Gerard van Harten

Curriculum vitae

Jet Propulsion Laboratory
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Scientist in remote sensing instrumentation, operating at the interface between science and engineering.

Education

- **PhD**, Astronomy, Leiden University — 2014
  Dissertation: "Spectropolarimetry for planetary exploration"
  Advisors: Prof. dr. Christoph U. Keller, Dr. Frans Snik
- **MSc**, Astrophysics, Utrecht University — 2010
- **BSc**, Physics and Astronomy, Utrecht University — 2009

Employment History

- **Jet Propulsion Laboratory**
  - Scientist — 2017 — present
    Projects: MAIA, AirMSPI, AirMSPI-2, HiMAP, CLARS-FTS
  - Postdoctoral Scholar — 2015 — 2017
    Advisor: Dr. David J. Diner
- **SRON Netherlands Institute for Space Research**
  - Postdoctoral Scholar — 2014 — 2015
    Advisors: Dr. Martijn Smit, Dr. Otto Hasekamp

Research Experience

- **Multi-Angle Imager for Aerosols (MAIA) instrument development**
  - Polarimetric error budget management.
  - Instrument simulations and sensitivity studies in support of engineering decisions.
  - Onboard calibrator design, prototyping and characterization.
  - Polarimetric component characterization and modeling: photoelastic modulators, quarter-wave retarders, polarizers, diffusers.
  - Design, documentation, and execution of on-ground and in-flight instrument calibration and validation.
- **Airborne Multiangle SpectroPolarimetric Imager-2 (AirMSPI-2) instrument development**
  - Onboard polarization validator design, characterization, and data implementation.
- **AirMSPI data acquisition, processing, delivery, and science product development**
  - Field team lead: flight planning, instrument operations, data processing, quality checking, hardware and software repairs.
  - Management and scheduling of level 1 data checkout, delivery and documentation.
  - Level 2 aerosol and cloud product validation and comparison with remote sensing and in-situ data.
  - Level 2 data checkout, delivery and documentation.
- **AirMSPI instrument characterization**
  - On-ground polarimetric calibration and validation at 10^{-3} level.
  - Implementation of in-flight radiometric and polarimetric calibration.
  - Radiometric and polarimetric in-flight data comparisons with RSP, SPEX airborne, and AirHARP.
  - Instrument simulation and error analysis.

- High-resolution Imaging Multiple-species Atmospheric Profiler (HiMAP) instrument development
  - Trade study for spectrally resolved imaging polarimetry from UV—NIR
  - Design and characterization of metasurface-based imaging spectropolarimeter
  - Polarimetric instrument calibration using AirMSPI's Polarization State Generator-2
- California Laboratory for Atmospheric Remote Sensing - Fourier Transform Spectrometer (CLARS-FTS) instrument development
  - Adding polarimetric capability to Fourier transform spectrometer
  - Development and application of polarimetric calibration source
  - Mueller matrix modeling and experimental validation of scanning mirror polarimetric response
- SPEX instrument development
  - Design, construction, calibration and commissioning of ground-based SPEX instrument.
  - Ground-based sky measurements and aerosol retrievals.
  - Data processing software development.
  - Prototype satellite instrument calibrations, including absolute polarimetric calibration at 10^{-3} level.
  - Construction and characterization of partially polarized calibration stimulus.
  - Instrument design optimization: athermalization and widefielding.
  - Instrument simulation and error analysis.
- Ultra-broadband spectropolarimetry
  - 300—2500 nm full-Stokes stepped retarder polarimeter add-on for the X-shooter spectrograph on the 8-m Very Large Telescope: design, construction, calibration.
  - 450—900 nm full-Stokes ferro-electric liquid crystal-based polarimetric integral field unit for the ExPo instrument on the 4-m William Herschel telescope: design, construction, calibration, commissioning.
- Miscellaneous projects
  - Modeling of SCHIAMACHY's in-flight mirror contamination.
  - Development of spectroscopic Mueller matrix ellipsometer, based on liquid crystal variable retarders.
  - Mueller matrix ellipsometry and modeling of aluminum mirrors and twisted nematic liquid crystals.
  - Design and characterization of broadband polarization scramblers.
  - Modeling and experimental verification of polarized spectral fringes in waveplates.
  - Development of ferro-electric-liquid-crystal-based circular polarimeter for remote sensing of biomarkers.
  - Development of live demonstration setup for remote sensing of particulate growth using SPEX.
  - iSPEX optical design and iPhone app development.

