughman**, D. Ward, R. McPeters, R. Veiga, M. Cisewski, J. Zawodny, and W. Chu, 2000. The possibility of ozone profiling with SAGE III limb scatter data. Poster session, Spring AGU Meeting, Washington, D.C.
- **Loughman, R.P.**, D.E. Flittner, and B.M. Herman, 1998. Scattering in the limb of a spherical-shell atmosphere as computed by a scalar radiative transfer model. Spring AGU Meeting, Boston, Massachusetts.

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### Selected Conference Presentations (continued)

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- Benner, D.C., V.M. Devi, G. Guelachvili, K.L. Thornhill, **R. Loughman**, and K.N. Rao, 1993. Spectroscopic constants of CS<sub>2</sub>. 48<sup>th</sup> Symposium on Molecular Spectroscopy, Columbus, Ohio.

### Funded Proposals as Principal Investigator and/or Institutional Lead

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- Inferring Ozone Profiles from SAGE III Limb Scattering Measurements, NASA Langley Research Center, \$80,809, February 2004 – February 2005.
- Radiance Tables for OMPS Limb Profiler Research, NOAA NESDIS (through CUNY, via the NOAA CREST grant), \$18,391, September 2005 – June 2006.
- Inferring Ozone Profiles from SAGE III Limb Scattering Measurements, NASA Langley Research Center, \$160,000, May 2006 – April 2008.
- Limb Scattering Research with SAGE III, Preparation for the OMPS Program, NASA Langley Research Center, \$247,691, September 2007 – September 2010.
- Developing Climate Data Records from the OMPS Limb Profiling Sensor, NASA Langley Research Center, \$50,994, May 2008 – May 2009.
- Developing Climate Data Records from the OMPS Limb Profiling Sensor, NASA Langley Research Center, \$66,114, August 2009 – August 2010.
- Plasma Measurements for Geotail: Science and Outreach at Hampton University, NASA, \$39,988, May 2008 – April 2012 (with one year no-cost extension, assumed from Dr. William Paterson in August 2010).
- Developing Climate Data Records from the OMPS Limb Profiling Sensor, NASA Langley Research Center, \$69,460, September 2010 – September 2011.
- Developing Climate Data Records from the OMPS Limb Profiling Sensor, NASA, \$40,000, June 2011 – June 2012.
- Forward Model Development and Aerosol Sensitivity Studies for the OMPS Limb Profiler Instrument, NASA Goddard Space Flight Center, \$114,292, June 2012 – June 2013.
- OMPS-LP Data Analysis Support, SSAI Sub-Contract, \$133,995, May 2013 – April 2014.
- OMPS-LP Data Analysis Support, SSAI Sub-Contract, \$143,909, May 2014 – April 2015.
- Development of Vertical Ozone Profile Dataset from the OMPS Limb Profiler Instrument on Suomi NPP, NASA, Hampton University Sub-Award \$56,863, June 2014 – May 2017 (PI: P.K. Bhartia, NASA Goddard Space Flight Center).
- OMPS-LP Data Analysis Support, SSAI Sub-Contract, \$121,280, May 2015 – April 2016.
- MFRSR Calibration Support, SSAI Sub-Contract, \$17,985, May 2015 – April 2016.
- OMPS-LP Data Analysis Support, SSAI Sub-Contract, \$87,906, May 2016 – April 2017.
- OMPS-LP Radiative Transfer Modeling and Retrieval Algorithm Support, SSAI Sub-Contract, \$154,124, May 2017 – February 2018.

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### **Funded Proposals as Principal Investigator and/or Institutional Lead (continued)**

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- Algorithm Development and Validation Towards an Improved Aerosol Extinction Profile Dataset from the Suomi NPP OMPS Limb Profiler, NASA Roses A.37 (The Science of TERRA, AQUA, and Suomi NPP), Hampton University sub-award \$110,610, May 2017 – April 2021 (PI: Ghassan Taha, USRA)
- OMPS-LP Radiative Transfer Modeling and Retrieval Algorithm Support, SSAI Sub-Contract, \$100,588, March 2019 – January 2020.
- OMPS-LP Radiative Transfer Modeling and Ozone Retrieval Algorithm Support, SSAI Sub-Contract, \$28,225, July 2021 – March 2022.
- Community Response Testing with the X-59 Quiet Supersonic Technology Aircraft, Sub-Contract with Harris Miller Miller and Hanson, Inc., Hampton University funding up to \$213,213, July 2021 – September 2023.
- Algorithm Development and Validation of the Aerosol Extinction Profile Dataset from the Suomi NPP OMPS Limb Profiler, NASA Roses A.52 (SUOMI NPP and JPSS Standard Products for Earth System Data Records), Hampton University Sub-Award \$155,436, Awarded July 2021 (PI: Ghassan Taha, USRA)
- OMPS-LP Radiative Transfer Modeling and Ozone Retrieval Algorithm Support, SSAI Sub-Contract, \$30,774, April 2022 – August 2022.

