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EDUCATION

- 03/2004-10/2008:** Ph.D. in Atmospheric Sciences, Institute of Physics and Meteorology, University of Hohenheim, Stuttgart, Germany. *Magna cum laude* (certified on Feb 17, 2009). Thesis: A mobile, scanning eye-safe lidar for the study of atmospheric aerosol particles and transport processes in the lower troposphere.
- 07/2002-03/2004:** Master of Technology (M. Tech) in Atmospheric Physics, University of Pune, India. Project work performed at the Indian Institute of Tropical Meteorology, Pune, India. Master Thesis: LIRAD (Lidar and RADiometer) sounding of the atmospheric aerosols and pre-cursor gases over Pune.
- 07/2000-06/2002:** Master of Science (M.Sc.) in Physics, Department of Physics, University of Kalyani, West Bengal, India. Specialization: Advanced Electronics.
- 04/1997-06/2000:** B.Sc. with Honors in Physics (Chemistry and Mathematics as other subjects), Department of Physics, St. Paul's Cathedral Mission College, University of Calcutta, India.

PROFESSIONAL EXPERIENCES

- 09/2018-Present:** Assistant Professor, Department of Geosciences (Atmospheric Science Group), Texas Tech University, Lubbock, TX, USA.
- 07/2017-08/2018:** Assistant Research Professor, Graduate Faculty Member, Department of Meteorology and Atmospheric Science, The Pennsylvania State University, University Park, PA, USA.
- 09/2015-07/2017:** Research Associate, Graduate Faculty Member, Department of Meteorology and Atmospheric Science, The Pennsylvania State University, University Park, PA, USA. Project: ACT–America: Atmospheric Carbon and Transport – America.
- 02/2013-08/2015:** Research Associate, Department of Environmental Sciences, University of Virginia, Charlottesville, VA, USA. Project: MATERHORN (Mountain Terrain Atmospheric Modeling and Observations Program).
- 02/2012-01/2013:** Postdoctoral Research Associate, Laboratoire de Météorologie Dynamique (LMD), CNRS-Ecole Polytechnique, Paris, France. Project: ICOS (Integrated Carbon Observing System).

- 10/2010-01/2012:** Postdoctoral Research Associate, Laboratoire des Sciences du Climat et de l'Environnement (**LSCE**), CEA, Paris, France. Project: CO2-MEGAPARIS (Quantification des emissions de CO2 en Ile de France).
- 11/2008-04/2010:** Postdoctoral Research Associate, Institute of Physics and Meteorology, **University of Hohenheim**, Stuttgart, Germany. Project: COPS (Convective and Orographically-induced Precipitation Study).

RESEARCH EXPERTISE

- **Boundary layer meteorology:** Investigation of boundary layer features over diverse land surface (arid, semi-arid, tropics, inland vs. coastal, urban-sub-urban-rural environments) in different spatial scales (local-regional-continental scales), on diverse timescales (diurnal-synoptic-seasonal, inter-annual) and over different topographical regions (flat terrain, mountaintops, slopes, valleys) using active (e.g. lidar, sodar, ceilometer), passive (e.g. MWR) and soundings (e.g. tethered balloon, rawinsondes, hexacopter, very tall tower).
- **Lidar remote sensing of state variables and tracers:** Vertically-pointing and scanning lidar remote sensing technology for aerosols, temperature, wind, water vapor, O₃; Development of novel data analyses techniques (e.g., boundary layer height estimation, lidar signal inversion, turbulence structure retrievals).
- **Turbulence:** Fluxes using tower-based micro-meteorological measurements (i.e. Eddy Covariance Systems) and airborne measurements; Profiling of turbulence features combining ground-based lidars, sodar; spatial heterogeneity in turbulence features over flat and mountainous terrain as well as urban, rural and semi-urban sites; Surface layer turbulence features using tower-based measurements.
- **Mountain meteorology:** Boundary layer features over complex mountainous areas (arid and sub-humid regions) of different scales (low mountaintops < 1500 m MSL, tall mountains > 2500 m MSL); Impact of thermally driven circulations (up/down slope-valley flows, gap flow) and their impact on tracers (aerosol, CO, CO₂, O₃ etc.) in mountain-valley atmospheres; Impact of mountain ridges in governing spatial variability of convective boundary layer features (e.g. terrain following, independent) and turbulence kinetic energy; Convective and orographically-induced precipitation processes, Pre-convective and convective processes including convection initiation.
- **Carbon cycle:** Measurement and analyses of atmospheric greenhouse gases, land-surface interaction and effect on tracer distributions in the lower troposphere, transport processes in the lower troposphere during fair and synoptically active environment; Exchange of carbon and water between the biosphere and the atmosphere over land; CO₂ distribution over megacities.
- **Atmospheric aerosols:** Physiochemical properties of aerosol particles using ground based, airborne, satellite borne measurements; Air pollution; Spatiotemporal variability in aerosol optical depth and size distributions, Impact of boundary layer depth on aerosol distributions; Roles of aerosols in near-surface fog, convection initiation, and cloud formation; Aerosol emission and transport processes.