Awards

- JPL Voyager Award (2019)
  For excellence in leading the development of polarimetric system and calibrations for the Multi-Angle Imager for Aerosols
- JPL Team Award (2019)
  For the MAIA Project Critical Design Review team
- NASA Group Achievement Award (2019)
  For the ObseRvations of Aerosols above CLouds and their intEractionS (ORACLES) campaign team
- JPL Team Award (2018)
  For the MAIA Project Preliminary Design Review team

- NASA Group Achievement Award (2017)
  For exceptional AirMSPI science planning, sensor operations, ground support, calibration, and data processing during the CalWater-2, RADEX, ImPACT-PM, and ORACLES campaigns
- Dutch National Academic Year Award (2012)
  For the organization of a national citizen science project to measure air quality with smartphones, including the development and distribution of 10,000 spectropolarimetric iPhone camera add-ons and app, and the storage and scientific interpretation of the iSPEX imagery.

Manuscript Reviewing

- Earth and Space Science, American Geophysical Union
- Journal of Quantitative Spectroscopy and Radiative Transfer, Elsevier
- Optics Communications, Elsevier
- Remote Sensing of Environment, Elsevier
- Atmospheric Measurement Techniques, European Geosciences Union
- Applied Optics, Optical Society
- Optics Express, Optical Society
- Journal of Vacuum Science and Technology, American Institute of Physics

Publications

1. *Intercomparison of biomass burning aerosol optical properties from in situ and remote-sensing instruments in ORACLES-2016*
   Pistone, K., Redemann, J., Doherty, S., Zuidema, P., Burton, S., Cairns, B., Cochrane, S., Ferrare, R., Flynn, C., Freitag, S., Howell, S. G., Kacenelenbogen, M., LeBlanc, S., Liu, X., Schmidt, K. S., Sedlacek III, A. J., Segal-Rozenhaimer, M., Shinozuka, Y., Stamnes, S., van Diedenhoven, B., **van Harten, G.**, Xu, F., Atmospheric Chemistry and Physics 19:9181-9208, 2019
2. *SPEX airborne spectropolarimeter calibration and performance*
   Smit, J. M., Rietjens, J. H. H., **van Harten, G.**, Di Noia, A., Laauwen, W., Rheingans, B. E., Diner, D. J., Cairns, B., Wasilewski, A. P., Knobelspiesse, K. D., Ferrare, R. A., Hasekamp, O. P., Applied Optics 58:5695-5719, 2019
3. *Intercomparison of airborne multi-angle polarimeter observations from the Polarimeter Definition Experiment (PODEX)*
   Knobelspiesse, K., Tan, Q., Bruegge, C., Cairns, B., Chowdhary, J., van Diedenoven, B., Diner, D., Ferrare, R., **van Harten, G.**, Jovanovic, V., Ottaviani, M., Redemann, J., Seidel, F., Sinclair, K., Applied Optics 58:650-669, 2019
4. *Calibration and validation of Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) polarization measurements*
   Van Harten, G., Diner, D. J., Daugherty, B. J. S., Rheingans, B. E., Bull, M. A., Seidel, F. C., Chipman, R. A., Cairns, B., Wasilewski, A. P., Knobelspiesse, K. D., Applied Optics 57:4499-4513, 2018
5. *Coupled Retrieval of Liquid Water Cloud and Aerosol Above Cloud Properties using the Airborne Multiangle SpectroPolarimetric Imager (AirMSPI)*
   Xu, F., **van Harten, G.**, Diner, D. J., Davis, A. B., Seidel, F. C., Rheingans, B. E., Tosca, M. G., Alexandrov, M. D., Cairns, B., Ferrare, R. A., Burton, S. P., Fenn, M. A., Hostetler, C. A., Wood, R., Redemann, J., Journal of Geophysical Research 123:3175-3204, 2018
6. *Spectropolarimetry for earth observations: a novel method for characterization of aerosols and clouds*

