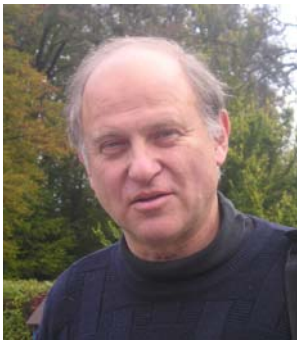
"Curriculum Vitae" of Thomas Trickl



Born in Munich (Germany) on March 27, 1953

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1972-1978 Studies of physics at the Technical University of Munich, diploma work on radiation-induced lattice defects in molybdenum, characterized by ^{181}Ta Mößbauer spectrometry (supervisor: Prof. W. Gläser)

1979-1982 Doctoral studies at the Max-Planck Institute for Quantum Optics, title of thesis: "Laser-spectroscopic Studies of Iodine Monofluoride, formed in the Reactions of Fluorine Atoms with Iodine Halides" (supervisor: Prof. H. Walther)

January 1983: Graduation at the University of Munich (Ludwig-Maximilians-Universität)

1982-1986 Scientist at the Max-Planck Institute for Quantum Optics, precision spectroscopic study of IF; improved spectra of the faint IF chemiluminescence accompanying the F + IX reactions. Later (in the division of Prof. K. L. Kompa): Development of a state-selected beam of nitrogen ions generated by resonance-enhanced multi-photon ionization; spectroscopic studies of the Lyman-Birge-Hopfield band system of N_2

1986-1987 Postdoctoral Fellow at the Lawrence Berkeley Laboratory and the University of California in Berkeley (host: Prof. Y. T. Lee), highlights:

- development of the spectrally brightest tunable extreme-ultraviolet (XUV) radiation source to that date (bandwidth in the 90-120 nm range roughly 155 MHz), based on sum-frequency mixing with a near-transform-limited powerful dye laser system (130 mJ, 78 MHz bandwidth), in co-operation with Dr. A. H. Kung
- Design and construction of a large molecular-beam photo-ionization experiment
- High-resolution photo-ionization spectroscopy of H_2, N_2 (state-selected ionization; substantial improvement of the value of the N_2 ionization energy), and Kr (XUV frequency determination at a relative uncertainty level of 6×10^{-9}, detailed hyperfine and lifetime studies for five states)
- Development of a liquid-nitrogen-cooled pulsed source of hydrogen molecules; photo-ionization studies of H_2 and $(H_2)_2$ with tunable XUV laser light at 74 and 80 nm
- 1986: Nobel Price in Chemistry for Prof. Y. T. Lee

1988-1989 Scientist at the the Max-Planck Institute for Extraterrestric Physics; DFG-funded project on the investigation of ion-molecule reactions under interstellar conditions; revision of the parametrization of the Lyman-Birge-Hopfield system of the nitrogen molecule.

1989 Second visit to Berkeley, attempt of a high-accuracy measurement (uncertainty < 15 MHz) of the ionization energy of H_2 with two transform-limited pulsed dye lasers

1990-2018 Senior scientist at the Fraunhofer Institute for Atmospheric Environmental Research (IFU) in Garmisch-Partenkirchen (since 2002: Forschungszentrum Karlsruhe (now: Karlsruher Institut für Technologie, KIT), IMK-IFU); field: development and application of laser remote sensing methods; highlights:

Lidar System Development:

Development of seven wide-range mobile and stationary lidar systems for accurate measurements of atmospheric trace constituents (ozone, water vapour and aerosol); a number of important novel technical approaches were introduced. In detail:

- Two differential-absorption ozone lidar (DIAL) systems (stationary and mobile), featuring uncertainty levels of 5 % and less in a major part of the operating range; the stationary system is the primary work horse of lidar-based atmospheric research at IFU. The mobile system, developed in co-operation with OHB System (Bremen), was applied during a number of field campaigns before it was destroyed during a major flooding event in May 1999.
- A powerful water-vapour DIAL based on a 250 mJ/20-Hz single-mode Ti:sapphire laser; the system is operated at the Schneefernerhaus research station (UFS) at 2675 m a.s.l. and provides measurements throughout the free troposphere. Upgraded Littman-type single-mode optical parametric oscillator serve as the oscillators and were further optimized in co-operation with Radiant Dyes.
- Since 2009, a high-power Raman lidar system for extending the water-vapour measurements into the stratosphere has been developed alongside the H_2O DIAL at UFS. This system is based on a 180-W single-line XeCl laser and a receiver with a 1.5-m-diameter primary mirror. The system provides water-vapour profiles up to 25 km and temperature profiles to more than 80 km, both for measurement times of just one hour.
- A high-spectral-resolution aerosol lidar (HSRL): The IFU three-wavelength mobile aerosol lidar originally built in 1978 was modernized and a 532-nm HSR channel was added. The lidar was successfully tested during the EARLINET intercomparison campaign in Leipzig (2009).
- An eye-safe 1.56-µm aerosol lidar based on stimulated Raman shifting 1064-nm radiation in deuterium.
- Contributions for a new transportable spatially scanning lidar system for boundary-layer applications (ATMONSYS).