TEACHING & PEDAGOGIC EXPERIENCES

Courses taught in Texas Tech University: ATMO 1300-005 (3 credit UG course): Introduction to Atmospheric Science

Courses taught before 09/2018: Boundary layer meteorology, Mountain meteorology, Instruments and Field campaigns at the University of Virginia and Micrometeorology at the Pennsylvania State University; Introduction to Micrometeorology (Guest Lecturer) Fall-2016 at the Pennsylvania State University; Similarity Theory and Turbulence kinetic energy and dynamic instability relationship; **Course** EVAT 5500-100, Spring 2014: Boundary layer mixing and turbulence: a lidar perspective; Mountain Meteorology in Fall 2013. Topics: Diurnal mountain winds, conducting field experiments, Air pollution in mountains, Climate change in mountainous regions. Cold air damming, field campaign, climate change in mountainous areas; Mean boundary layer characteristics, Turbulence variances, Turbulence closure, Convective boundary layer, Stable boundary layer.

STUDENT MENTORING

- **Graduate students (Ph.D. and MS level) co-supervised**
 - **Temple R. Lee:** Ph.D. (Environmental Sciences) at the Department of Environmental Sciences at the University of Virginia, Charlottesville, VA. Provided guidance for research papers and dissertation work between 02/2013 and 08/2015. Title of Ph.D. Dissertation: The impact of planetary boundary layer dynamics on mountaintop trace gas variability.
 - **Mark Sghiatti,** M.Sc. (Environmental Sciences) at the Department of Environmental Sciences at the University of Virginia, Charlottesville, VA. Provided guidance for dissertation work between 08/2013 and 08/2015. Title of M.Sc. Dissertation: The spatial variability and structure of turbulent kinetic energy in the convective boundary layer over an isolated mountain.
 - **Lamia Ammoura, M.Sc.** (M2, Enseignant de Sciences Physiques), University of Paris VI: Thesis supervised at the Laboratoire des Sciences du Climat et de l'Environnement, CEA, Saclay; Title of Dissertation: Atmospheric boundary layer height variability around Paris megacity.
- **Other students (UG/Diploma level) supervised**
 - **Marcel Briguglio:** Summer-2018 REU student visiting from Department of Civil and Environmental Engineering, Rowan University, NJ in Department of Meteorology and Atmospheric Science at the Pennsylvania State University. Thesis: Spatial Variability in Greenhouse Gas Concentrations over Three Regions in the Eastern US.
 - **Benjamin Yang:** 2018-19: Undergraduate researcher in the department. Research topic: Exploring boundary layer versus free tropospheric tracers from airborne measurements in winter under shallow boundary layer scenarios.
 - **Kylie Hoffman:** 2017 Fall Internship Project (MEA) Student at the Department of Marine, Earth and Atmospheric Sciences at the North Carolina State University. Research topic: Airborne lidar investigation of atmospheric boundary depths during frontal passages.