Van der Togt, O., Verlaan, A., Moddemeijer, K., Smit, M., Rietjens, J., Hasekamp, O. P., Stam, D., Snik, F., **van Harten, G.**, Proceedings of SPIE 10564, 2017

7. *Polarization Modeling and Predictions for DKIST Part 2: Application of the Berreman Calculus to Spectral Polarization Fringes of Beamsplitters and Crystal Retarders*
   Harrington, D., Snik, F., Keller, C. U., Sueoka, S., **van Harten, G.**, Journal of Astronomical Telescopes, Instruments, and Systems 3:048001, 2017
8. *Coupled retrieval of aerosol properties and land surface reflection using the Airborne Multiangle SpectroPolarimetric Imager*
   Xu, F., **van Harten, G.**, Diner, D. J., Kalashnikova, O. V., Seidel, F. C., Bruegge, C. J., Dubovik, O., Journal of Geophysical Research 122:7004-7026, 2017
9. *Joint retrieval of aerosol and water-leaving radiance from multi-spectral, multi-angular and polarimetric measurements over ocean*
   Xu, F., Dubovik, O., Zhai, P.-W., Diner, D. J., Kalashnikova, O. V., Seidel, F. C., Litvinov, P., Bovchaliuk, A., Garay, M. J., **van Harten, G.**, Davis, A. B., Atmospheric Measurement Techniques 9:2877–2907, 2016
10. *A multi-domain full-Stokes polarization modulator that is efficient for 300-2500 nm spectropolarimetry*
    Snik, F., **van Harten, G.**, Alenin, A. S., Vaughn, I. J., Tyo, J. S., Proceedings of SPIE 9613, 2015
11. *Accurate spectrally modulating polarimeters for atmospheric aerosol characterization*
    Rietjens, J. H. H., Smit, J. M., **van Harten, G.**, Di Noia, A., Hasekamp, O. P., de Boer, J., Volten, H., Snik, F., Keller, C. U., Proceedings of SPIE 9613, 2015
12. *Preliminary design of the full-Stokes UV and visible spectropolarimeter for UVMag/Arago*
    Pertenais, M., Neiner, C., Pares, L., Petit, P., Snik, F., **van Harten, G.**, Proceedings of IAU 305:168–174, 2015
13. *Use of neural networks in ground-based aerosol retrievals from multi-angle spectropolarimetric observations*
    Di Noia, A., Hasekamp, O. P., **van Harten, G.**, Rietjens, J. H. H., Smit, J. M., Snik, F., Henzing, J. S., de Boer, J., Keller, C. U., Volten, H., Atmospheric Measurement Techniques 8:281–299, 2015
14. *Spectropolarimetry for planetary exploration*
    Van Harten, G., PhD thesis, Leiden University, 2014
15. *Atmospheric aerosol characterization with a ground-based SPEX spectropolarimetric instrument*
    Van Harten, G., de Boer, J., Rietjens, J. H. H., Di Noia, A., Snik, F., Volten, H., Smit, J. M., Hasekamp, O. P., Henzing, J. S., Keller, C. U., Atmospheric Measurement Techniques 7:4341–4351, 2014
16. *Mapping atmospheric aerosols with a citizen science network of smartphone spectropolarimeters*
    Snik, F., Rietjens, J. H. H., Apituley, A., Volten, H., Mijling, B., Di Noia, A., Heikamp, S., Heinsbroek, R. C., Hasekamp, O. P., Smit, J. M., Vonk, J., Stam, D. M., **van Harten, G.**, de Boer, J., Keller, C. U., Geophysical Research Letters 41:7351–7358, 2014
17. *SPEX: a highly accurate spectropolarimeter for atmospheric aerosol characterization*
    Rietjens, J. H. H., Smit, J. M., Di Noia, A., Hasekamp, O. P., **van Harten, G.**, Snik, F., Keller, C. U., Proceedings of ICSO, 2014
18. *Exact bound-bound Gaunt factor values for quantum levels up to n=2000*
    Morabito, L. K., **van Harten, G.**, Salgado, F., Oonk, J. B. R., Röttgering, H. J. A., Tielens, A. G. G. M., Monthly Notices of the Royal Astronomical Society 441:2855–2860, 2014
19. *UVmag: Space UV and visible spectropolarimetry*
    Pertenais, M., Neiner, C., Pares, L., Petit, P., Snik, F., **van Harten, G.**, SPIE 9144, 2014

