An overview of Middle atmosphere lidars at National Atmospheric Research Laboratory, India

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National Atmospheric Research Laboratory (13.45^{o}N, 79.17^{o}E), (NARL), Gadanki, India has been operating and maintaining Rayleigh and Mie lidars established under Indo-Japanese collaboration programme in the year 1998. The lidar system is primarily supporting middle atmospheric research areas. Many Scientific programmes like Equatorial Wave campaign (EW), Middle Atmospheric Dynamics (MIDAS) Programme, Tropical Tropopause Dynamics (TTD) experiment, Sudden Stratosphere Warming (SSW), Study of Atmospheric Forcing and Responses (SAFAR), Pre Monsoon Campaign (PMC) etc of ISRO/NARL have been carried out succesfully. The lidar system was utilised for validating and comparison of observations with Multiwavelength airglow photometer, Airglow Imager, Radiosonde, Doppler lidar, satellite based instruments and worked as a good complementary system for colocated MST radar in cloud studies.

Taking the limitations of colocated radar observations into consideration and to study atmospheric coupling processes and climatological purposes, a Rayleigh Doppler Lidar (RDL) has been developed indigenously in the year 2012 to measure winds in troposphere and stratosphere. Optical fiber coupling of the signal, tilting telescope in altitude-azimuth directions, monitoring stabilised laser parameters and motorised dome with shutters are some of the important features of the Doppler lidar system. Multi angle observations with this rotating telescope enabled unique measurements of aerosol parameters like optical depth, backscatter ratio etc.

Development of DIfferential Absorption Lidar (DIAL) system is under progress for monitoring ozone concentrations in tropopsphere and stratosphere. This will be empolyed to understand Upper Troposphere and Lower Stratosphere processes and to establish a relation between Cold Point Tropopause and ozone concentrations. Raman converter for generating ON-OFF wavelengths, Multitelescope approach for signal reception and monochromator for separation of the wavelengths are some of the important features of this system. Contribution from interfering gases is taken into account in data analysis.

An overview of middle atmospheric lidars, technology developments in new lidars and proposed lidars at NARL, India with new data analysis techniques/methods for improving the height coverage, signal to noise to ratio and for extraction of atmosphere parameters is discussed.