- **Erika Algaard:** Undergraduate researcher for the ACT-America Project at the Pennsylvania State University working on the synthesis of field campaign data sets
- **Hanna Haas:** Undergraduate researcher for the ACT-America Project at the Pennsylvania State University working on the field campaign organization, meteorological forecasts for research flights.
- **Quinn Lease:** Senior undergraduate researcher at the Department of Meteorology and Atmospheric Science at the Pennsylvania State University for his research on ACT-America project.
- **Kylie Hoffman:** Summer-2017 REU student from North Carolina State University in Department of Meteorology and Atmospheric Science at the Pennsylvania State University. Research topic/report: Do Synoptic Weather Patterns Have an Effect on Atmospheric Boundary Layer Depths?
- **Lyndsie Slater:** Summer-2016 REU student from Texas Tech University at the Department of Meteorology and Atmospheric Science at the Pennsylvania State University. Research topic/report: How Carbon Dioxide Variability Changes with a Synoptic Weather Event?
- **Ann Rodden:** Department of Meteorology, The Pennsylvania State University. Analyzing weather events during the ACT winter field campaign 2017.
- **Kelsey Everard, B.Sc.** Environmental Sciences. Supervised her works between 08/2014 and 04/2015 for her Distinguished Major Program at the Department of Environmental Sciences, University of Virginia, Charlottesville, VA. Dissertation title: Spatiotemporal variability in cloud base height and cloud fraction across the Virginia Blue Ridge Mountains.
- **Ralph Kurash:** M.Sc. level student, Part time summer job at the University of Hohenheim, Germany.

COMPLETE LIST OF PUBLICATIONS

1. Lee, T.R., De Wekker, S.F.J., and **Pal, S.**, 2018: The Impact of the Afternoon Planetary Boundary-Layer Height on the Diurnal Cycle of CO and CO₂ Mixing Ratios at a Low-Altitude Mountaintop, **Boundary-Layer Meteorology**, 168(1), 81-102. doi: 10.1007/s10546-018-0343-9
2. Lee, T.R., and **Pal, S***, 2017: On the potential of 25 years (1991-2015) of rawinsonde measurements for elucidating key climatological and spatiotemporal patterns of afternoon boundary layer depths over the contiguous US, **Advances in Meteorology**, Article ID 6841239, 19, <https://doi.org/10.1155/2017/6841239>
3. **Pal, S.**, Lee, T.R., and de Wekker, S.F.J., 2017: Combined impact of boundary layer height and near-surface meteorological conditions on the CO diurnal cycle at a low mountaintop site: Case studies using simultaneous lidar and in situ observations, **Atmospheric Environment**, 164, 165-179, <https://doi.org/10.1016/j.atmosenv.2017.05.041>.
4. **Pal, S.**, De Wekker, S.F.J., Emmitt, G.D., 2016: Spatial variability of the atmospheric boundary layer heights over a low mountain region: Cases from MATERHORN-2012 field experiment, **Journal of Applied Meteorology and Climatology**, DOI: <http://dx.doi.org/10.1175/JAMC-D-15-0277.1>.
5. **Pal, S.**, 2016: On the factors governing water vapor turbulence profiles in the convective boundary layer over land: Concept and data analyses methodology using ground-based lidar

