PL-TR-96-2080
Special Reports, No. 278

PROCEEDINGS OF THE 18TH ANNUAL CONFERENCE ON ATMOSPHERIC TRANSMISSION MODELS, 6-8 JUNE 1995

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18 April 1996

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LIDAR ATMOSPHERIC PROFILE SENSOR (LAPS): A REMOTE SENSING PROTOTYPE

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A sensor capable of measuring profiles of the atmospheric properties has been prepared. The Lidar Atmospheric Profile Sensor (LAPS) instrument is currently undergoing testing of its automated operation and determination of its accuracy under a wide range of meteorological conditions. The instrument measures the water vapor profile based on the vibrational Raman scattering and the temperature profile based on the rotational Raman scattering. These measurements provide a realtime profile of RF refractivity. Profiles are obtained from the surface to 7 km each 5 minutes, with a vertical resolution of 75 meters. The prototype instrument has been designed to provide the realtime measurements of profiles from an instrument which includes several sub-systems to automate and monitor the operation. The instrument includes an X-band radar which detects aircraft as they approach the beam and automatically protects a 6 degree cone angle around the beam. The instrument includes self calibration, performance testing and BIT to check many functions.

In addition to the water vapor and temperature profiles, the true extinction and ozone profiles are also measured. By comparing the molecular profiles of the N_2 vibrational and rotational Raman profiles with the neutral atmosphere gradient, the extinction profile can be obtained. The day time measurements of water vapor are determined using the solar blind ultraviolet wavelengths. The ratio of the N_2 and O_2 vibrational Raman measurements on the slope of the Hartley band of ozone provides the DIAL measurement of the ozone profile in the lower atmosphere, up to 3 km. Initial results from the instrument are presented. Eventual deployment of the LAPS instrument will provide results to test and improve the optical propagation models of the atmosphere.