Photonic spectroscopy for atmospheric chemistry applications

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Our world is changing at an accelerating rate. Climate change and air pollution are the two greatest environmental challenges facing society today. Atmospheric chemistry research is a key part of understanding and responding to these challenges. One of the five priority science areas in atmospheric chemistry research is the quantification of emissions and removal of gases and particles in a changing Earth system [1]. Developments of new analytical techniques, instruments, measurement platforms and modeling capabilities are needed to understand the complex problems in atmospheric chemistry.

In this presentation, we will overview our recent progress in the development and applications of high sensitivity spectroscopic instruments for *in situ* optical diagnostics of key atmospheric trace constituents (gases and particulates) in intensive field campaigns, in smog chamber and in laboratory investigation [2].

References

[1] The Future of Atmospheric Chemistry Research: Remembering Yesterday, Understanding Today, Anticipating Tomorrow. United States, National Academies Press, 2016. ISBN 978-0-309-44565-8 | DOI: 10.17226/23573

[2] Advances in Spectroscopic Monitoring of the Atmosphere, eds. by Weidong Chen, Dean S. Venables, Markus W. Sigrist, ISBN: 978-0-12-815014-6, Elsevier (2021)

Dr. Weidong CHEN received : his B.S. degree in Radio-Physics from Zhangshan University (Guangzhou, China), his M.S. and PhD degree in Physics from University of Sciences & Technologies of Lille in France. He is now full professor with Université du Littoral Côte d'Opale in France.

His current research projects focus on : (1) the developments of optical sensing instrumentation involving modern photonic light sources (such as quantum cascade lasers, difference-frequency generation sources, diode lasers, light emitting diodes, supercontinuum light) combined with high sensitivity spectroscopic techniques (like off-axis integrated cavity output spectroscopy, incoherent broadband cavity enhanced absorption spectroscopy, Faraday rotation spectroscopy, photoacoustic and quartz-enhanced photoacoustic spectroscopy, laser heterodyne radiometry, wavelength modulation and multipass direct absorption approaches); (2) Application of the developed photonic instruments in applied spectroscopy, optical metrology and sensing of key atmospheric species, including trace gases (concentration, isotope ratios, vertical concentration profile in the atmospheric column) and aerosols (optical properties), in laboratory, in smog chamber and in intensive field campaigns.