- measurements, **Science of the Total Environment**, 554-555, 17–25, doi: <http://dx.doi.org/10.1016/j.scitotenv.2016.02.147>.
6. Koffi, E. N., Bergamaschi, P., Karstens, U., Krol, M., Segers, A., Schmidt, M., Levin, I., Vermeulen, A. T., Fisher, R. E., Kazan, V., Klein Baltink, H., Lowry, D., Manca, G., Meijer, H. A. J., Moncrieff, J., **Pal, S.**, Ramonet, M., and Scheeren, H. A., **2016**: Evaluation of the boundary layer dynamics of the TM5 model over Europe, **Geoscientific Model Development**, 9, 3137-3160, doi:10.5194/gmd-9-3137-2016.
 7. **Pal, S.**, and Haeffelin, M., **2015**. Dynamics and forcing mechanisms governing diurnal and seasonal variability in the atmospheric boundary layer depths over a suburban site near Paris: A five-year long lidar-based study, **Journal of Geophysical Research-Atmospheres**, 120, doi:10.1002/2015JD023268.
 8. **Pal, S.**, Lopez, M., Schmidt, M., Ramonet, M., Xueref-Remy, I., Ciais, P., **2015**. Investigation of the atmospheric boundary layer height variability and its impact on the ²²²Rn concentration over a rural background site in France, **Journal of Geophysical Research-Atmospheres**. doi: 10.1002/2014JD022322.
 9. Lee, T.R., De Wekker, S.F.J., **Pal, S.**, Andrews, A., Kofler, J., **2015**. Meteorological controls on the diurnal variability of carbon monoxide mixing ratio at a mountaintop monitoring site in the Appalachian Mountains, **Tellus B** 2015, 67, 25659.
 10. Behrendt, A., Wulfmeyer, V., Hammann, E., Muppa, S., **Pal, S.** **2015**. Profiles of second- to fourth-order moments of turbulent temperature fluctuations in the convective boundary layer: First measurements with rotational Raman lidar. **Atmospheric Chemistry and Physics**, 15, 5485-5500.
 11. Fernando, H. J. S. and co-authors (including **Pal, S.**), **2015**. The MATERHORN – Unraveling the intricacies of mountain weather, **Bulletin of American Meteorological Society**, 96, 1945-1967.
 12. **Pal, S.**, Lee, T.R., Phelps, S., De Wekker, S.F.J., **2014**. Impact of atmospheric boundary layer depth variability and wind reversal on the diurnal variability of aerosol concentration at a valley site. **Science of the Total Environment**, 496, 424–434.
 13. **Pal, S.**, **2014**. Monitoring depth of shallow atmospheric boundary layer to complement lidar measurements affected by partial overlap, **Remote Sensing**, 6(9), 8468-8493.
 14. **Pal, S.**, Haeffelin, M., and Batchvarova, E., **2013**. Exploring a geophysical process-based attribution technique for the determination of the atmospheric boundary layer depth using aerosol lidar and near surface meteorological measurements, **Journal of Geophysical Research-Atmospheres**, 118, 1–19.
 15. Lac C., Donnelly, R.P., Masson, V., **Pal, S.**, Riette, S., Donier, S., Queguiner, S., Tanguy, G., Ammoura, L., Xueref-Remy, I., **2013**. CO₂ Dispersion modelling over Paris region within the CO₂-MEGAPARIS project, **Atmospheric Chemistry and Physics**, 13, 4941–4961.
 16. Cimini, N., Angelini, F., Dupont, J.-C., **Pal, S.**, Haeffelin, M. **2013**. Microwave radiometer measurements of mixing layer height, **Atmospheric Measurement Techniques**, 6, 2941–2951.
 17. **Pal, S.**, Xueref-Remy, I., Ammoura, L., Chazette, P., Gibert, F., Royer, P., Dieudonné, E., Dupont, J.C., Haeffelin, M., Lac, C., Lopez, M., Morille, Y., Ravetta, F., **2012**. Spatio-temporal variability of the atmospheric boundary layer depth over the Paris agglomeration: An assessment of the impact of the urban heat island intensity, **Atmospheric Environment**, 63, 261-275.