Research:

- Validation studies for lidar aerosol backscatter measurements; contributions to several aerosol field campaigns for characterizing the impact of Alpine and marine aerosol on visibility conditions.
- As an essential part of the efforts of IFU to convert the former hotel Schneefernerhaus into a high-altitude research station a research programme for lidar measurements of water vapour and potentially other trace was initiated. Two H_2O lidar systems (DIAL, Raman) were built and successfully applied in atmospheric studies.
- Investigation of the impact of atmospheric transport on the vertical distribution of atmospheric trace constituents, with emphasis on the Alpine wind system, stratosphere-to-troposphere transport and long-range (intercontinental) transport of polluted air masses, fire plumes and North African and Asian dust.

- 1996: first detection of pronounced North American ozone plumes over Europe; the first publication on this topic [A. Stohl, T. Trickl, Journal of Geophysical Research **104** (1999), 30445] defines a "Fast Moving Research Front" in Geosciences (Thomson ISI, July 2005).
- Since 2007 a programme of routine lidar measurements of tropospheric ozone, water vapour and aerosol has been conducted, during daytime as the only station world-wide. A special highlight has been the detection of the extremely low water-vapour content of deep stratospheric air intrusions into the troposphere suggesting very low free-tropospheric mixing of air masses. These findings imply a considerable challenge for tropospheric modelling.
- A strong impact of stratospheric air intrusions on the troposphere was found. Intrusions have been detected in the free troposphere on 84 % of the lidar measurement days between 2007 and 2016. Starting in 2020 the high stratospheric ozone fraction was quantified for the Zugspitze summit (2962 m a.s.l.), based on observational data alone (1970-2020), revising a preliminary study by H. E. Scheel in 2005. The increase of this contribution since the 1970s went along with a considerable drying, in agreement with the global humidity trend in the free troposphere. A lowering in trend of both ozone and humidity was observed around 2003, after the emission of the sun started to diminish.
- Principal investigator in numerous national and international research projects, the most important ones being the EUROTRAC subprojects TESLAS, TOR and TOR 2, the EU projects VOTALP, VOTALP II, STACCATO, EARLINET, and the project ATMOFAST funded within the programme "Atmosphärenforschung 2000" of the German Federal Ministry of Education and Research; work-package co-ordinator in two EU projects
- Principal investigator in the European Aerosol Research Lidar Network (EARLINET), now a part of the European research infrastructure ACTRIS; initiative for the participation of IMK-IFU (and, thus, KIT) in ACTRIS.
- Co-ordinator of the project ATMOFAST (Atmospheric Long-range Transport and its Impact on the Trace-gas Distribution in the Free Troposphere over Central Europe, research programme "Atmosphärenforschung 2000" of the German Federal Ministry of Education and Research); as of 2014, ATMOFAST contributed to 22 reviewed publications.
- Member of the Task Force on Hemispheric Transport of Air Pollution, organized under the auspices of the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP Convention)
- Since 2000: Principal investigator for the aerosol lidar activities at Garmisch-Partenkirchen within the Network for the Detection of Atmospheric Composition Change (NDACC, formerly NDSC) focussing on the long-term vertical sounding series of the (mostly volcanic) stratospheric aerosol started in 1976. Fast aerosol removal from the lower stratosphere in the mid-latitudes contrasts the long-lasting contributions from strong tropical eruptions. Since 2016 the measurements have been continued in a range up to 45 km a.s.l. at UFS. This period covered several strong events of biomass-burning influencing the stratosphere up to more than 20 km and the Hunga Tonga volcanic plume in 2022 and 2023.
- Contributor to the Tropospheric Ozone Assessment Report (TOAR) initiated by the International Global Atmospheric Chemistry Project (IGAC) in 2014
- As of May 2023: 117 reviews for peer-reviewed journals and research organizations

Since 2019: Retired from KIT; ongoing publishing efforts and data analyses