20. *Five-dimensional optical instrumentation: combining polarimetry with time-resolved integral-field spectroscopy*
    Rodenhuis, M., Snik, F., **van Harten, G.**, Hoeijmakers, J., Keller, C. U., SPIE 9099, 2014
21. *Spectral line polarimetry with a spectral modulation polarimeter*
    Van Harten, G., Snik, F., Rietjens, J. H. H., Smit, J. M., Keller, C. U., Applied Optics 53:4187–4194, 2014
22. *Mirror contamination in space I: mirror modelling*
    Krijger, J. M., Snel, R., **van Harten, G.**, Rietjens, J. H. H., Aben, I., Atmospheric Measurement Techniques 7:3387–3398, 2014
23. *Design of a full-Stokes polarimeter for VLT/X-shooter*
    Snik, F., **van Harten, G.**, Navarro, R., Groot, P. J., Kaper, L, de Wijn, A. G., SPIE 8446, 2012
24. *Spectropolarimeter for planetary exploration (SPEX): performance measurements with a prototype*
    Voors, R. H. M., Moon, S. G., Hannemann, S., Rietjens, J. H. H., **van Harten, G.**, Snik, F., Smit, J. M., Stam, D. M., Keller, C. U., Laan, E. C., Verlaan, A. L., Vliegenthart, W. A., ter Horst, R., Navarro, R., Wielinga, K., Proceedings of SPIE 8176, 2011
25. *Prototyping for the Spectropolarimeter for Planetary EXploration (SPEX): calibration and sky measurements*
    Van Harten, G., Snik, F., Rietjens, J. H. H., Smit, J. M., de Boer, J., Diamantopoulou, S., Hasekamp, O. P., Stam, D. M., Keller, C. U., Laan, E. C., Verlaan, A. L., Vliegenthart, W. A., ter Horst, R., Navarro, R., Wielinga, K., Hannemann, S., Moon, S. G., Voors, R. H. M., Proceedings of SPIE 8160, 2011
26. *SPEX: The Spectropolarimeter for Planetary EXploration*
    Rietjens, J. H. H., Snik, F., Stam, D. M., Smit, J. M., **van Harten, G.**, Keller, C. U., Verlaan, A. L., Laan, E. C., ter Horst, R., Navarro, R., Wielinga, K., Moon, S. G., Voors, R. H. M., Proceedings of ICSO, 2010
27. *SPEX: the spectropolarimeter for planetary exploration*
    Snik, F., Rietjens, J. H. H., **van Harten, G.**, Stam, D. M., Keller, C. U., Smit, J. M., Laan, E. C., Verlaan, A. L., ter Horst, R., Navarro, R., Wielinga, K., Moon, S. G., Voors, R. H. M., Proceedings of SPIE 7731, 2010
28. *Polarization properties of real aluminum mirrors, I. Influence of the Aluminum Oxide Layer*
    Van Harten, G., Snik, F., Keller, C. U., Publications of the Astronomical Society of the Pacific 121:377–383, 2009