18. **Pal, S.**, Devara P.C.S., **2012**. A wavelet-based spectral analysis of long-term time series of optical properties of aerosols obtained by lidar and radiometer measurements over an urban station in Western India, **Journal of Atmospheric and Solar Terrestrial Physics**, 84, 75-87.
19. Behrendt, A., **Pal, S.**, Aoshima, F., Bender, M., Blyth, A., Corsmeier, U., Cuesta, J., Dick, G., Di Girolamo, P., Dorninger, M., Flamant, C., Huang, Y., Gorgas, T., Kalthoff, N., Khodayar, S., Wulfmeyer, V., **2011**: Observation of Convection Initiation Processes with a Suite of State-of-the-Art Research Instruments during COPS IOP8b, **Quarterly Journal of Royal Meteorological Society**, 137, 81-100.
20. Behrendt, A., **Pal, S.**, Wulfmeyer, V., Valdebenito, A. M., Lammel, G., **2011**: A novel approach for the characterisation of transport and optical properties of aerosol particles near sources Part I: Measurement of particle backscatter coefficient maps with a scanning UV lidar, **Atmospheric Environment**, 45, 2795-2802.
21. Valdebenito, A. M., **Pal, S.**, Behrendt, A., Wulfmeyer, V., Lammel, G., **2011**: A novel approach for the characterisation of transport and optical properties of aerosol particles near sources - Part II: High-resolution chemistry transport model and its assessment using lidar measurements, **Atmospheric Environment**, 45, 2981-2990.
22. Bhawar, R., Di Girolamo, P., Summa, D., Flamant, C., Althausen, D., Behrendt, A., Kiemle, C., Bosser, P., Cacciani, M., Champollion, C., Di Iorio, T., Herold, C., Mueller, D., **Pal, S.**, Riede, A., Wirth, M., Wulfmeyer, V., **2011**: Water Vapour Intercomparison Effort in the Frame of the Convective and Orographically-Induced Precipitation Study: Airborne-to-Ground-based and airborne-to-airborne Lidar Systems. **Quarterly Journal of Royal Meteorological Society**, 137 325-348.
23. Wulfmeyer, V., and co-authors (including **Pal, S.**) **2011**: The Convective and Orographically Induced Precipitation Study (COPS): An overview of the field phase and first highlights. **Quarterly Journal of Royal Meteorological Society**, 137, 3-30.
24. **Pal, S.**, Behrendt, A., Wulfmeyer, V., **2010**: Elastic-backscatter-lidar-based characterization of the convective boundary layer and investigation of related statistics, **Annales Geophysicae**, 28, 825-847.
25. Wulfmeyer, V., **Pal, S.**, Turner, D. D., Wagner, E., **2010**: Can the water vapor Raman lidar resolve profiles of turbulent variables in the convective boundary layer? **Boundary Layer Meteorology** 136 253-284.
26. **Pal, S.**, Behrendt, A., Bauer, H., Radlach, M., Riede, A., Schiller, M., Wagner, G., Wulfmeyer, V., **2008**: 3 -dimensional observations of atmospheric variables during the field campaign COPS, **IOP: Earth and Environmental Sciences**, 1 012031, ISSN 1755-1307 (Print), ISSN 1755-1315 (Online).
27. Groenemeijer, P., Barthlott, C., Behrendt, A., Corsmeier, U., Handwerker, J., Kohler, M., Kottmeier, C., Mahlke, H., **Pal, S.**, Radlach, M., Trentmann, J., Wieser, A., Wulfmeyer, V., **2008**: Observations of kinematics and thermodynamic structure surrounding a convective storm cluster over a low mountain range. **Monthly Weather Review** 137 585-602.
28. Behrendt, A., Wulfmeyer, V., Riede, A., Wagner, G., **Pal, S.**, Bauer, H., Radlach, M., Späth, F., **2009**: 3-Dimensional observations of atmospheric humidity with a scanning differential absorption lidar **Proc. SPIE** 7475, 74750L (2009); doi:10.1117/12.835143, **ISBN: 9780819477804**.
29. Behrendt, A., Wagner, G., Petrova, A., Shiler, M., **Pal, S.**, Schaberl, T., Wulfmeyer, V., **2005**: Modular lidar systems for high-resolution 4-dimensional measurements of water vapor,

temperature, and aerosols, **Proc. SPIE** 5653, Lidar Remote Sensing for Industry and Environmental Monitoring V, 220; doi:10.1117/12.579139. **ISSN 0277-786X, eISSN 1996-756X.**

CONFERENCE CONTRIBUTIONS

Complete list available at: <https://sites.google.com/view/sandippal-ttu/publications/non-peer-reviewed-articles-published-in-the-proceedings>

Published more than 150 conference papers in: International Laser Radar Conference (ILRC), International Symposium of Tropospheric Profiling (ISTP), American Meteorological Society Annual Meeting (AMS), American Geophysical Union Fall Meeting (AGU), European Geosciences Union Assembly (EGU), International Symposium for the Advancement of Boundary-Layer Remote Sensing (ISARS), International Conference on Alpine Meteorology (ICAM), Others (NACP, ICDC, IWGGMS, ACCENT, DACH, SPIE, ACTRIS, ARM Science, DACA, GMAC).