### **Selected Funded Proposals as Named Co-Investigator**

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- The Living, Breathing Planet (LBP), NASA Astrobiology Institute, June 2015 – May 2020 (PI: William Moore, Hampton University).
- Hampton University Center for Atmospheric Research and Education (CARE), NASA, August 2015 – July 2020 (PI: William Moore, Hampton University).
- CREST renewal, NOAA, September 2016 – August 2021 (PI: M. Patrick McCormick, Hampton University).
- OMPS-LP Radiative Transfer Modeling and Retrieval Algorithm Support, SSAI Sub-Contract, March 2018 – February 2019 (PI: Ernest Nyaku, Hampton University).
- REU Site: An immersive experience in atmospheric and planetary science research, NSF, August 2022 – July 2025 (PI: William Moore, Hampton University).

### **Professional Affiliations and Awards**

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- Member of the American Geophysical Union and the American Meteorological Society
- 2004: NASA Group Achievement Award (STS-107 SOLSE-2 Team)
- 1995 – 1998: Graduate funding from NASA's Earth System Science Fellowship Program

### **Programming skills**

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- FORTRAN and IDL (fluent), Matlab and Python (proficient), Unix shell scripts, C++ (familiar)

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### Academic and Professional Mentors

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B.S. Honors thesis: “Analysis of Fourier Transform and Tunable Diode Laser Absorption Spectra of 32S12C32S and 32S12C34S in the 1440 to 1552 cm<sup>-1</sup> Region, with Calculation of Molecular Constants”

Thesis advisor: Dr. D. Chris Benner

M.S. thesis: “A detailed numerical description of the solar aureole”

M.S. thesis committee: Drs. Benjamin M. Herman (director), Richard Schotland, and Rong Fu

Ph.D. dissertation: “A spherical-shell radiative transfer model for the calculation of limb radiances”

Ph.D. dissertation committee: Drs. Benjamin M. Herman (director), Richard Schotland, Rong Fu, Nilton Renno, and Jerome Maloney

Primary post-doctoral advisors: Drs. Richard McPeters, P.K. Bhartia, Jay Herman and Mr. Ernest Hilsenrath.

### Teaching Activities

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- Developed and taught the graduate Atmospheric Radiative Transfer course (APS 649), Spring 2006 - present.
- Developed and taught the graduate Atmospheric Measurements course (APS 750), Fall 2006 – 2010, 2013 - present.
- Co-taught the graduate Atmospheric Physics course (APS 745), Fall 2006.
- Co-taught graduate Professional Writing and Presenting (APS 700), 2010 – present.
- Taught the undergraduate Weather and Climate course (APS 101), 2011 - present.
- Developed and taught the undergraduate Atmospheric Physics (SEA 345), Spring 2004 and Spring 2005.

### Notable Departmental Development Activities as Chairman (APS, 2010-present)

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- Collaborating with CAS Co-Directors to coordinate and strengthen the APS academic and research programs, which involve five professors and approximately ten research faculty members.
- Creating five APS departmental committees to coordinate essential departmental functions: Curriculum and Testing; Recruiting, Outreach and Special Programs; Seminars and Presentations; Long-Range Planning; and Facilities and Maintenance.
- Leading Hampton University’s successful application for UCAR membership (in 2016).
- Facilitating graduate student population growth, from 8 students in 2010 to as many as 17 students.