Technical Documents

1. *Multi-Angle Imager for Aerosols (MAIA) Calibration Plan*
   Bruegge, C. J., Sandhu, J., **van Harten, G.**, Jovanovic, V., JPL D-101520, 2019
2. *MAIA Dual PEM EM Performance Test Plan*
   Van Harten, G., Hancock, B., JPL D-101542, 2018
3. *AirMSPI Level 2 Cloud Droplet Size and Cloud Optical Depth Product Quality Statement: RADEX Campaign*
   Van Harten, G., Xu, F., Diner, D. J., McDuffie, J. L., Tkatcheva, I. N., Garay, M. J., Nastan, A. M., JPL D-102564, 2018
4. *AirMSPI Level 2 Cloud Droplet Size and Cloud Optical Depth Product Quality Statement: CalWater-2 Campaign*
   Van Harten, G., Xu, F., Diner, D. J., McDuffie, J. L., Tkatcheva, I. N., Garay, M. J., Nastan, A. M., JPL D-102565, 2018

5. *AirMSPI Data Quality Statement: ImPACT-PM Campaign*
   Diner, D. J., Garay, M. J., Bruegge, C. J., Seidel, F. C., Bull, M. A., Jovanovic, V. M., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.**, Xu, F., Nastan, A. M., JPL D-101766, 2018
6. *AirMSPI Data Quality Statement: SPEX-PR Campaign*
   Diner, D. J., Garay, M. J., Bruegge, C. J., Seidel, F. C., Bull, M. A., Jovanovic, V. M., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.**, Xu, F., Nastan, A. M., JPL D-101765, 2018
7. *AirMSPI Data Quality Statement: ACEPOL Campaign*
   Diner, D. J., Garay, **van Harten, G.**, Nastan, A. M., Rheingans, B. E., M. J., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Xu, F., JPL D-101764, 2018
8. *AirMSPI Data Quality Statement: RADEX Campaign*
   Diner, D. J., Garay, **van Harten, G.**, Nastan, A. M., Rheingans, B. E., M. J., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Xu, F., Seidel, F. C., JPL D-101763, 2018
9. *AirMSPI Data Quality Statement: CalWater-2 Campaign*
   Diner, D. J., Garay, **van Harten, G.**, Nastan, A. M., Rheingans, B. E., Seidel, F. C., M. J., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Xu, F., JPL D-101762, 2018
10. *AirMSPI Data Quality Statement: SEAC^{4}RS Campaign*
    Diner, D. J., Garay, M. J., Bruegge, C. J., Seidel, F. C., Bull, M. A., Jovanovic, V. M., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.**, Xu, F., Nastan, A. M., JPL D-100824, 2018
11. *Data Product Specification for the AirMSPI Level 1B2 Products (V006)*
    Diner, D. J., Garay, M. J., Seidel, F. C., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.,** Nastan, A. M., Hansen, E. G., JPL D-100825, Rev. C, 2018
12. *Data Product Specification for the AirMSPI Level 1B2 Products (V005)*
    Diner, D. J., Garay, M. J., Seidel, F. C., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.,** Nastan, A. M., Hansen, E. G., JPL D-100825, Rev. B, 2018
13. *Multi-Angle Imager for Aerosols (MAIA) Level 1B1 Radiance Data Product Algorithm Theoretical Basis Document*
    Bruegge, C. J., **van Harten, G.**, Bull, M. A., Hancock, B. R., Sandhu, J. S., JPL D-98491, 2017
14. *AirMSPI Level 2 Cloud Droplet Size and Cloud Optical Depth Product Quality Statement: ORACLES Campaign*
    Van Harten, G., Xu, F., Diner, D. J., McDuffie, J. L., Tkatcheva, I. N., Garay, M. J., Nastan, A. M., JPL D-101481, 2017
15. *Cloud Droplet Size and Optical Depth Retrieval Algorithm Theoretical Basis*
    Xu, F., Diner, D. J., McDuffie, J. L., Garay, M. J., Tkatcheva, I. N., Bull, M. A., Seidel, F. C., **van Harten, G.**, Davis, A. B., Di Girolamo, L., Fu, D., Su, M., Zhao, G., JPL D-100521, 2017
16. *AirMSPI Data Quality Statement: ORACLES Campaign*
    Diner, D. J., Garay, M. J., Seidel, F. C., Bruegge, C. J., Jovanovic, V. M., Bull, M. A., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.**, Nastan, A. M., Xu, F., JPL D-100522, 2017
17. *AirMSPI radiometric / polarimetric uncertainties*
    Diner, D. J., **van Harten, G.**, 2017
18. *AirMSPI Data Quality Statement: PODEX Campaign*
    Diner, D. J., Garay, M. J., Bruegge, C. J., Seidel, F. C., Bull, M. A., Jovanovic, V. M., Tkatcheva, I. N., Rheingans, B. E., **van Harten, G.**, JPL D-97927, 2017