FUNDING/GRANTS

- **Submitted:** NASA-ROSES proposal (\$800,000), Project: Getting Terrestrial carbon fluxes right for the right reason: A synthesis of flux tower observations and the MstMIP model suite. Role **Co-Investigator, Status: Not funded.**
- **Awarded:** A project proposal submitted to the Director of Science Education and Public Outreach for Science Outreach Internal Funding Opportunity at University of Virginia (\$ 10 K). Project title: Understanding the influence of meteorological processes on the near-surface air pollution. Role: **Principal Investigator.**
- **Accepted: NRC research proposal** (\$80,000) Project: On the factors governing vertical variability of water vapor turbulence features in the quasi-stationary convective boundary layer over land surface, Submitted to National Research Council. Got Recommended by National Research Council of National Academy of Sciences, USA. Scored 86 %. Role: **Principal Investigator.**
- **Awarded:** Internal funding at the Department of Environmental Sciences, University of Virginia for the Fiscal Year 2014-15 (\$2,000). A grant for purchasing a state of the art particle counter system has been received to support teaching and research in the department. Role: **Co Investigator**
- **Awarded: International Laser Radar Conference Travel Grant** (\$2,000), Nara, Japan, 2006: Awarded by the International Coordination-group for Laser Atmospheric Studies (ICLAS) of the International Radiation Commission, International Association of Meteorology and Atmospheric Physics.

MAJOR HONORS & AWARDS

- **Travel Grant Award:** Selected presenter for lightning talk: \$200 Travel Grant Award in 2017; Awarded by the Director, Office of Postdoctoral Affairs, The Penn State University.

- **Young Scientist Award** in 7th COPS workshop, Strassbourg, France, 2008, awarded by COPS International Scientific Steering Committee (ISSC of COPS) for outstanding performance in COPS project.
- **Recognized reviewer of the Elsevier journal** Urban Climate, Science of the Total Environment, Luminescence, Elsevier, Amsterdam, The Netherlands.
- **Best Poster Award** in DACH conference, Hamburg, Germany, 2007, organized by German Meteorological Society (DMG) for presenting four posters in a row on four different topics during a single session.
- **New Hot Paper in the field of Geosciences:** Co-authored a paper published in a high-impact journal (Quarterly Journal of the Royal Meteorological Society) on the results obtained from COPS Field Campaign in 2007 in Europe, considered as new Hot Paper in Geosciences by Thompson Reuters. <http://archive.sciencewatch.com/dr/nhp/2011/11sepnhp/11sepnhpWulf/>

SYNERGISTIC ACTIVITIES & SELECTED SERVICE

Reviewer of research proposals and grant applications:

- National Science Foundation
- Research Grant Council of Hong Kong
- EU-COST Action proposal, Federal Department of EAER (Switzerland)
- Project Proposals for New Horizon Travel Grants at the University of Virginia

Editorial Board Member

- Advances in Meteorology (2015-2017)
- Frontiers in Atmospheric Science (2015- Present)

Journal referee

More than **50 international journals**: List of few recent journals: Journal of Geophysical Research-Atmospheres, Journal of Applied Meteorology and Climatology, Journal of Atmospheric and Oceanic Technology, Meteorology and Atmospheric Physics, Optics Express, Quarterly Journal of Royal Meteorological Society, Environmental Science and Technology, Atmospheric Chemistry and Physics, Atmospheric Measurement Techniques, Atmospheric Environment, Atmospheric Research, Boundary Layer Meteorology.