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### Academic Advising Activities

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Service as primary research advisor for graduate students:

- Dr. Ernest Nyaku (2010 – 2016), currently employed by SSAI, Inc., resident at NASA Goddard Space Flight Center, as a Research Scientist.
- Dr. Alok Shrestha (2012 – 2018), currently employed by NASA Ames Research Center as a Senior Engineer in the Earth Sciences Division.
- Dr. Surendra Bhatta (2016 – 2021), currently employed by Morgan State University / GESTAR, resident at NASA Goddard Space Flight Center, as a Research Associate.
- Mr. Nicholas Ernest (2022 – present)
- Mr. Kevin Herrera (2022 – present)

Service as research committee member for graduate students:

- Served as Ph.D. committee member for Drs. Charles Hill, Kevin Leavor, Robert Lee, and Steven Buckner, and for current Ph.D. candidate Shuang Xu.
- Served as M.S. committee member for graduate Ariana Atwell

Service as primary research advisor for undergraduate students (each student's future academic or professional position is given in parenthesis, if known):

- 2004-2005: Advised Kristie Lee, Sher'rie Bacon and Roshawnda Walker.
- 2009 Summer REU Program: Advised Jordan Foley (U. of Maryland, Meteorology), David Auslender (U.S. Coast Guard) and Darel Davidson (Accenture Technology Consultant).
- 2010 Summer REU Program: Advised Jonathan Geasey (Hampton University, APS) and Nicolas Carletta (U. of North Dakota, Meteorology).
- Fall 2010 – Spring 2011: Advised Anderson Hayes (Hampton University, Physics) and Brent Gills (Florida A&M, Physics).
- 2011 Summer CREST Undergraduate Research Experience (CURE) Program, and Fall 2011 – Spring 2012: Advised Simone Hyater-Adams (U. of Colorado-Boulder, Physics Education).
- 2012 Summer CURE Program: Advised Ricardo Uribe (Peace Corps) and Curtis Driver.
- 2013 Summer CURE Program: Advised Brent McBride (U. of Maryland – Baltimore County, Physics).
- 2014 Summer CURE Program: Advised Ryan McCabe (Hampton University, APS) and Ashley Orehek (FEMA Corps Team Member).
- 2015 Summer CURE Program: Advised Nelson Ojeda (Warner Robins Air Logistics).
- 2016 Summer CURE Program and Fall 2016: Advised Baseemah Rucker (City College of New York).
- 2018 Summer CURE Program: Advised Caleb Cyres (Equitable, Actuarial Intern).
- 2019 Summer CURE Program: Advised Albert Kodua (NASA Goddard Space Flight Center).

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## Professional Service

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Internal Hampton University service:

- Served as Department Representative for Research Day (2007 – 2010)
- Served as Department Graduate Program Coordinator (2008 – present)
- Served as Department Graduate Council Representative (2009 – present)
- Served as Director of the CURE (CREST Undergraduate Research Experience) program (2011 – present)
- Served as an elected member of the Academic Personnel Committee (2013 – 2015)
- Served as Institutional Animal Care and Use Committee (IACUC) member (2013 – 2018)
- Served as Faculty Mentor for new faculty members Dr. Shawn Dash (2014 – 2015) and Dr. Romeo Awi (2017 – 2018)
- Served as a member of the Committee on Board Relationships (2016 – 2021)

Representation of Hampton University for external bodies:

- Virginia Air and Space Center, Foundation Board of Directors (2010 – 2019)
- National Institute for Aerospace, Technical Advisory Council (2010 – present)
- Virginia Space Grant Consortium, Advisory Council and Panelist for the Undergraduate Fellowship, Graduate Fellowship and New Investigator program reviews (2010 – present)
- UCAR Member Representative (2017 – present)

Service on external committees:

- NASA OMPS Science Team Member (2006 – present).
- Planning Committee member for the 4<sup>th</sup> Limb Workshop, Virginia Beach, 2007.
- Scientific Committee member for the 7<sup>th</sup> Limb Workshop, Bremen, Germany, 2013.
- Served as the external examiner for Dr. Adam Bourassa's dissertation defense (University of Saskatchewan, 2007).
- Served on several proposal review panels for NASA (including the SCIS, IIP, ESUSPI and ACPS programs), and provided reviews for NSF's HBCU-UP program.
- Served as a session convener for scientific meetings (AGU, COSPAR).
- Provided peer reviews for numerous academic journals, including Atmospheric Measurement Techniques, Applied Optics, Bulletin of the American Meteorological Society, Remote Sensing, Optics Letters, Optics Express, the Journal of Geophysical Research, Advances in Space Research, the Canadian Journal of Physics, and the Journal of Quantitative Spectroscopy and Remote Sensing.

(Revised: June 2022)