Presentations

1. **SPIE Remote Sensing**, Strasbourg, FR, Sep 9—12, 2019
   From AirMSPI to MAIA: Studying health effects of airborne particulate matter using multiangle, multispectral imaging polarimetry

2. **MAIA Pre-CDR Calibration Peer Review**, Pasadena, CA, USA, Feb 21, 2019
   Polarization products and calibration
3. **AGU Fall Meeting**, Washington, DC, USA, Dec 10—14, 2018
   Radiometric and Polarimetric Calibration of AirMSPI for ACEPOL, and Level 1 Data Comparisons with AirHARP, RSP, and SPEX Airborne (poster)
4. **ORACLES Science Team Meeting**, Mountain View, CA, USA, June 5—7, 2018
   AirMSPI cloud and aerosol retrievals for ORACLES 2016
5. **MISR Science Team Meeting**, Pasadena, CA, USA, Feb 14—15, 2018
   Remote sensing of aerosols and clouds using AirMSPI: from raw data to science products (poster)
6. **AGU Fall Meeting**, New Orleans, LA, USA, Dec 11—15, 2017
   First results of AirMSPI imaging polarimetry at ORACLES 2016: aerosol and water cloud retrievals (poster)
7. **MAIA Preflight Calibration Peer Review**, Pasadena, CA, USA, Nov 13, 2017
   Polarization products and calibration
8. Colloquium, **SRON Netherlands Institute for Space Research**, Utrecht, NL, Oct 31, 2017
   Remote Sensing of Atmospheric Aerosols and Clouds Using High-Accuracy Polarimetry
9. **1st International Workshop on Advancement of polarimetric observations: calibration and improved aerosol retrievals (APOLO2017)**, Hefei, CN, Oct 24—27, 2017
   Calibration and validation of AirMSPI / MAIA polarimetric imagery
10. **SPIE Optics and Photonics**, San Diego, CA, USA, Aug 6—10, 2017
    Remote sensing of atmospheric aerosols and clouds using the AirMSPI imaging polarimeter during ORACLES 2016
11. **ORACLES Science Team Meeting**, Mountain View, CA, USA, May 15—18, 2017
    AirMSPI cloud retrievals in ORACLES 2016
12. Colloquium, **University of Arizona**, Tucson, AZ, USA, Jan 17, 2017
    Remote sensing of atmospheric aerosols and clouds using high-accuracy polarimetry
13. **AGU Fall Meeting**, San Francisco, CA, USA, Dec 12—16, 2016
    Calibration of Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) polarization measurements, and in-flight comparisons with the Research Scanning Polarimeter (RSP) and the Spectropolarimeter for Planetary EXploration (SPEX) (poster)
14. **MISR Science Team Meeting**, Pasadena, CA, USA, Dec 8—9, 2016
    AirMSPI cloud droplet size retrievals during ORACLES
15. **MISR Science Team Meeting**, Pasadena, CA, USA, Dec 8—9, 2016
    Calibration of Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) polarization measurements, and in-flight comparisons with the Research Scanning Polarimeter (RSP) and the Spectropolarimeter for Planetary EXploration (SPEX) (poster)
16. **MISR Science Team Meeting**, Pasadena, CA, USA, Feb 18—19, 2016
    On-board calibration of Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) polarization measurements (poster)
17. **AGU Fall Meeting**, San Francisco, CA, USA, Dec 17, 2015
    On-board calibration of Airborne Multiangle SpectroPolarimetric Imager (AirMSPI) polarization measurements (poster)
18. Colloquium, **Leiden Observatory**, NL, Nov 6, 2014
    Spectropolarimetry for planetary exploration
19. Seminar, **Jet Propulsion Laboratory**, Pasadena, CA, USA, May 9, 2014
    Novel Modulation Techniques for Planetary and Stellar Spectropolarimetry