Professional membership:

- Optical Society of America
- American Meteorological Society (AMS, Associate member)
- American Geophysical Union (AGU)
- International Association for Urban Climate (IAUC)
- Indian Aerosol Science and Technology Association (Life Member)

Other Community and Departmental Services

- Reviewer and Judge: The 14th Annual Huskey Research Exhibition-2014, University of Virginia
- Multi-disciplinary research oriented activities (e.g. Chalk-Talk, Post-doctoral day 2013, 2014, 2015) led by UVA- Postdocs

- Reviewer and Judge: The 13th Annual Huskey Research Exhibition-2013, University of Virginia,
- Reviewer and Judge: Enviro-Day: Annual Research Symposium, Department of Environmental Sciences at the University of Virginia
- Referees for Graduate Students at the Department of Environmental Sciences, University of Virginia

Outreach Activities

- Demonstration of radiosonde launch to the middle and high-school students during COPS, Black Forest, Germany;
- Kinder-Uni: Demonstration of meteorological instruments to school students at the University of Hohenheim, Stuttgart, Germany
- Eiffel Tower: CO₂ mixing ratio measurements were carried out on the top of the Eiffel tower (310 m). Demonstration of the system to the tourists during calibration once a month.
- Highlights of Physics 2004: Science fair at Stuttgart downtown for school students and public: Demonstration of laser and lidar systems for meteorological research.
- Demonstration of radiosounding system to school students. Western Albemarle High School students, Popular Talk at Albemarle High School
- Science Fair mentorship program initiated by the University of Virginia Faculty by Vice President for Research within the university outreach activities
- Popular Talk at Park Forest Elementary School (second graders): What is weather? Spet 2017.

FIELD PROGRAMS & EXPERIENCES

- **ACT-America summer 2016, winter and fall 2017, and spring 2018 Flight Campaigns (Shreveport, LA; Lincoln, NE; Wallops, VA)**: Atmospheric Carbon and Transport-America for investigating spatiotemporal variability in GHG concentrations and thermodynamics.
- **MATERHORN** (Mountain Terrain Atmospheric Modeling and Observations) **FOG campaign, winter 2014-15**: Physical processes during Fog formation and dissipation in mountainous terrain.
- **MATERHORN-X2** (May 2013, Dugway Proving Ground, Utah, USA): The Mountain Terrain Atmospheric Modeling and Observations (MATERHORN) Program: The Second Field Experiment.
- **CO2-MEGAPARIS 2011** (March 2011, Paris, France): A multi-lidar-based experimental investigation of the variability of the atmospheric boundary layer height in the Paris megacity.
- **FLUXPAT 2009** (September 2009, Dueren, Germany): A national field campaign to investigate the 3-dimensional field of water vapor over different agricultural field near Dueren, Germany.
- **COPS-2007**: (June-August, 2007, Black Forest Mountain, Germany): An international field campaign for Convective and Orographically Induced Precipitation Study (COPS) from Jun-Aug 2007 in the region of south west Germany and eastern France Black forest.
- **PRINCE 2006**: (June-July 2006, Black Forest Mountain, Germany): Precipitation Identification and tracking of convective cells, Location: Hornisgrinde (1182 m ASL) located in Black forest in south-west Germany, June 2006.
- **BW-PLUS Field campaign 2005** (September, 2005, Mettingen, Germany): Aim: Three-dimensional measurements of aerosol flows close to a source (livestock farm) at Mettingen, a flat terrain in Northern Germany with an eye-safe scanning aerosol lidar system.

- **Highlights of Physics 2004** (June 2004, Stuttgart, Germany): Experiment with a vertically-looking elastic-backscatter lidar (at 1064 and 532 nm) mainly for exploration of the convective boundary layer processes in different times of the day over an urban region.

INSTRUMENTS DEVELOPMENT & APPLICATIONS

Ground-based vertically-pointing Ozone differential absorption lidar (DIAL); Mobile eye-safe scanning aerosol lidar for the determination optical properties of aerosols; Scanning rotational Raman lidar for tropospheric temperature field; Scanning water vapor DIAL; Ground-based Doppler lidar for wind measurements; Data analyses and retrieval for Multi-functional Fiber Laser Lidar (MFLL) for columnar CO₂ content; Numerous compact lidar systems designed by Leosphere (ALS 450, ALS300, Doppler lidar); Ceilometers (CT12K, CL31); Particle counter; X-Band radar; Eddy Covariance; MICROTOPS; Viasala meteorological sensors; PICARRO cavity ring down spectrometer; Meteorological instruments (tower based); Rawinsonde; Tethersonde; Maintenance of long-term tower-based weather stations and flux towers.