CSIR-NLC Mobile LIDAR – First Scientific Result

V. Sivakumar[1,2], M.Tesfaye[1,2], D. Moema[1,3], A. Sharma[1] and C. Bollig[1]

[1]*National Laser Centre, Council for Scientific and Industrial Research,*
P.O. Box 395, Pretoria 0001, South Africa

[2]*Department of Geology, Geoinformatics and Meteorology, University of Pretoria,*
Lynwood Road, Pretoria 0002, South Africa

[3]*Tshwane University of Technology, Pretoria 0001, South Africa*

Abstract

Laser radar, more popularly known as LIDAR (LIght Detection And Ranging) uses electromagnetic radiation at optical frequencies. LIDAR has become an excellent tool for monitoring the atmosphere in a relatively short period of time (a few seconds to minutes). Currently, LIDAR systems are used for studying the atmospheric structure and dynamics, trace constituents, aerosols, clouds, boundary and mixed layers and other meteorological applications [1].

Although ground-based LIDAR systems deployed for atmosphere studies in many developed countries, it is still a very novel technique for South Africa and African countries. There are currently two different LIDARs available in South Africa, located in Pretoria and Durban. Both LIDAR systems are similar in operation and specifications which permits the establishment of simultaneous measurement studies. The Durban LIDAR is operated at University of KwaZulu-Natal as part of cooperation between the Reunion University and the Service d'Aéronomie (CNRS, IPSL, Paris) for climate research studies. The Council for Scientific and Industrial Research (CSIR) National Laser Centre in South Africa has recently designed and developed a mobile LIDAR system (see. Figure) to contribute to atmospheric research in South Africa and African countries [2]. The CSIR mobile LIDAR [3] acts as an ideal tool to make measurements over Southern Hemisphere regions and this will encourage collaboration with other partners' in-terms of space-borne and ground based LIDAR measurements. At present, the system is capable of providing aerosol/cloud backscatter measurements for the height region from ground to 40 km with a 10 m vertical height resolution. The major advantage of the LIDAR is to provide the vertical cross-section of cloud including the thickness which is important for better understanding the cloud dynamics and the earth-radiation budget [2]. The cloud information is also useful for predicting the convective systems and rain. The LIDAR measurements will also elucidate the aerosol concentration, optical depth, cloud position, thickness and other general properties of the cloud which are important for a better understanding of the earth-radiation budget, global climate change and turbulence. In this paper, we present the obtained first scientific results from CSIR-NLC

mobile LIDAR and its validation/comparison with other ground and space-borne measurements. The LIDAR results are validated by using Stratosphere Aerosol Gas Experiment (SAGE) - Aerosol measurements, Optical depth derived from sun-photometer employed under AErosol RObotic NETwork (AERONET) and obtained backscatter co-efficient from radiosonde – Relative Humidity measurements.

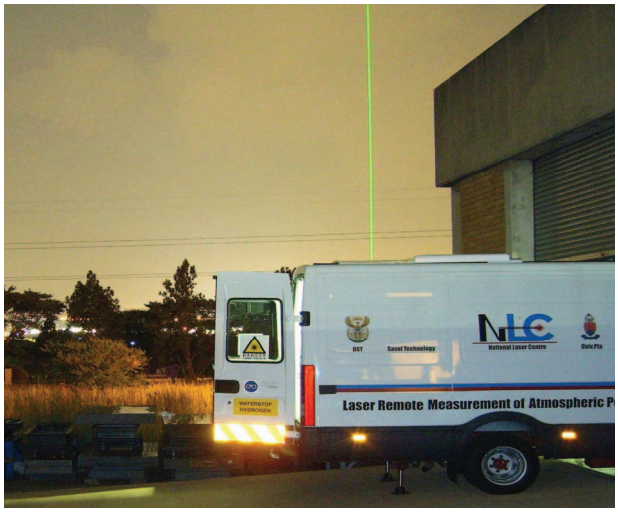

Figure-1: CSIR-NLC-Mobile LIDAR system

References

[1] LIDAR for ground and air borne trace gas detection, Chapter in a text book 'Lasers in Chemistry', edited by Maxwell Lackner, *Wiley-VCH publications*, Germany, 2008.

[2] Sivakumar, V., D. Moema, A. Sharma, N. Mbarah, C. Bollig, S. Malinga, G. Mengistu, H. Bencherif and P. Keckhut, LIDAR for Atmosphere Research over Africa – A trilateral research programme (LARA - trip), *Proceedings of 24th international laser radar conference*, 742-745, 2008.

[3] Sivakumar, V., A.Sharma, D. Moema, C. Bollig C. van der Westhuizen and H. van Wyk, CSIR-NLC South Africa Mobile LIDAR system description, *Proceedings of 24th international laser radar conference*, 99-102, 2008.