20. **SPIE Defense, Security, and Sensing**, Baltimore, MD, USA, May 5, 2011
    Atmospheric aerosol characterization through ground-based SPEX and iSPEX multi-angle spectropolarimetry
21. **Lorentz Center Workshop on Polarimetric Techniques & Technology**, Leiden, NL, Mar 24, 2014
    The SPEX instrument: measurement concept, polarimetric calibration, ground-based measurements
22. Seminar, **University of Arizona**, Tucson, AZ, USA, Dec 19, 2013
    Novel Modulation Techniques for Planetary and Stellar Spectropolarimetry
23. **AGU Fall Meeting**, San Francisco, CA, USA, Dec 10, 2013
    Remote Sensing of Atmospheric Aerosols with the SPEX Spectropolarimeter (poster)
24. Science Discussion, **HAO/NCAR**, CO, USA, Dec 6, 2013
    Full-Stokes Polychromatic Modulators for X-shooter and the ExPo IFU
25. OLEG Seminar, **North Carolina State University**, NC, USA, Dec 5, 2013
    A Full-Stokes Polarimetric IFU
26. Atmospheric Physics Brown Bag, **University of Maryland, Baltimore County**, MD, USA, Dec 3, 2013
    SPEX: Remote Sensing of Atmospheric Aerosols
27. **Calibration Workshop of the MP1104 COST Action**, Zurich, CH, Jan 24, 2013
    Design of a Partially Polarized Calibration Stimulus
28. **370 Years of Astronomy in Utrecht**, Noordwijkerhout, NL, Apr 2—5, 2012
    SPEX Instruments for Measuring Atmospheric Aerosol (poster)
29. **MP1104 COST Action 1st WG meeting**, Warsaw, PL, May 9, 2012
    SPEX (Spectropolarimeter for Planetary EXploration): instruments for atmospheric aerosol characterization
30. **PEGASOS-NL Meeting**, Bilthoven, NL, Nov 14, 2012
    Remote aerosol characterization with a ground-based SPEX spectropolarimeter
31. **NOVA Fall School**, Groningen, NL, Oct 3, 2012
    SPEX: Spectropolarimeter for Planetary EXploration
32. **Workshop on Polarimetry with Extremely Large Telescopes**, Utrecht, NL, Nov 30, 2011
    Polychromatic Modulators
33. **Workshop on Polarimetry with Extremely Large Telescopes**, Utrecht, NL, Nov 29—Dec 1, 2011
    Prototyping for the Spectropolarimeter for Planetary Exploration (SPEX) (poster)
34. **SPIE Optics and Photonics**, San Diego, CA, USA, Aug 22, 2011
    Spectropolarimeter for Planetary EXploration (SPEX); Prototyping: calibration and sky measurements
35. **Second International Summer School on Solar and Stellar Polarizations**, Yibin, CN, July 16, 2011
    Spectropolarimeter for Planetary Exploration
36. **Dutch Astronomy Conference**, Texel, NL, May 18—20, 2011
    Prototyping for the Spectropolarimeter for Planetary Exploration (SPEX) (poster)