LIDAR REMOTE SENSING FROM SPACE: NASA'S PLANS IN THE EARTH SCIENCES

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NASA, in collaboration with the Earth Sciences community, is developing a multidisciplinary study of the Earth System to provide a better understanding of the complex interrelated processes involved in that system. The name given to this NASA program is the Earth Observing System (Eos). Capabilities of the Space Station, both the polar orbiting platform and the lower inclination platforms, will be used to accommodate a number of large active and/or passive sensors. These platforms are well matched to the requirements of anticipated lidar instruments. Two lidar instruments being considered as part of the Eos payload are the Lidar Atmospheric Sounder and Altimeter (LASA) and the Laser Atmospheric Wind Sounder (LAWS). For each of these lidar instruments, a panel composed of earth scientists as well as laser technologists has been assembled to describe the science objectives and instrument characteristics.

The LASA instrument is separable into two portions: the atmospheric sounder component and the retroranging component. The LASA atmospheric sounder will sample the spatial distribution of several atmospheric parameters. Most significant in terms of improved understanding of the global hydrological cycle is atmospheric water vapor. Characteristic of a lidar instrument, LASA will provide high spatial resolution observations of water vapor and other atmospheric parameters, with limited coverage. These characteristics make LASA observations a strong contributor to synergistic studies utilizing observations from a number of other Eos sensors. The primary objective of the retroranging component of LASA will be to determine the precise three-dimensional position of specifically placed retro-reflectors and to sense how these retro-reflectors change position over monthly to yearly time periods.

The instrument concept for LAWS utilizes a lidar system capable of measuring the Doppler shift in the backscattered intensity to determine the wind velocity profile. The ability to directly measure atmospheric motions is a scientific goal crucial to future progress in the atmospheric sciences. Early testing of the LAWS concept is being considered for both the Shuttle and Space Station platforms. The current concept of the NASA Eos LASA and LAWS lidar systems will be described including their measurement objectives and evolution for follow-on flights.